SHOULD ENGINEERING COMPANIES MAKE NATIVE DRAWING FILES AVAILABLE TO CONSTRUCTION?

Introduction:

The above question was never really asked on the pipingdesign.com forum. It is an appropriate one though to put the below opinions on the topic into context. The below are an edited summary of the opinions on this practise from one individual written in response to a comment made by another individual that their company sends native files to the construction company.

Summary:

I work for a producer (client) company and deal with several engineering companies. We specify that the deliverable to us will be IFC stamped hard copies of the engineered drawings, .dwg files for 2D projects and .dwg flattened from the 3D model (and the 3D model) for 3D projects. We also specify that .dwg files are not to be sent to any construction contractors without our prior approval. Hard stamped copies only are to be sent to contractors. There are rare times when we will allow the native file to be sent. For instance we approved sending native files to the company that were doing the engineered lifts. They requested them to bring information into their own drawings.

I'll share a couple of stories:

A couple of years ago an engineering company that was executing one of our major projects sent .dwg files of the piling to the surveying company. This was a 2D job by the way, no 3D. The surveying company imported these into their survey drawings and went their merry way staking out the plant. Months later the piperack modules started to arrive and of course were placed on the piling. Moving ahead, the mechanical contractor started to erect the connecting piping from the racks to the equipment and the spools weren't fitting. Too short in the horizontal on one side, and too long in the horizontal on the other. This was a 300m rack, and no connecting spools are fitting. It was determined very quickly that the rack was out by 1m north of the intended location. But why? The field were instructed to stay on schedule and do any cutting and rewelding required. The Stress Group also spent time reviewing all affected lines. In the meantime the PM wanted some answers. Cutting a long story short, the coordinates and dimensioning on all engineered hard copies were correct, but the .dwg file was worked on by an incompetent drafter who opted to edit the dimensions (un-associative) manually. This rather than to move the piles in the drawing to the correct location and allow the associative dimensioning to do it's thing for the IFC issue. The surveying company had not checked anything back against the stamped drawings and relied entirely on the integrity of the pile location within the .dwg file. Money can fix most problems and a million dollars of rework later it did all come together.

On another project and at a different engineering company. I walked by the sign-off table in Document Control and there were 22" x 34" large copies and 11" x 17" reduced copies of piping general arrangements laid out awaiting the engineer's stamping and sign-off. I'm a piping layout guy and a former checker. I'm drawn to piping drawings like a bee to honey. On the left side of the table are the large copies and on the right side the reduced, all nicely stacked in numerical order. It is a fluke that the readily viewable top copies of both piles had noticeable differences in the piping layout, small differences, but non-the-less differences. So I start asking some questions and again cutting a long story short, it turned out that the reduced copies were run from the same file as the large copies but several days apart. The designer, not totally happy with his layout had gone in during the interim and made changes. This after all the reviews, stress analysis and approvals of the layout.

It is due to incidents like the above that my company has the following requirements:

1. Full size general arrangements are plotted then stamped and signed by the engineer and approvers.
2. Reduced copies are only ever made from the full size copy.

3. Electronic copies are allowed, but only .pdf format made from the plotted stamped drawings. Never from the native files.
4. Everything is built from these stamped hard copies.
5. The engineering company must not send native files to any contractors without prior discussion and client approval, and a clear written instruction on the approved use of these files.

I know everyone wants to be the nice guy and help the other guy out, but the risks associated with transferring electronic files to end users who do not refer back to the actual stamped drawings can be substantial for the engineering company. Unless you have security on the files, and can guarantee the integrity of these files, I recommend that you do not do it. The outcome of my second story was that we went to the back-up files and everything was reinstated. No big deal as the differences had not left the office. The outcome to my first story was that we spent a million dollars to save ten thousand in drafting by the surveying company. My bosses accepted that mistakes happen and absorbed the cost. I'm not so sure another client would be so benevolent, and I wouldn't want to be the engineering company president on the defendant's side explaining to Judge Judy why they're not responsible. I always say to everyone that the only original, the one to be built to, is the one right in front of you. The hard copy with the engineer's stamp.

Some people feel it's ok to send drawing files just as long they're not editable and send .dwf. But the problem for engineering companies refers back to my story number two and securities around the file. The .dwf is made from the .dwg and until securities are in place that will guarantee that the files match the stamped drawings I'm not going to recommend any changes. So far I have not seen one engineering company that can offer this guarantee. Therefore, in my opinion, .pdf from the original stamped drawing is the only acceptable electronic format.

I'm informed that some producer companies are apparently instructing the engineering company to send the native electronic files. Why, I can't imagine. However, just because a client wants something doesn't make it right. Engineering companies have to understand and inform as to the risks of the request. There is a professional responsibility to do so. If the client insists, get a disclaimer.

While I'm a big fan of CAD there are problems that can't be ignored. I'm not referring to the software issues, but the abuse, intentional or otherwise, by the users. I'll share another couple of experiences:

I was a lead piper on a project with an engineering company a few years back on a 3D project. A structural designer came to me and said that one of the piping areas hadn't changed in almost a couple of weeks, which I couldn't believe because everything was fine as far as I knew. Anyway I went and looked at the model of the area he was talking about and sure enough no development. So I went to the piping designer and discovered that he had (I'll call him Bob) created his own directories and files: "Bob's layout 1", "Bob's layout 2", "Bob's layout 3". Nothing he was working on had been updated into the official model directory under the official naming convention and it was no wonder that the structural guy couldn't find the latest model for x-ref. Enough to say that I was peeved.

Going back ten years on a 2D project. A guy quits as the project's winding down and we're gathering .dwg files for close out. I don't recall how exactly it came to light, but someone picked up on and told me that the drawings on the network that this guy had been working on were preliminary design and not the final IFC. A bit of searching and more than a few panicked minutes later we found everything on his C: drive. Great that we found it, but what if his computer had crashed the week before IFC. There would have been nothing on back-up to fall back on.

Let's imagine that all the .dwg files from the network for the project I mention above had been sent to the constructor. They'd have been sent some out of date drawings due to some cowboy who kept the latest on his C: drive. I guarantee that someone would build to the out of date files regardless of IFC hard

copies in their possession. Even assuming all the files were the right ones, I also guarantee that there are cowboys in the field with AutoCAD who think they know better than the guy that laid the piping out and the stamping engineer, and they will make changes. Don't aid them by sending editable files.

I don't believe it's a question of "if' this will happen to an engineering company that allows this practise, but "when". And when it does most likely some heads will role, but not the guys who instructed it, the guys whose bonuses are affected. No, it'll be the leads and the department head, those who "should've known better". The company position will be that those that went along with it should've had a better handle on the drafting group. If I were one of them I'd get something in writing from the PM.

By sending native files to a construction company there is an inference by the engineering company that they can be printed and distributed for construction. Electronic files can be copied, changed, renamed, and moved. Any of which is potentially problematic. Any drafting manager will tell you that it is virtually impossible to control these practises.

I'm not saying that those that use/abuse CAD files are all necessarily unprofessional. The vast majority of people are very professional and conscientious. Generally there is integrity of the files. Unfortunately there are a small percentage of people who don't understand the repercussions of what they are doing.

These are the ones that you have to worry about, and you never know how or when this will happen nor to what degree it may bite you.

Until these issues can be resolved, and I'm not sure they ever can be no matter how many hands are slapped, I advise sending hard copies and non-editable .pdf files only, created from the original stamped drawings.