Use of Standards In the ASABE ¼ Scale Tractor Design Competition

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Travis Tsunemori
Technical Services Support Engineer
ASABE
Standards & Technical Activities

Typical Questions

- What are standards?
- Who creates and maintains them?
- Why use standards?
- What specific standards should I use in designing my pulling tractor?
- How can I find and access standards?

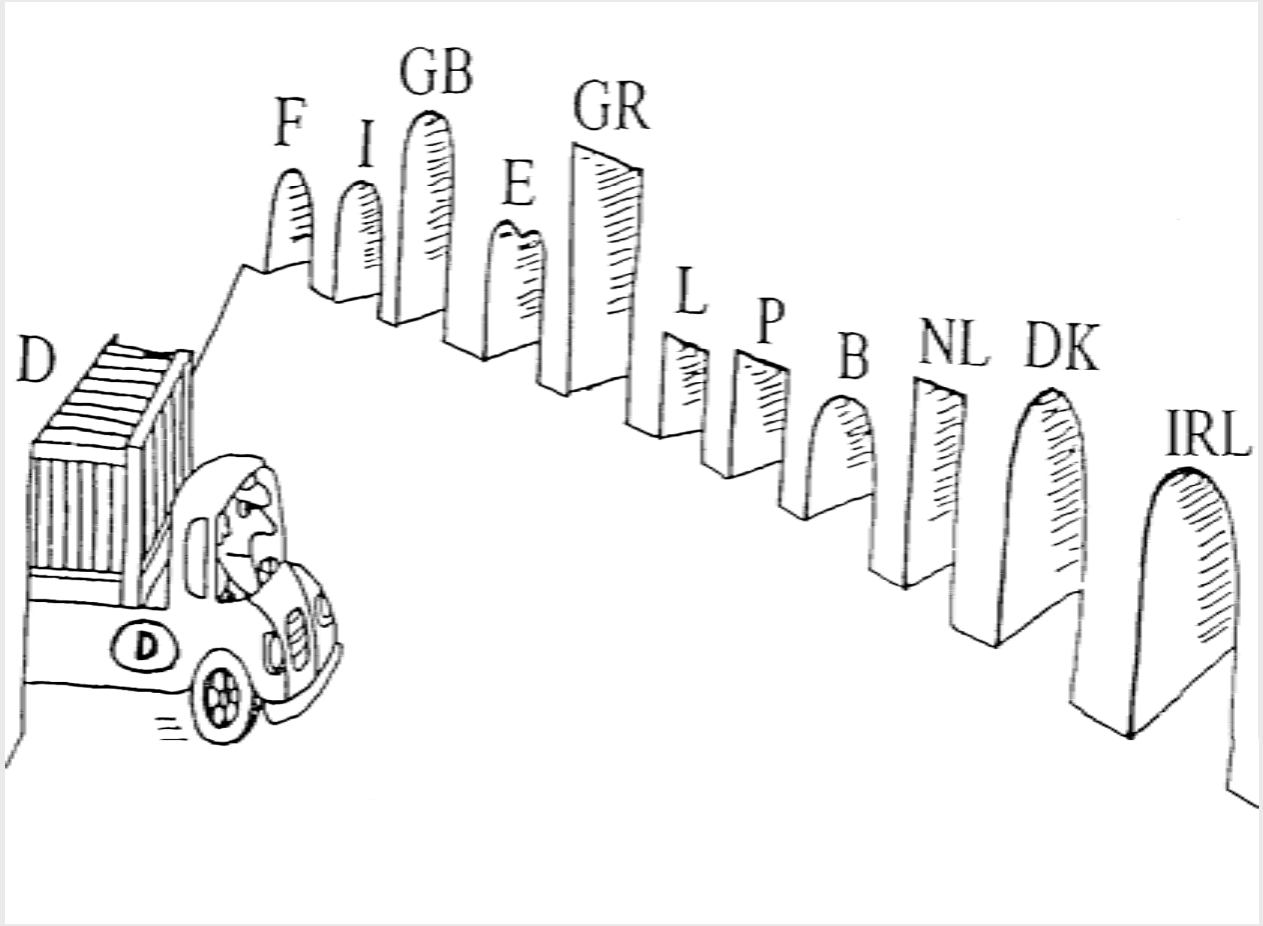
What are standards and what is their purpose?

- Specifications prepared to define materials, products, processes, tests, testing procedures, and performance criteria in an effort to achieve certain specified purposes
- Must specifically define the properties required
  - Without restrictive specifications that thwart originality or progress
- Developed from need for action on common problems

Why use standards?

- Improve compatibility, interchangeability, and safety;
- Reduce component variety --> increase availability;
- Establish performance criteria and uniform test procedures;
- Provide data for design;
- Use as sound basis for reasonable codes, education, and legislation;
- Increase efficiency of engineering effort in design, development, and production.

Trade barriers hindering the economy



(slide credit: DIN, the German Institute for Standardization)

Who creates and maintains standards?

- Standards developing organizations (SDOs)
  - ASABE, others
  - ~~ANSI~~
  - ISO, other international
- Government
  - USDA?
  - OSHA?
  - NIST?
- How
  - Input from affected parties
  - Rigorous process to ensure fairness and balance

What specific standards should I use in designing my pulling tractor?

- Some listed in rules
  - ISO 5395 Power lawn-mowers, lawn tractors, lawn and garden tractors, professional mowers, and lawn and garden tractors with mowing attachments -- Definitions, safety requirements and test procedures
  - SAE fasteners
  - ASAE S493 Guarding for Agricultural Equipment
  - SAE J1502 Connections for Fluid Power and General Use-Hydraulic Couplings-Diagnostic
  - ISO 1219 Fluid power systems and components -- Graphic symbols and circuit diagrams -- Part 1: Graphic symbols for conventional use and data-processing applications
  - SAE J833 Operator Space Envelope Dimensions for Off-Road Machines (Cancelled May 2003, Superseded by ISO 3411)

Others to consider

- ROPS/Seat belts/general safety
- SMV/SIS/lighting & marking
- Graphical symbols/operator controls

- It’s a design project; use your head!

How can I find and access standards?

- ASABE members receive online access at no charge (http://www.asabe.org) then click “Technical Library”
- Site licenses
- ANSI
- Directly from the SDO
- Other

Ergonomics Considerations In the ASABE ¼ Scale Tractor Design Competition

Ergonomics Judging

- Subjective and Objective
- Where to find data
- Design considerations
- Compromises
- Testing

Subjectivity/Objectivity

- Objectivity – data is available for “percentile” men and women – use it!
- Guidelines from NIOSH, OSHA
- Subjectivity – everyone’s idea of “perfect” is different
- Feature for one person might be problem for next

Finding Data

- Guidelines – OSHA, NIOSH, design texts
- Text – *Off-Road Vehicle Engineering Principles* (Goering, Stone, Smith, Turnquist) – ASABE
- Standards – 95th, 90th, 50th percentile man/woman/race
- ISO 3411:1995 Earth-moving machinery – Human physical dimensions of operators and minimum operator space envelope

Design Considerations

- Comfort
  - Seat
  - Controls
  - Mount/dismount
  - Space
  - Reach
  - Operator clothing, etc.

Design Considerations

- Safety
  - Visibility
  - Mount/dismount
  - Non-skid
  - Accidental control movement
  - Clearly marked controls
  - Never compromise safety…but remember ergonomics play a part in safety (see accidental, above)

Design Considerations

- Health
  - –Whole body vibration
  - –Noise
  - –Neck/back/joint injuries
  - –Control system ergonomics
  - –Eye strain

Compromises

- Never compromise safety (but that’s not a valid excuse for poor design)
- Who is your target market?
- How long will the typical user be on the tractor?

Testing

- Variety of subjects
- Mount/dismount from both sides, if possible
- Look everywhere
- Use inexperienced people (for testing)
- Mock ups

Summary and Questions?

- Standards available from ASABE, ANSI, other services
- Refer to the rules for requirements
- Data (anthropomorphic) and standards available for ergonomic design
- Questions – contact ASABE staff or ¼ Scale Rules Committee (committee has final say)