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The Value of Standards for Teaching, Research, and Facilities Use at Princeton and Purdue

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The Value of Standards for Teaching, Research, and Facilities Use at Princeton and Purdue

— Anya C Bartelmann, Princeton University —
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About Us



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About Our Institutions

Princeton University



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Purdue University



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About Our Standards Collections

Princeton University

- Mostly electronic, individual standards purchased in print or electronic format based on request; small collection of print standards in Engineering Library and at PPPL
- Collections obtained through publisher platforms: ASME, ASTM, IEEE, SAE, Compendex, IUPAC Standards Online Database, etc
- Collections obtained through aggregator platforms:
 - IHS Standards Expert (DoD, NFPA)
 - MADCAD (ACI, ASHRAE, FEMA, ICC)
 - Many others!

Purdue University

- Mostly electronic, individual standards purchased or added to the collection upon request, small print collection (includes local/state codes, standards frequently checked out in print, etc.)
- Collections obtained through publisher platforms: AIAA, ASCE, ASME BPVC, ASTM, IEEE, SAE
- Collections obtained through aggregator platforms:
 - ICAO Standards - (IHS)
 - AASHTO, ACI, AHAM, ANS, ASHRAE, ASME (non-BPVC), BSI (selected), ICC, ISO (selected), NFPA (Fire)) - (TechStreet)
- Compendex (EV) - indexes selected standards

Value of Standards - Teaching

At both Princeton and Purdue, providing access to standards and teaching about standards supports ABET accreditation requirements for engineering programs

ABET Engineering Accreditation Commission (EAC) Criteria for Accrediting Engineering Programs, 2019 – 2020

Criterion 3: Student Outcomes

- (2) an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
- (4) an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts
- (6) an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
- (7) an ability to acquire and apply new knowledge as needed, using appropriate learning strategies

Criterion 5: Curriculum

- (d) a culminating major engineering design experience that 1) incorporates appropriate engineering standards...

Value of Standards - Teaching

Additionally at Purdue, providing access to standards and teaching about standards supports ABET accreditation requirements for engineering technology programs

ABET Engineering Accreditation Commission (ETAC) Criteria for Accrediting Engineering Technology Programs, 2019 – 2020

Criterion 3: Student Outcomes

- (2) an ability to design systems, components, or processes meeting specified needs for broadly-defined engineering problems appropriate to the discipline;
- (3) ... and an ability to identify and use appropriate technical literature;
- (4) an ability to conduct standard tests, measurements, and experiments and to analyze and interpret the results...

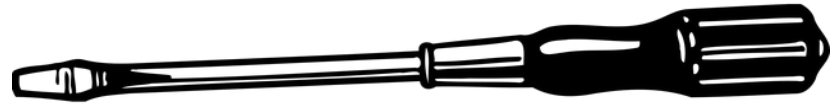
Criterion 5: Curriculum: Discipline specific content:

- (D) Include design considerations appropriate to the discipline and degree level such as: industry and engineering standards and codes...

Teaching - Example at Purdue

MET 102: Production Design & Specifications

- 2nd/3rd year project-based course
- Design, evaluation, and documentation of engineering specifications; CAD emphasis
- Scaffolding approach to standards education over 16 week course
- Flipped classroom, librarian-led standards session
- “Everyday objects” standards assignment
- Librarian consultations



MET 102 teaching approach shared in these publications:

IEEE Standards Association. (2018). Introducing engineering technology students to technical standards. *Practical Ideas from Professors: Standards Education in Action*. IEEE Standards University.

<https://www.standardsuniversity.org/courses/practical-ideas-from-professors/>

Phillips, M., Fosmire, M., & McPherson, P. (2018). Standards are everywhere: a freely available introductory online educational program on standardization for product development. *Standards Engineering*, 70(3). https://docs.lib.purdue.edu/lib_fsdocs/201/

Phillips, M., & McPherson, P. (2016). Using everyday objects to engage students in standards education. *Paper presented at the 2016 IEEE Frontiers in Education (FIE) Conference*, Erie PA. doi:10.1109/FIE.2016.7757698

Value of Standards - Research (Princeton)

- Standards requested for research, experiments, projects, and facilities work at PPPL and Princeton
- Requests made by graduate students, faculty, engineers/scientists, and other researchers
- Engineering Librarian makes majority of purchases for use by departments within the School of Engineering and Applied Science
- Electronic usage statistics are not usually productive in determining who uses standards for research unless the standard is cited in a publication

Recent publication by Princeton University and PPPL researchers that cited ASME standards:

Acciarri, R., Adams, C., An, R., Aparicio, A., Aponte, S., Asaadi, J., ... Zuckerbrot, M. (2017). Design and construction of the MicroBooNE detector. *Journal of Instrumentation*, 12(02), P02017–P02017.
<https://doi.org/10.1088/1748-0221/12/02/P02017>

Ramana, M. V., Hopkins, L. B., & Glaser, A. (2013). Licensing small modular reactors. *Energy*, 61, 555–564.
<https://doi.org/10.1016/j.energy.2013.09.010>

Value of Standards - Research (Purdue)

It can be challenging to determine *who* is using standards on campus and for exactly *what purposes* with traditional use statistics.

Overall ASME standards use:

- Non-BPVC: 158 different standards downloaded at least 1x (8/2018-8/2019)
- BPVC: median # of documents accessed per month - 10 (5/2017 - 3/2019)

Recent publication from a Purdue researcher that cites the ASME BPVC (as well as several ASTM standards):

Caccia, M., Tabandeh-Khorshid, M., Itskos, G., Strayer, A. R., Caldwell, A. S., Pidaparti, S., ... & Kang, T. (2018). Ceramic-metal composites for heat exchangers in concentrated solar power plants. *Nature*, 562(7727), 406-409.

Value of Standards - Facilities Use (Princeton)

With over 500 employees and many experiments and research areas, PPPL makes extensive use of standards from the following areas: **Facilities, Environmental Safety & Health, Fire Protection, Engineering, Welding,** etc.

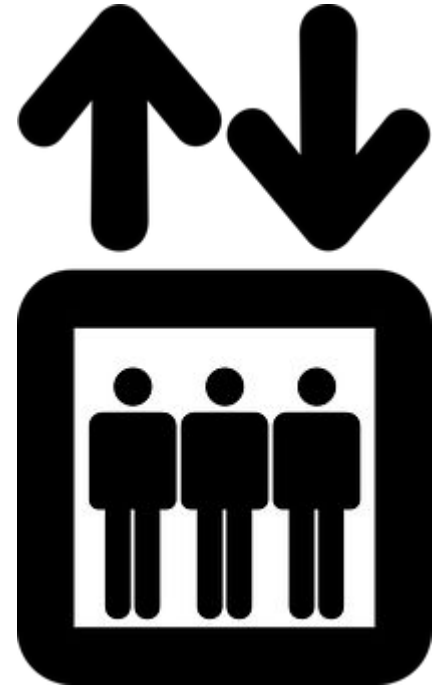


Examples of recent standards purchased:

- ASSP Fall Protection & Fall Restraint (Z359)
- AWWA M42 Steel Water Storage Tanks
- ASHRAE Laboratory Design Guide: Planning and Operation of Laboratory HVAC Systems
- NFPA 45, Standard on Fire Protection for Laboratories Using Chemicals Handbook
- RCC-MR 2007 Design and Construction Rules for Mechanical Components of Nuclear Installations
- SAE AMS 5597g – Nickel Alloy, Corrosion and Heat Resistant, Sheet, Strip, and Plate 52.5Ni – 19CR – 3.0Mo – 5.1Cb (Nb) - 0.90Ti – 0.50Al – 18Fe Consumable Electrode or Vacuum Induction Melted 1950 F (1066 C) Solution Heat Treated

Value of Standards - Facilities Use (Purdue)

- **Physical Facilities departments: Asset Management (includes architectural and engineering services, infrastructure repair, etc), Buildings & Grounds**
 - Examples: ASME mechanical identification standards, ASME BPVC, ASME safety code for elevators, IBC Code & Commentary, IFC Code & Commentary, IMC Code & Commentary
- **Radiological & Environmental Management (e.g., lab safety, ergonomics)**
 - Examples: OSHA standards, ANSI LIA Z136 Standards (safe use of lasers), NFPA standards
- **PUR-1, Purdue's Nuclear Reactor**
 - Examples: ANS standards



Questions?

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Peter B. Lewis Science Library, Princeton University
Photo by Ricardo Barros
<https://paw.princeton.edu/article/lewis-library>



Wilmeth Active Learning Center (houses the Library of Science & Engineering),
Purdue University. <https://www.lib.purdue.edu/inside/2017/july19.html>

Discuss Questions

- How are standards collected and promoted at your institution?
- What value do standards bring to teaching and research at your institution?
- In what ways are standards used for facilities needs at your institution?
- What challenges do researchers and/or students at your institutions have with standards discovery, access, and/or use?