

Codes and Standards

Using material from:

http://www.slidefinder.net/s/system_engineering_realistic_design_constraints/32583793

And

http://www.astm.org/studentmember/Learning_Modules.html/ASTM_Standards_You_audio.ppt

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Realistic Design Constraints

- ***Standards***
- Health and Safety
- Ethics / Environmental / Social-Political
- Economic
- Sustainability
- Manufacturability

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Standards

- Standards are rules, testing methods, definitions, recommended practices, or specifications that **promote uniformity**
- Engineering standards are **developed by experts** within each technical field

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Who Is Responsible for Standards?



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Why Do We Use Standards?

- Standards promote: Safety
 - Ease of interfacing
 - Uniform performance
 - Fairness
 - Technological development
 - Professional development

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Standards Lower Costs

- A standard part gives rise to **economies of scale**
- Standardization reduces cost through lowering of inventories and **simplification of supply chains**
- **Don't reinvent** the wheel

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Corporate Standards

- Some companies have their own standards for safety and performance that **may exceed required standards**
- Learn and follow these standards when you work for such a company

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Example MATLAB Corporate Standard

1. Maximum line length of 80 characters
2. Variables start with a lowercase letter
3. Word breaks should have a delimiter
4. Comments shall have a 60 character "****" top line
5. Constants shall be in all CAPS
6. Always use brackets to define matrices, [1:5]
7.

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Resources

- NIST web site <http://www.nist.org>
- ANSI Web site <http://www.ansi.org>
 - ANSI News - on the web
- <http://www.Standardslearn.org>

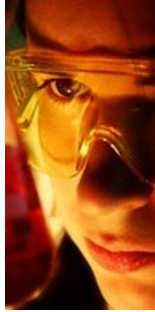
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**ASTM Standards and You:
The Role of Standards in
our Everyday Lives**

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ASTM Standards.... More than Meets the Eye!



- Enhance health, safety and quality of life
- Facilitate global trade and market access
- Support product reliability and quality
- Reduce costs, improve supplier relations
- Guide business communications and marketing
- Advance innovation and new technologies
- Support regulatory goals and compliance
- Transfer technology to the marketplace

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Environmental Health



Water Quality

- Drinking water is tested for harmful bacteria and other elements using ASTM standards

Asbestos Monitoring

- ASTM test methods and practices help to monitor asbestos in the indoor environment

Environmental Site Assessment

- ASTM standards facilitate environmental site assessments in compliance with U.S. Environmental Protection Agency regulations

Did You Know:

Cleaner air is made possible by ASTM standards for biodiesel, an alternative fuel that helps reduce serious air pollutants

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Health and Medical Care



Health Information

- Continuity of Care Record defines a core set of information in the healthcare setting

Hearing Aids

- ASTM standards are assisting in the development and performance of implantable hearing device technology

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Sports and Recreation



Safety Helmets

- ASTM safety helmet standards are used in sports such as bicycling, roller skating, soccer, horseback riding and martial arts

Snow Skiing

- ASTM standards provide guidance on proper performance of the ski-boot-binding system

Did You Know:

Even pole vault participants are safer thanks to an ASTM standard that covers performance requirements for helmets used in this track and field related sport.

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Home and Building Performance



Building Codes

- More than 1300 ASTM building design and construction related standards ensure that buildings comply with safety and other code requirements

Home Heating

- ASTM standards help manufacturers develop high performing, safe, and cost effective insulation

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Car and Road Travel

Night Time Driving

- ASTM standards cover raised pavement markers, which highlight lanes, medians and road barriers

Engine Fuels

- We are ensured of the indicated octane level every time we pump gas thanks to ASTM standards



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Aviation

Airport Security

- Airport personnel can identify guns, bombs and other illegal packages with the help of ASTM standards

Turbine Fuels

- ASTM standards contribute to the production of fuels that are clean and free of contamination



Did You Know:

More than 25 ASTM standards related to light sport aircraft are referenced by the FAA.

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Consumer Products

- ASTM closely cooperates with the U.S. Consumer Products Safety Commission

Flooring

- ASTM standards test for slip resistance of bathroom facilities



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Homeland Security

- ASTM Committee E54 formed in 2004

Hospital Preparedness

- ASTM standards help prepare healthcare facilities for large scale emergencies



Did You Know:

ASTM has developed new standards for urban search and rescue robots and their role in life saving efforts.

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Materials

- A01 on Steel – ASTM's first technical committee started in 1901

Latest Developments

- Methods that support the portable testing of large pieces of steel



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Advancing Innovation



Drug Manufacturing

- New ASTM standards are aimed at streamlining the process of drug manufacturing, leading to improved product quality and lower cost for consumers

Nanotechnology

- ASTM standards initiatives are focused on supporting commercialization efforts of this ground breaking technology

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ASTM International Learning Module Series

www.astm.org

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Standards - Final Thoughts

- Promote the success of engineers in every field
- Make lives safer, more productive, and more efficient
- You will need to follow corporate, industry, national, and international standards in your career
- Examine the standards that directly applicable to your project

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- ***Realistic Design Constraints***

- Standards
- Health and Safety
- Ethics / Environmental / Social-Political
- Economic
- Sustainability
- Manufacturability

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Health and Safety Constraints

News Release CPSC

U.S.
Office of Information

For Immediate Release
September 04, 2016

Fisher-Price Lead Paint S

WASHINGTON, DC
the firm named be

Consumers should stop using recalled products immediately unless otherwise instructed. (To access color photos of the following recalled products, see CPSC's Web site at www.cpsc.gov.)

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on
Washington, D.C. 20207

(800) 496-8330
(703) 638-2772
(703) 504-7908

Violation of

operation with
sumer product.

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Health and Safety Constraints

LIL SNOOPY



Price: \$6.44

Manufacturer or Distributor:

Fisher Price, Inc., a subsidiary of Mattel, Inc.,
East Aurora, NY 14052

Purchased: Walmart

Age Recommendation: "1+"

Warnings: None

HAZARD: POTENTIAL FOR STRANGULATION
AND ENTANGLEMENT INJURIES!

W.A.T.C.H. OUT! Despite the industry's voluntary standard requiring strings on playpen or crib toys to be less than 12" in length, some manufacturers continue to market toys such as this "Lil Snoopy" pull toy, with a cord measuring approximately 27". Sold to be "[y]our child's very first puppy!", it is intended for children as young as 12 months old and thus is a prime candidate for cribs and playpens.

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Ethical Constraints

“*[Defining technology as value neutral]* provides a ready made basis for engineers and other participants in technological developments to deny responsibility.”

“I am merely making things; responsibility lies entirely with the user.”

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Ethical Constraints

- How might your device be manufactured, marketed and used?



Manufactured with child labor?

Will it be marketed to children?



Transfer dangerous technology to a country with lower safety standards?

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Environmental Constraints

- What is the environmental impact of the **production** of this device or product? (Toxic waste or hazardous emissions.)
- What is the environmental impact of the **operation** of this device? (Is the device energy efficient?)
- What is the environmental impact of the **end of the device's Life Cycle**? (Can the product be discarded?)

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Environmental Constraints

| Company | | National Semiconductor | | URL for Additional Information | | |
|--|--|---|--|---|-----------|----------|
| National Semiconductor | |  | | http://www.national.com/quality/green/ | | |
| Contact | Title | Phone | Email | | | |
| Gloria Gordon | Engineering Project Manager | 1-408-721-8435 | Green_project@nsc.com | | | |
| Part Number | MSL Rating | Peak Body Temp C | MaxTime (Sec) | Cycles | | |
| LM2578AM | 1 | 235 | 30 | 4 | | |
| Document Date | contains Lead(Pb) and is NOT European RoHS Compliant | | Weight (mg) | Unit Type | | |
| 18-Aug-2007 | NOT China RoHS Compliant | | 70.000 | Each | | |
| Homogeneous Material Composition Declaration for Electronic Products | | | | | | |
| Item | Weight (mg) | Component | CAS# | Weight (mg) | Item-ppm | Part-ppm |
| Plastic | 44.710 | SiO2 | 60676-86-0 | 36.215 | 810,000 | 517,359 |
| | | Epoxy Resin | 25928-94-3 | 7.243 | 162,000 | 103,472 |
| | | Sb2O3 | 1309-64-4 | 0.894 | 20,000 | 12,774 |
| | | Brominated Epoxy | 40039-93-8 | 0.358 | 8,000 | 5,110 |
| Leadframe | 20.560 | Cu | 7440-50-8 | 20.036 | 974,500 | 286,225 |
| | | Fe | 7439-89-6 | 0.493 | 24,000 | 7,049 |
| | | Zn | 7440-66-6 | 0.025 | 1,200 | 352 |
| | | P | 7723-14-0 | 0.006 | 300 | 88 |
| Chip | 2.360 | Si | 7440-21-3 | 2.346 | 994,000 | 33,512 |
| | | Al | 7429-90-5 | 0.014 | 6,000 | 202 |
| Ext. LeadFinish | 1.840 | Sn | 7440-31-5 | 1.564 | 850,000 | 22,343 |
| | | Pb | 7439-92-1 | 0.276 | 150,000 | 3,943 |
| Die Attach | 0.270 | Ag | 7440-22-4 | 0.203 | 750,000 | 2,893 |
| | | Epoxy Resin | 25928-94-3 | 0.068 | 250,000 | 964 |
| Int. LeadFinish | 0.180 | Ag | 7440-22-4 | 0.180 | 1,000,000 | 2,571 |
| Wires | 0.080 | Au | 7440-57-5 | 0.080 | 1,000,000 | 1,143 |

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Environmental Constraints



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Social Political Constraints

- **Society decides** which engineering projects SHOULD and SHOULD NOT be done through the sometimes imperfect mechanism of **politics**
- Society decide which engineering projects:
 - 1) To promote
 - 2) To allow
 - 3) To discourage
 - 4) To prohibit

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Social Political Constraints Discouraged or Prohibited Projects

- 1) They are perceived to **pose risks** to safety, health, and welfare of the public
- 2) They could **restrict personal rights**
- 3) Some are perceived to be inherently **unethical**
- 4) Some are perceived to be **too expensive**

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Economic Constraints

- Purchase and use **expensive equipment**?
- Will its production be extremely **labor intensive**?

Motor winding
automation



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Economic Constraints



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Sustainability Constraints

- Engineering to meet the needs of the present...

...without compromising the future

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Sustainability Constraints

- A sustainable design balances three considerations:
 - Environmental stewardship
 - Social impact
 - Economic feasibility

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Manufacturing Constraints

- The *traditional* approach to design was to “**throw it over the wall**” from marketing to design to production.
- Produced products technologically **impossible**, **impractical**, or **uneconomical** to manufacture.
- Quality programs, such as **ISO 9000**, now require cross-functional product development that integrates marketing, design, and production.

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Manufacturing Constraints

- Reduce the number of parts
- Standardize and use common parts
- Design such that parts only assemble one-way
- Design parts with tapers and chamfers
- Design parts that can be guided and automatically fed
- Avoid large heavy parts or small, fragile parts
- Eliminate fasteners where possible (snap-fitting)
- Standardize fasteners
- Provide modular designs (subassemblies)

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Global Considerations

Global Engineering - General Electric

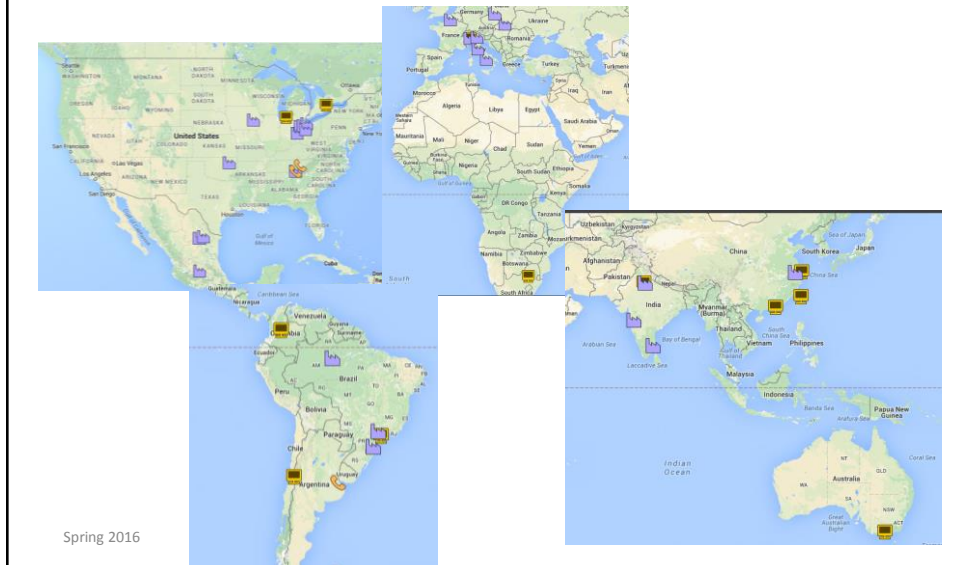


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Global Considerations

Whirlpool Corp. - Global Locations



Questions?

- Thanks for your attention.
- Reminders:
 - Management meetings on Thursday
 - Bring status reports, feasibility and merit criteria
 - EMAIL your individual progress report (what have YOU contributed to your group's progress thus far?)
- Next class meeting: Tuesday, February 16.
- Looking ahead ...
 - March 1: Journal/Patent Summaries due

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