Being Precise in the Construction World

By Bill Schmalz

"It is the mark of an educated man to look for precision in each class of things just so far as the nature of the subject admits."—Aristotle, Nicomachean Ethics

Have you heard this one? A class of school children touring a natural history museum come to a fossil skeleton of a dinosaur. When one of the kids asks a guard how old the fossil is, he tells her, "65,000,029 years old." The teacher is surprised and asks how he knew the age so precisely. "Well," he says, "when I started working here, I asked them how old this here dinosaur was, and they said it was 65 million years old. And that was 29 years ago."

And now a true story: Everyone knows that normal human body temperature is 98.6°F. That must be a carefully determined number, since it seems so precise, right? But isn't it odd, even weirdly coincidental, that 98.6°F converts *exactly* to 37°C? Actually, it's not odd at all. In the 1860s, a German physician, Carl Wunderlich, took more than a million temperature readings from patients, and determined that the normal human body temperature was highly variable, depending on specific individuals and the times of day the measurements are taken. On average, however, it was around 37°C. Take note of that number: *around 37°C*, not *37.0°C*. When non-metric physicians converted 37°C into Fahrenheit, it worked out to be 98.6°. That 0.6° makes a temperature of *around* 37°C become one that's *precisely* 98.6°F. Since then, millions of parents have panicked because their children had "fevers" of 98.8°F, even though Dr. Wunderlich knew full well it's in the range of normal human temperatures.

These stories illustrate how levels of precision can be misunderstood. Levels of precision govern much of our professional lives as designers. All measurements—time, temperature, length, cost, whatever—can only be as precise as their inherent tolerances allow. And in any grouping of measurements, mixing different levels of precision will not produce a useful or sensible result.

Take cost estimates, for example. If your Schematic Design estimate includes a line item for structural steel of $1,200,000 and a line item for curtain wall of $1,516,874, two alarm bells ought to go off in your head. First, the quality of information available to the estimator at the end of SD—usually overall areas and approximate unit costs—do not allow a level of precision to the nearest dollar. Second, mixing the appropriately rounded structural number with the too-precise curtain wall number will not give you a bottom line number that makes sense.

The same principle applies when dimensioning drawings. A dimension's level of precision should never be greater than industry-standard construction tolerances. For example, when locating partitions on a floor plan, construction tolerances allow the location of the partition to be within a quarter of an inch one way or the other from where the dimension says it should be. And that's okay, because most building codes and building inspectors accept standard construction tolerances. But since a partition can be anywhere between plus ¼ inch and minus ¼ inch from its dimensioned location, then it makes no sense to dimension the partition to the nearest 1/8 inch. Similarly, if you have a string of dimensions, they should all be to the same level of precision. A dimension string of 6'-0", 4'-0", 1'-2 1/16", and 3'-0" is immediately suspicious. If that 1'-2 1/16" works out to precisely that number, then most likely you're dimensioning the wrong thing. A good rule of thumb is that the dimensions that matter, the ones you should care about, are usually nice round numbers, certainly no more precise (for floor plans) than to the nearest quarter inch, and usually to the nearest inch. Details drawn at larger scales often require higher levels of precision. If you draw a detail at 3"=1'-0", then dimensions to the nearest eighth or even sixteenth inch may be appropriate. (Levels of precision exceeding standard construction tolerances can usually be achieved, but only at a considerable cost. Such precision is rarely justified in the design.)

The lesson to be learned is to always try to understand the precision you need for what you are doing, and to take care that you aren't mixing different levels of precision in the same group of measurements. In fact, this mantra is so important it's worth repeating at least once every day. Or, to be precise, every 23.897 hours.