NOT YOUR TYPICAL STRUCTURAL ENGINEERING FIRM

What Engineering Rules to Follow When the Rules Aren't Clear—Zip Line Design

Robert A. Hubbard, P.E., S.E. - David S. Merrell, P.E., M.L.S.E.
• Founded in 2012 as a continuation of T.O.R. Engineering’s Structural Department.
• Located in Flagstaff, AZ
• Licensed in 17 States primarily for Zip Line/Challenge Course work
Currently employ 13 people including:
- 5 P.E.’s
- 2 Full Time Drafters
- Expert in Challenge Course Operations and Inspections

Began Challenge Course design in 2009.
- NAU Challenge Course Relocation
- Over 40 Challenge Course/Zip Line Projects Total
• Struggles:
  • “Standard” didn’t exactly cover structural parameters.
  • “Designer” had no input on connections or style.
  • Site had shallow rock – Standard utility pole installation did not work.
  • Our firm served as the Building Official for most university projects, so we had no forum for consideration.
  • Third party inspectors – Unqualified to inspect.
  • Knowledge of constructability limited.
NAU ‘Challenge’ Swing
• Standards
  • Quality
  • Alternate “similar” standards
• Jurisdictional Acceptance
  • Plan Reviewers
  • Inspectors
• Consequences on imperfection
• Unforeseen conditions
• Etc…

When you innovate, you’ve got to be prepared for people telling you that you are nuts.

Larry Ellison - Co-founder, Oracle
• Be Proactive.
• Get Involved.
• Use sound engineering judgement.
• Let your client know what they are getting into.
• Know which standards may apply and which you’d like to live by
  • ADA
  • Building Codes
  • Jurisdictional Standards
  • Other Standards
• Contact the Building Official.
  • Determine the Standards they will hold you to.
  • Set a process for review and “determining conformance”
• Find Trade Associations and join them.
• Find an ANSI or ASTM standards writing group and discover their thoughts, plans and actions.
• Encourage jurisdictions to adopt “design friendly” standards.
• Get hands on with the final product.
• Don’t use untested principles on untested projects.
• Have a peer double check your work.
• Break those old text books out.
• Find inexpensive places to be conservative.
• Ask others in similar situations what they are doing.
• “I don’t know” is a perfectly acceptable answer.
• Communicate, Communicate, Communicate.
LET'S GO FOR A RIDE
ANY QUESTIONS?

ZipLines@HubbardMerrell.com