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Tigers and Graders

I would be willing to bet that no matter how little you think you know about the evolution of military tanks in the 20th Century you have still heard of the German Tiger tank. And you have heard of it for good reason. It was a weapon to be feared. Based on the simple evolutionary idea of adding a bigger and proven gun (the deadly German '88') to thicker armor, the Tiger tank was rightly feared by our Allied troops. If someone was to base their opinion of this tank on the video games they play in their mom's basement they would likely think that the Tiger tank was the pinnacle of tank design during World War Two. But, the Tiger tank had more to consider than inches of armor. First, it was not only a bear to manufacture due to its complexity, but it was also a very expensive tank in both cost and materials. Second, again due to its complexity, it was a mechanical nightmare. And finally, it was a gas hog—a bad trait when Germany was nearly out of gas. Warts aside, it was indeed a terrible weapon and worthy of being remembered by history—but getting one operational and fighting was no easy task. And this all pretty well sums up my opinion of how proposed grade contours effect GPS data. Some appear to look at contours and think that just converting the contours will provide great data. What they fail to understand is that while a great tool, contours are also a great trap to lazy or misguided data building.

Big, deadly and famous—the Tiger tank. But…

But lets take a step back for a moment. For anyone who builds data for GPS machine control, they know that they need to rely on many sources of elevations. Proposed spot elevations, profiles, pad elevations, super-elevation diagrams, typical sections, cross sections and yes, even proposed grade contours. A good, competent design engineer will have many sources of grade information in their construction plans—unfortunately it is not uncommon to get a project that only has one or maybe two sources. As a competent data builder, its your job to recreate the engineers design using all the pieces of the puzzle, relying the heaviest on the most accurate source of elevations.

Now you may be thinking 'What's the big deal, contours are accurate, they give a specific location and a specific elevation.' Okay, lets explore both of those points for a moment: location and elevation. Lets say you just got a new project and you need to build the data for it. It is your typical simple site. There are proposed grade contours shown, but the engineer is being a stick in the mud and refuses to provide the CAD files. You have been able to redraw the parking lot based on the specific dimensions in the plans, but what about the contours? Sure you can measure off the plans that have been copied ten times, but is that accurate enough for fine grading with machine control? Unlike a horizontal alignment or spot elevation, contours do not provide a precise location—the

Precise, reliable and effective–GPS Machine Control. If…

only way to place them precisely is by having the CAD file. So they may not be super accurate for location, but they are good for elevation right? If you are sitting on top of a contour, sure, you know that the elevation at that point is 104.00. But what happens when you move off of it? *If* there are no grade breaks in the design between contours, your golden. But, as soon as there is a grade break between the contours there is now a problem with your model—you need something beyond a contour to define that break properly. Which brings us to my point: contours *alone* are not accurate for location or elevation. We are now back to the whole idea of basing your model off of *all* sources of information and not just one source. Common sense right?

Unfortunately no. Time and time again I have seen and heard of data builders using proposed grade contours as the only basis for their model regardless of what other sources of information the engineer has provided. The attitude seems to be "Never mind the profile, never mind the spot elevations—just convert the contours and we have good data!" If you want to go in the field and move around dirt for mass grading, then that is just fine. Your converted contours will provide that accuracy. You want to take your grader out and fine grade a parking lot? Then your about to have all sorts of problems.

So how does one use contours correctly? Simple. A good, competent professional engineer will generate contours based on their design—*not* generate their design based on contours. Such a simple principle seems to be lost on the majority of design engineers the world over. But this same principle applies to data builders. Contours should be one part of your model—not *the* part of your model. Look at your personal data building procedure. When do you start using contours? Is it the first thing you use? Do you just convert the contours, add a spot here and there for low or high points and then call it good data? Let me make a small suggestion: work with every source of grade information in a project *except* contours. Once you have defined everything you can in your model based on all *other* sources of grade information, then turn to the contours and see what they can add to your project. As stated previously, you want the source of greatest accuracy. Use all these other sources and then fill in the gaps with the contours.

Its tempting to look at the Tiger tank and think "Who cares how it runs, look how thick the armor is!" While that is true on the battlefield, you have to get the stinker to that point first and therein lies the primary weakness of an otherwise great tank. Data builders who think "Who cares about profiles or cross sections, we have contours and can just convert those and be close enough" will get out of their model the exact same amount of work they put into it. Sloppy data building practices provide sloppy data. Sloppy data provides sloppy GPS equipment performance. For your data to be clean, clear and correct, you need to do a little more than convert the contours. Or else, much like the Tiger tank, your going to have a very expensive, complex and gas hungry piece of equipment that doesn't work correctly. MC

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