

## **Definition of Surveying Engineering – June 2004**

Earl F. Burkholder, PS, PE

It has been suggested recently that the practice of surveying and the practice of engineering are, or should be, taken to be mutually exclusive. The purpose of this short article is to offer a different view. Of the various ways to define something, two primary methods exist – define what it is and define what it isn't. Without debating the merits of which method is best, the following thoughts are offered with the hope that the relationship between engineering and surveying can be viewed as symbiotic.

Bear with me a minute –

Science can be defined as the process of organizing knowledge in such a manner that conclusions are consistent with beginning assumptions and subsequent observations.

Science is often broken into two categories – physical science and social science.

1. Physical science is that branch of science that deals with physical matter and processes.
2. Social science is that branch of science that deals with the reasons for and consequences of decisions made by humans.

Whether physical or social, science is also categorized according to method of inquiry – theoretical or applied.

1. Theoretical inquiry is conducted for the purpose of gaining a better understanding of the object or process of inquiry (called pure science).
2. Applied scientific inquiry is conducted for the purpose of finding or documenting that arrangement of elements or sequence of events that will produce a desired outcome (also called engineering).

### **Definition of Engineering – ABET:**

Engineering is the profession in which a knowledge of the mathematical and natural sciences gained by study, experience, and practice is applied with judgement to develop ways to utilize economically the materials and forces of nature for the benefit of mankind.

Question:

Is the ABET definition of engineering compatible with the previous statements?

Possible answer:

The ABET definition presumes application of physical science. The previous assertion accommodates both physical science and social sciences. Otherwise, yes, the two definitions are viewed as compatible.

**Definition of Surveying – could come from any of many sources. I suggest:**

Surveying (geomatics) is the process of generating, manipulating, evaluating, analyzing, presenting, and drawing inferences from spatial and geospatial data in various forms.

Comments about the definition –

1. The definition precludes social science surveys involving tabulation of answers.
2. In addition to “spatial” data, the term “geospatial” applies to those data that are connected to the real world. “Spatial” also carries an implication about the location of a point and the size and shape of objects.
3. The definition says nothing about the qualifications of those persons generating, analyzing, interpreting, or presenting conclusions based upon the data.
4. The whole issue of generating spatial data and making, evaluating, and interpreting measurements falls within the broad definition of engineering.
5. It can be argued that many categories of measurement activities are not considered “engineering,” i.e. building a house, planting a field (farming), making and reading x-rays, making garments, and others. But, as one is increasingly concerned about the quality and exactness of the measurements, or as one worries about the consequences of an inferior measurement (protecting the public), engineering principles cannot be avoided. At what point do such activities become “engineering”? It would be stretching it to say they do not.
6. Land surveying is a legitimate part of measurement science, but the practice of land surveying also crosses over into social science because one must address various legal issues related to land boundaries. And, land surveying is an enormously important professional activity that deserves separate (special) consideration when evaluating the need to protect the public against incompetent (or unqualified) practice.
7. Therefore, I do not believe surveying and engineering should be considered mutually exclusive. At a gross level, one could argue that land surveying has little or no need for the application of engineering principles (or as Walt Robillard puts it – surveyors don’t need calculus). And, it might be possible (though not recommended) for one to be a “good” land surveyor without understanding or applying fundamental engineering principles.
8. But just as it is much easier to mow a lawn with a power mower, the public is better served by professionals having the intellectual horsepower of a formal college education that includes fundamental concepts used by both professions. While it is true, having a college degree (motor on the mower) provides an enormous advantage, regrettably, having a degree does not guarantee that one is qualified to be a professional. We should also recognize that, whether using a push mover or a power mover, keeping the blade sharp (continuing education) also contributes to a quality job well done.