AIA Best Practices:
When more is less: Why do we draw so many sheets?

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Summary

This Best Practice looks at the reasons for the growth in construction sheet count and makes suggestions for ways to pare down sheet sets to the essential.

A tale of two projects

On July 10, 1987, a set of construction documents was issued for a 36-story apartment building that contains 221 units and has 160 enclosed parking stalls (see image 1, left). For this project a total of 126 sheets were in the set of documents; of those, 38 were architectural sheets.

On April 15, 2005, a set of drawings was issued for a 64-story condominium building approximately twice the gross square footage, containing 334 units and 377 enclosed parking spaces with a few more amenities (see image 2, right). The construction documents for this project contained 768 total sheets with 354 architectural sheets.

IMAGE 1 AND IMAGE 2.

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While the projects are not apples to apples, there are similarities: They are each high-rise residential, some key members of the team are the same, and they are a product of the same architectural firm. The more recent project is larger and more complex, which would account for the necessity for more sheets—but not nine times as many architectural sheets or six times as many total sheets.

Changes in construction documents

Since the drawing of construction documents has become computerized there has actually been an increase in the number of sheets. The sheet count explosion over the past 20 years is indicative of an unstable system. More and more sheets are being added to construction document sets while the quality of the information communicated has decreased.

There is no direct correlation between the number of sheets in a set and the quality of construction documents. More is not necessarily better. In fact, it is a burden to the team in terms of manpower utilization and costs to produce sets of drawings that are unnecessarily large. So why is it that the construction documents have so many sheets?

Here are a number of reasons that sheet count has increased so dramatically:

- Underutilized paper space, including sheets with excessive unused white space; sheets are often issued with less than 25% of the space containing drawings/details.
- Details, drawings and sheets that provide minimal information; these include sheets of window types, floor plans or reflected ceiling plans that show very limited, isolated items such as sheets only displaying fire alarm devices and others showing partial building elevations with little additional information on them.
- The same section detail is drawn at three or four different scales; for example, ¼" scale reference wall sections, ¾" scale isolated details, and 3" large-scale details.
- Drawing "isolated parts" details and downloaded manufacturer details where the detail fails to sufficiently address integrated systems. Often there are other details in the set showing system interfacing, which renders the isolated parts redundant.
- Creating families of details where the details are slight modifications of each other but little new information is imparted. Sometimes this is done at the expense of details not being drawn that would show relevant new information; this is detailing in the comfort zone.
- Sheets of boilerplate details whether or not they are applicable or sufficiently specific to the project.
- Creating "system sheets" where a sheet consists of partial elevations, partial plans and maybe two wall sections. Only the wall sections provide new information. The partial elevations and partial plans are for reference.

- Retaining sheets that may have been relevant during the conceptual or schematic design phases but no longer provide useful information in either the design development or construction documents phases.

Causes

Below are five potential reasons a firm may be producing unnecessarily large construction document sets.

1. Design professionals do not have a clear idea of what constitutes a useful set of drawings.
2. There is a lack of planning and organization.
3. The ease with which the computer permits the generation of the same drawing, or portion of a drawing, within a set at an assortment of scales.
4. Staff simply do not check—and correct—their work prior to issue.
5. There is potentially more interest by some younger staff in the products that come from a computer (such as animated three-dimensional renderings) than the product that is created from the drawings (a building)

Decades ago, many people entered the architecture profession because they were inspired by built works that they had seen and wanted to emulate in their own way. The goal was to build beautiful, inspiring buildings. The virtual world of the computer can be a complete disconnect from that goal. With the changes in technology, some may find their goal is to create beautiful buildings in a virtual world through impeccably rendered building models. The built world can become secondary. The concern and focus shifts from such things as how to truly detail a window opening to learning the latest rendering software.

The profession has always had those who can create compelling graphic visions of a project necessary to convey information to clients. Now there is an increasing shortage of those with a great depth of understanding of what is required beyond that.

Computers and the generation gap

One of the noted causes addresses the ease by which the computer permits drawing modifications but doesn't necessarily allow architects to solve problems at a faster rate, or at least not at a proportionate rate. It is easy is to create drawings by changing scales, making slight modifications and extracting portions from drawings. It's not nearly as simple to create drawings and to solve new detail problems. There is a tendency for the architectural production staff to draw what is easy and in their comfort zone rather than solving new problems.

When computer-aided drawing replaced hand drawing, a disconnect developed between senior and younger technical staff on projects. There is a resistance by the younger generation to make paper prints and a resistance by the older generation to review drawings on computer screens. The paper "check set" is more difficult to produce than during the hand-drawn days. Project managers and project architects slipped into a habit of directing drawing tasks rather than addressing problem solving or detailing tasks.

Architects should focus their effort on understanding the intent of construction documents and provide clean and efficient drawings that communicate the required information. It is important to focus on the information that needs to be communicated. In the old days, when sheets were hand drawn, a great deal of planning went into sheet organization, scale of drawings, and exactly what sections and details were to be drawn, at what scale and what information was to be included. Today there seems to be much less planning and much more drawing.

About the contributor

Michael J. Lough, AIA, is a principal of Integral Consulting, a quality management consulting practice. The practice focuses on peer reviews and other technical services designed to assist firms and project teams in improving the successful implementation and execution of architectural projects. Clients include architects, owners, development management companies and contractors.

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