CSI-HOUSTON

TECHNICAL COMMITTEE

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THE ISSUE

Forward thinkers have undoubtedly embraced the electronic age and all its possibilities. The world is becoming smaller and the day is becoming shorter. Project teams are not always local to the jobsite or even to each other. Electronic data transfer, specifically construction submittals and record documents, can help to keep up with the complexity and fluidity of the modern construction project.

In this two-part series, we will review some of the practical, legal, and economic issues involved with electronic submittals. Part 1 will address the general discussion on file transfer protocols and electronic document review procedures. Part 2 will address file storage issues and archiving record drawings and closeout documents.

 PART 1

The current practice of submittal transmittal and review - hand-delivery of multiple printed copies – is fast becoming antiquated, time consuming, expensive, and wasteful. It has not kept up with current delivery process requirements and methods of documentation. New technologies - email, File Transfer Protocol (FTP) sites, and the proliferation of Web-based project management software allows for the opportunity to address issues such as redundant and concurrent review procedures, wasted effort and manpower, and sustainability issues such as wasted paper and resources. These new technologies also address current trends towards truncated and fast-tracked construction schedules by allowing for quicker submittal transfer and reproduction turn-around times. Furthermore, the increasing use of Building Information Modeling (BIM) foreshadows the need for integrated documentation procedures.

Knowledge of, and experience with the myriad issues involved with electronic submittals can reduce your exposure to misuse and mismanagement of the documents. Key to the understanding of the issues is to be diligent in your investigation of the issues. Be cautious of jumping into the use of electronic data transfer without reviewing the issues with the other team members. In fact, AIA A201-2007, *General Conditions of the Contract* requires that the parties "endeavor to establish necessary protocols governing such transmissions". [1] Who will be the administrator of the information? What file format will be used? How and where will the data eventually be archived? How will the graphic quality, resolution and representation of the original document be maintained? How long does the data need to be kept, and what is the most advantageous storage media for the particular requirements? How is the data kept

safe? How is your network kept safe? It is not the intent of this article to address all these issues, however; in general, it will provide much needed information for you to make educated and diligent decisions.

It should be noted that resistance by the lower-tiered contractors may be encountered, as many contractors do not have the facilities or resources to develop submittals electronically. The recommendation in these cases would be for the development of a hybrid process which allows for the conversion of paper-copy to electronic copy and back to paper-copy. This conversion should be the responsibility of the prime Contractor who should be the lead and responsible party for ensuring conformance with the process requirements acting as the "gate-keeper" between the subcontractors and the Architect and Owner.

In preparation for this article, numerous prime contractors, subcontractors, suppliers, and manufacturers representatives were interviewed. It was confirmed that the mindset regarding electronic submittals has lulled into obsolete procedural modes. Apparently, regardless of what has been specified in Division 01 submittal requirements, the "standard" in the industry is still to submit seven to 10 paper-copied prints. This may be lingering practice from the days of hand drafting when large-format copiers and scanners were not available. One copy was reviewed by the Architect and Engineer and annotated by hand, while the remaining copies were thus transcribed by inexperienced interns and/or administrative clerks whose billing rates were substantially less. There was a great possibility for mistakes. Recent times have seen the use of large format scanners and copiers to expedite the review process. The Architect only has to annotate and return one copy to the Contractor who can make numerous copies for distribution to the subcontractors and vendors. Though this alleviates the potential for transcription and typographical errors, the additional copies provided by the Contractor are usually tossed into the garbage unreviewed creating unnecessary waste. Delivery of the paper-copy submittals is also a road-block to expeditious review and poses its own set of issues as bicycle messengers, car messengers and overnight services scurry about getting the documents to and from the Architect and the Contractor. Wasted time, fuel and resources sets up the potential for additional mismanaged and lost documents.

Archiving has also become an issue as Architects and Owners fill warehouses full of shop drawings, samples, product data and record documents which may or may not ever be retrieved again. Costs for long-term storage during the statute period (10 years in Texas) can be burdensome, and the potential for fire and flood make these arrangements vulnerable to forces outside of the Architects, Owners, and Contractors control.

FILE TRANSFER

Contemporary business practice requires that these issues be addressed using modern solutions. Condensing the information electronically to a format that can be easily transferred back and forth between team members seems to be the next logical evolutionary step. However, be aware of the legal and copyright implications of using electronic documents. For more discussion on this matter, refer to the AIA/AGC *Recommended Practices* document 1.11 - <u>Electronic Construction Documents</u> . [2]

File Transfer Protocol (FTP) is often utilized as a simple solution to enable the electronic exchange of business information and data. The adoption of transferring files across the open Internet has been so universally widespread that businesses now consider this ability to be critical to everyday business operations. In fact, it's now estimated that 83% of businesses are using FTP to move and share files and data. [3]

Typically, Portable Document Format (PDF) files are used for file transfer within email and file transmission protocols. The most commonly used system is Adobe Acrobat. Acrobat is the standard in the business world, and most people are familiar with its features and abilities. As an alternative to Adobe Acrobat, Bluebeam Revu ® (www.bluebeam.com) provides similar features to Acrobat with an expanded ability to review, edit, and annotate large scale CAD documents. It includes mark-up features, as does Acrobat, but has enhanced FTP and email capabilities with specialized security features developed to protect CAD drawings. It also has PDF scaling features, bookmarking features, is text searchable, and has wider support of other types of documents like Tiff, JPG, GIF, BMP and DWF. One of the most important features is its comprehensive solution to render merged lines accurately from an AutoCAD drawing. This ensures that the PDF file can be shared and plotted as an exact scalable representation.

Basic FTP can be a practical and viable method to transfer files if the data being transported is not critical, has no requirement for security and is not considered high risk. However, basic FTP itself is a weak link in the process of transferring confidential data due to its inherent lack of security and data management.

The original specification of the FTP protocol included minimal, if any, security. As FTP protocol use has increased and the Internet has evolved and become more accessible, the security limitations of FTP have been exposed. For example, the standard FTP specification does not include the use of strong authentication, such as encrypted passwords or authentication tokens. Sending the login credentials in clear text allows cyber-thieves to hack login information, which can then be used to gain unauthorized access to data. Even worse, the standard FTP does not encrypt the connection that files and data are being transferred over. Nor does it encrypt the files being transferred. Unencrypted file transfer, which can potentially allow a cyber attack and unauthorized viewing of data either during transmission or in storage on the server, has become a huge privacy concern today.

Regulatory compliance is another challenge that many companies are now faced with. In order to meet the legal requirements of compliance regulations, data must be managed throughout the file transfer business process. Businesses must sufficiently protect information from harm, whether health or financial records, customer accounts, or intellectual property such as shop drawings or design drawings. Audit trails which prove the safe management and secure movement of information are now a requirement of auditors. In such environments, standard FTP is not enough, due to its lack of strong security, data management, monitoring, and process control.

File Transfer Format Comparisons

	Location	Organize Email	Markups & Annotation	Submittal Exchange	RFI Exchange	Automatic Transmittals	Automatic Notification	External Collaborative	Version Tracking / Date Stamp	Search Features	Archiving	File Size Limitations	BIM Capable	Document Management	Project Management	Cost Basis
Attolist	Web	✘	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	M/Y
NewForma	Local	✔	✘	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	Y
Submittal Exchange	Web	✘	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	P
Buzzsaw	Web	✘	✘	✘	✔	✔	✔	✔	✔	✘	✔	✘	✔	✔	✔	Y/U
FTP Site	Web	✘	✘	✘	✘	✘	✘	✘	✘	✘	✘	✘	✘	✘	✘	Y
Email	Local	✘	✘	✘	✘	✘	✘	✘	✘	✘	✘	✘	✘	✘	✘	n/a

Y = Yearly   M/Y = Monthly or Yearly   P = Per Project   Y/U = Yearly Per User

*Attolist annotation software sold at discount through Bluebeam. Bluebeam Revu® included for free with Submittal Exchange.

There are project information management software options at your disposal that are specifically designed to overcome the problems with web-based file exchange for the construction industry. These software options help secure and increase the reliability of data transfer while providing encrypted data, file management and project monitoring, date stamping, tracking and searching, and project email management: Attolist (www.attolist.com), Newforma (www.newforma.com) and Submittal Exchange (www.submittalexchange.com) are AEC directed programs which assist in the entire Design and Construction Administration phases of a project.   Another notable information management package is Autodesk Buzzsaw® (www.autodesk.com) which is a view- on-demand online communication and collaboration file sharing program which assists in design, bid, construction, and facility management; however, it does not have submittal and file transfer features. Obviously, user preference will dicatate which software they use.

Costs range from $200 to $300 per month per project to $400 - $500 per yearly license per seat for unlimited use. Most programs are negotiable on cost based on project size or number of users. For example, at Submittal Exchange, the all inclusive fee will be about $2,000 for a project cost of $3,000,000 which is about 0.0065% of project cost. They claim to save the Owner about $15,000 in total net cost which includes savings in courier costs, printing costs, review time, and anticipated delays. On the other hand, Attolist charges about $235 per month per project on a month-to-month basis or $175 fixed fee per month per project paid up front. Buzzsaw costs about $11,250 for 25 seat licenses per year for unlimited use and unlimited projects.

DOCUMENT REVIEW

Regardless of which file transfer protocol is utilized, efficient document download and review procedures becomes imperative. Improper procedures could render the entire process futile. Once the submittals are transferred the process could run similarly to the conventional manner. Most cost effectively, the Architect would review the information directly from their PC. As previously mentioned, software is available that would allow annotations to be made directly on the electronic document without altering the original data. They could then attach an electronic transmittal, and return it to the Contractor without ever touching a hard copy. Less economical, but just as effective, the Architect could print the document, mark it up, re-scan it, and then attach a transmittal and return it to the Contractor. However, this additional step begins to go towards inadvertently deleting the purpose of the electronic process. Large shop drawing packages which require lots of coordination with other drawings, such as structural steel, casework, and curtainwall, or MEP submittals may need to be printed or may even need to be submitted conventionally. It will take some practice and training to review drawings on a computer monitor that were meant to be viewed full size. Furthermore, actual samples and color charts should also be submitted conventionally since photo-reproductions of samples and color charts may appear different on the computer and will not give a reliable representation of the material, color, texture, or patterns.

Ultimately the documents will also need to be stored by the Owner for facility management, and archived by the Architect. File storage and archiving can be a major investment. An entire fledgling market sector has grown from the need for digital data storage.

RECOMMENDATIONS

The decision to use electronic submittals should not be made unilaterally by the Architect, Owner, or Contractor. The decision should be made in collaboration with the project team with the ultimate goal delineated in the planning stages. If the goal is for the project to be delivered using integrated design and BIM, then requirements for 3-dimensional shop drawings may be in order. All of this information must be included in the Division 01 "Submittal Procedures" section of the Project Manual.

 If you choose to use an electronic submittal process, use it with the following in mind:

- *Invest in a software package that provides a safe, secure, encrypted transfer platform if you are concerned about copywrited material flowing freely across the internet, otherwise set up a FTP site of "dumping" of documents;*
- *Determine transferred file format, like PDF, and be consistent throughout the project;*
- *It may be helpful and advantageous to submit one hard paper copy with each electronic copy;*
- *It may be helpful to limit original size to 11x17 that can be easily printed, marked-up, scanned and returned;*
- *Use electronic submittals for submission of Shop Drawings, Product Data, calculations, and certifications only. Use electronic submittals for LEED submittals. Actual samples and color chart/chips should be submitted directly to the Architect. Submit original warranties and notarized affidavits directly to the Architect;*

- *Require transfer agreements and CAD waivers for use of CAD documents transferred electronically;*
- *Turn-around times should be clearly agreed upon at the beginning of the project;*
- *The prime general contractor or construction manager should be the responsible party for transmitting electronic submittals.*

REFERENCES

1. AIA A201 "General Conditions of the Contract for Construction" – 2007; §1.6.
2. http://www.agchouston.org/files/3632_1-11.12-03-Electronic_Construction_Documents.pdf
3. "The Why, What, and How of Managed File Transfer in Business", Ziff Davis Publishing, April 2007.