Standards in Capstone Projects
Teaching the Value of Standards Through Senior Design Work

BY JAY R. GOLDBERG

My standards education began in 1990 when I became the chairman of an ASTM International task group. I was the group leader of R&D for a medical device manufacturer, recognized the need for a specific industry standard and felt that taking a leadership role in developing this standard would be a good professional development activity. The standard was eventually approved and I continue to serve as a subcommittee chairman.

As a member of the biomedical engineering faculty at Marquette University in Milwaukee, Wis., I currently teach a two-semester, multidisciplinary senior capstone design course with faculty from other technical disciplines. The course helps prepare students for careers in engineering by helping them to develop various skills while learning about design through a team-based project experience. Teams define projects, identify customer needs, establish target product specifications, generate concepts, construct working prototypes and validate final designs.

As an instructor with industry product development experience, my goal is to prepare students for professional engineering practice. I share my experiences as a project engineer and engineering manager and focus on topics that are important to professional practice, such as standards. I discuss the role and value of standards in design and how they are developed (using the ASTM standards development process as a model), and present examples of various ASTM and International Organization for Standardization (ISO) standards. I also explain career benefits of participating in standards development such as increased visibility within industry, development of leadership skills and networking.

Standards are important to the capstone design experience and are discussed in the classroom and used in projects. To avoid costly design changes late in a project, students are urged to identify all customer needs and design requirements as early as possible. Early in their projects, along with a patent search, students are required to conduct a standards search to determine if standards exist that apply to their design projects. When writing the Customer Needs Document, students ask customers (project sponsors) if compliance with particular industry standards is a requirement. Standards are often used to develop performance requirements to be included in a team’s Target Product Specifications Document. For example, a team developing an electronic device might include requirements for minimum allowable leakage current as specified in an applicable standard.

Later in their projects, after construction of a working prototype, teams often use standards for design validation. The Experimental Validation Document requires students to design a set of experiments or tests to determine if the design performs as required (meets target specifications developed earlier in the project) and meets customer needs. Teams must develop a list of test procedures, conduct the tests and analyze the data to determine if specifications have been met. Students are encouraged to conduct tests using procedures described in applicable standards, if they exist, instead of developing their own set of test procedures.

Students learn that using standards saves time, provides them with technically valid, industry-approved methods and allows for comparison between competitive products tested per the same standard, not only for their capstone projects, but also for projects they will work on in industry.

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