

# **ABET Proposed Criteria and Manufacturing**

*NAMRI/SME Position Paper*



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## A Position Paper

By the North American Manufacturing Research Institution of SME (NAMRI/SME)

Historically, ABET mentioned manufacturing as a design constraint, but did not require manufacturing experiences in the learning outcomes for engineers. ABET requires engineering programs to demonstrate 11 outcomes: (a) through (k). The manufacturing constraint is contained in Student Outcome (c), which reads:

(c) an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, **manufacturability**, and sustainability (emphasis added)

This required outcome clearly makes manufacturing an optional consideration, one where design is central to the profession, but manufacturing is an optional consideration, similar to social and political constraints.

In 2012, the AMP report [1] made the following recommendations:

*Major research universities in the U.S. have a key role in defining the fundamental elements of advanced manufacturing and developing the next generation of educators and industrial leaders. They can qualitatively advance the manufacturing profession and retool its image as a challenging and rewarding career.*

*Universities, however, are uncertain about where the discipline of manufacturing best fits in academia. It does not fit well into normal boundaries of degree programs, departments, or even schools, and as a result often finds itself marginalized.*

*The AMP Steering Committee therefore recommends augmenting existing engineering curricula with manufacturing coursework, and creating new graduate-level programs that provide students with a comprehensive overview of manufacturing as well as technological and operation perspectives in a professional environment.*

In 2013, the Director of NIST, Patrick Gallagher, wrote a letter to ABET, which includes these recommendations:

*Through consultation with industry and academic leaders, this task team concluded the objective can be best achieved by minor revisions to the ABET General Criteria 3 – “Student Outcomes” to explicitly include manufacturing. The team recommends ABET consider the following edits, where **boldface** shows additions and strikethrough the deletion from current wording:*

*b. An ability to design, **build** and conduct experiments, as well as to analyze and interpret data*

*c. An ability to design **and manufacture** a system, component, or process to meet desired needs within realistic constraints ~~such as~~ **including** economic, environmental, social, political, ethical, health and safety, ~~manufacturability~~, and sustainability*

In 2014, Jeffrey Abell, SME Accreditation Committee Chair, wrote a letter to ABET, which included the same recommendations.

In 2015, ABET proposed a new set of requirements, where all mention of manufacturing has been removed. The new criterion that correlates to the previous student outcome (c) is now Student Outcome 2, which reads [2]:

1. An ability to apply both analysis and synthesis in the engineering design process, resulting in designs that meet constraints and specifications.

Constraints and specifications include societal, economic, environmental, and other factors as appropriate to the design.

Thus, in the new ABET requirements, societal constraints are preserved, but manufacturing is eliminated. It is not clear what societal constraints are, but one can infer that they are more important to ABET than manufacturing.

This modification is in direct contradiction to the recommendations by the Director of NIST, the SME Accreditation Committee and the AMP report. It is further marginalization of manufacturing in engineering curricula. In fact, it is a deletion of the mention of manufacturing in the desired learning outcomes.

### **Recommendations:**

- 1. NAMRI/SME Recommends that ABET reject the proposed changes to the Engineering Student Outcomes.**
- 2. NAMRI/SME Recommends that the changes proposed by Dr. Gallagher and the SME Accreditation Committee be adopted verbatim.**

### **References**

- [1] [http://www.manufacturing.gov/pubs\\_resources.html](http://www.manufacturing.gov/pubs_resources.html)
- [2] <http://www.abet.org/wp-content/uploads/2015/04/EAC-Proposed-Revisions-to-Criteria-3-and-5.pdf>