ENGR/PHIL 482
Engineering & Ethics
Effective Communications in Engineering

Two cases of ineffective engineering communications
Why are effective communications important in engineering?

- Public health, safety and welfare depends on effective communication of your designs and instructions.
- Credibility of the engineer is at stake

Why do I need to be able to write?...

I am a good engineer!
The Kyle Field collapse that didn’t happen…

During the 1960’s construction of the second deck at Kyle Field, President Earl Rudder toured the construction during erection of the precast concrete girders supporting the deck. He noticed some cracks and questioned the contractor, who assured him it was normal.
Kyle Field, second deck supports…

Observed cracks

Precast Concrete Girders supporting second deck seating
Rudder investigated further, assigning a young Civil Engineering faculty member, Teddy Hirsch to investigate the problem and report. Dr. Hirsch discovered that the structural engineer’s plans did not call out the size of the reinforcing steel at the crack location. The contractor, as was his usual practice, used minimum reinforcing steel for temperature reinforcement.
The Kyle Field collapse that didn’t happen…cont’d.

The engineer’s file calculations indicated that the reinforcement required in this section was much heavier, but the size of this reinforcement had been inadvertently omitted from the plans. The deck was subsequently reinforced externally with heavy angles, load tested, and opened on schedule.
The Kyle Field collapse that didn’t happen…cont’d.

What engineering communication weaknesses/failures are present in this case?

Ambiguity
Incomplete

Which is worse, in general?
Some common weaknesses in engineering communications

- Ambiguity (reader can’t tell what is meant)
- Incomplete (significant details omitted)
- Unsupported finding or position (missing or unconvincing data or logic) or poorly organized (logic is not obvious)
- Arrogance (assumes other viewpoints can’t be supported)
- Errors of grammar, spelling, style (leads to loss of credibility, just like technical errors will lead to loss of credibility)
- Too long (reader doesn’t have time to absorb it)
Some essential attributes of good engineering writing...

- complete and unambiguous (details and supporting materials included or referenced)
- convincing (your findings are supported logically)
- concise (not longer than needed)
- correctly presented (no significant logic or writing flaws)
- commitment (if you are not committed to your position, it will show)
- considers the audience (an article for a research journal will be written differently than assembly instructions for a consumer product)
Inadequate direction?

- Consider the following application instructions that were provided with a two-part epoxy material designed for use as a concrete bridge deck sealant...
MIX RATIO: 2:1 Resin/Cure
THEORETICAL POT LIFE: 50 min. @ 72°F with 0.5 lb mass
PRACTICAL POT LIFE: 20 min. @ 85°F
DIRECTIONS: Mix 1 resin and 1 cure component together as supplied for 4 minutes. Pour out mixed solution onto substrate as soon as possible and spread out with roller or squeegee to thin layer. Broadcast sand onto wet film within 1-2 hours after application.
STORAGE: Store components at coolest temperature possible.
NOTE: Pot life times decrease rapidly as ambient temperature increases. Therefore, working times for mixed epoxy are significantly shortened at elevated temperatures.
CLEAN: all equipment thoroughly with ACME#44 Epoxy Thinner to prevent equipment damage or loss.
What problems can be identified with the “application instructions”?

- Are they complete?
- Are they unambiguous?
- Are they concise?
- Are they correctly presented?
- Do they consider the correct audience?
One approach to persuasive writing:

- State your position in a topical sentence or paragraph.
- Build your argument carefully, citing or referencing the most important supporting data or facts.
- Tie these facts to your position.
- Rebut any obvious opposing positions.
- Summarize your position and its strongest support.
- Consider carefully how much detail to provide, given the constraints of space and time.
- Remember to present a committed attitude in your writing.
Some on-line writing resources

Texas A&M Univ. Writing Center

University of Toronto, Engineering Communication Ctr.
A good handbook for writing

The Gregg Reference Manual
William A. Sabin
Gregg Division
McGraw-Hill Book Company
Price: $25.50 (Spiral bound Edition)