Florida Public Service Commission
Staff Workshop on Electric Utility Infrastructure

Joint Use Pole Overloading

new stratagem consulting

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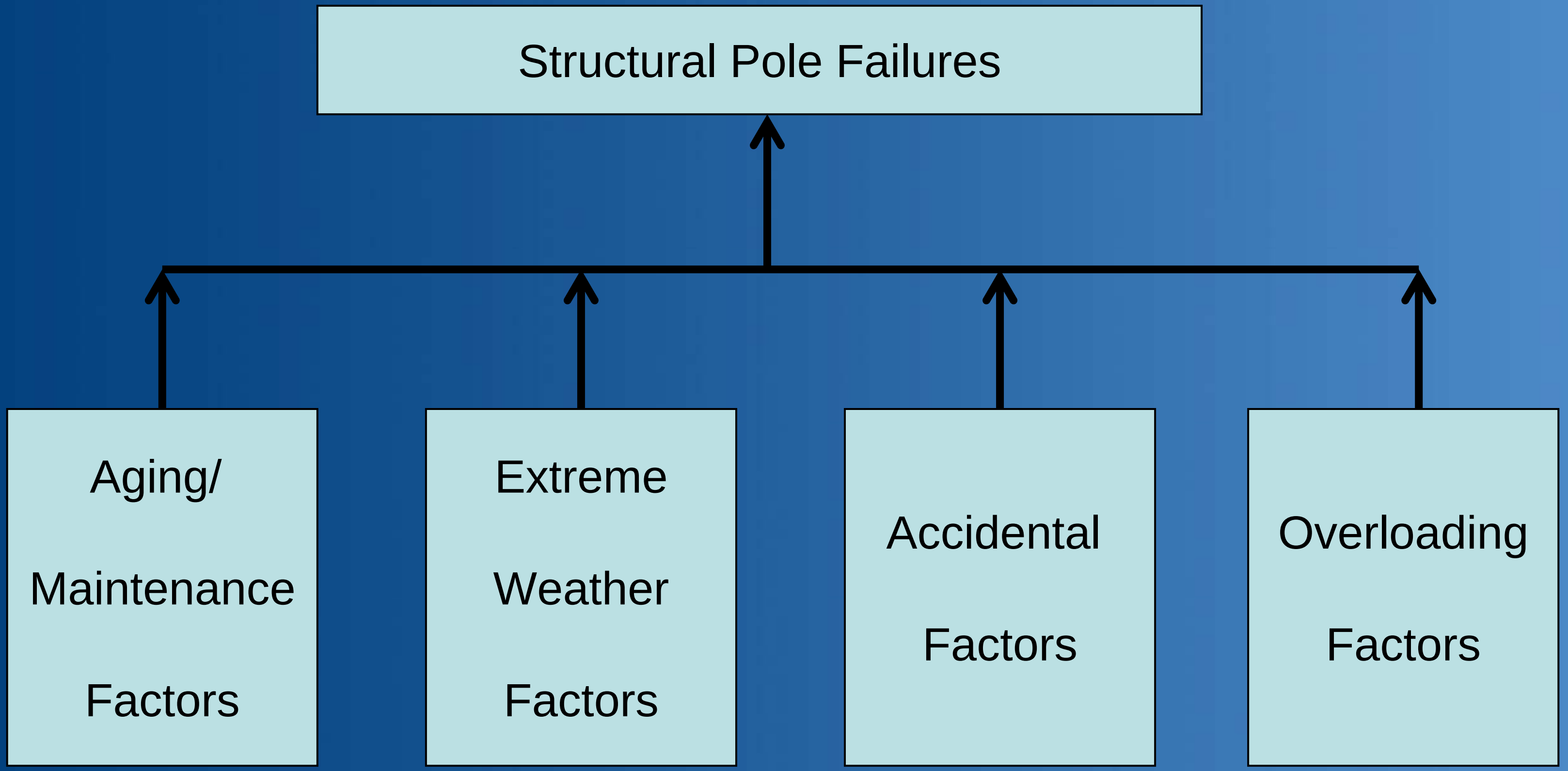
Factors Contributing to Pole Failures



Extent of Overloading

- Research suggests up to 5% of the poles on average may be overloaded
- Another 10% may be marginal, approaching overloaded conditions
- Overloading is most likely to occur:
  - In urban areas
  - Along main communications corridors (back-bone)
  - In areas where multiple, facilities-based communications service providers are operating – cable, telecom, fiber, etc.
- Heavy loading and overloading are significant contributing factors in pole failures due to weather, rotting, aging and accidents
- Continuing demand for expanded communications services is likely to contribute additional loadings on poles

Evolution of the Problem

- Pole overloading has developed slowly over decades
- Poles originally installed had sufficient excess capacity to avoid overloading for anticipated uses at the time
- Proliferation of communications applications increased demand for access to poles
- Some attaching entities failed to fully record facilities installed, often during rapid network build-out periods, resulting in incomplete inventories
- FCC sanctioned over-lashing without prior engineering review and approval is an additional source of loading uncertainty
- FCC policies designed to expedite network build-out by limiting the time to process applications may unintentionally exacerbated overloading

Defining "Pole Overloading"

- "Overloading" occurs when poles are stressed to levels that exceed standards set by the company in accordance with National Electric Safety Code, IEEE, state agencies, and/or other regulatory or professional organizations
- Departure from the standards may adversely affect the safety of workers and the general public, as well as service reliability
- Contributing factors are loads induced by electric, cable, telephone, and fiber conductors – as well as streetlights, signs, traffic signals, and other uses
- Bending-inducing stresses are the predominant factors contributing to pole failure, far exceeding vertical stresses in most cases

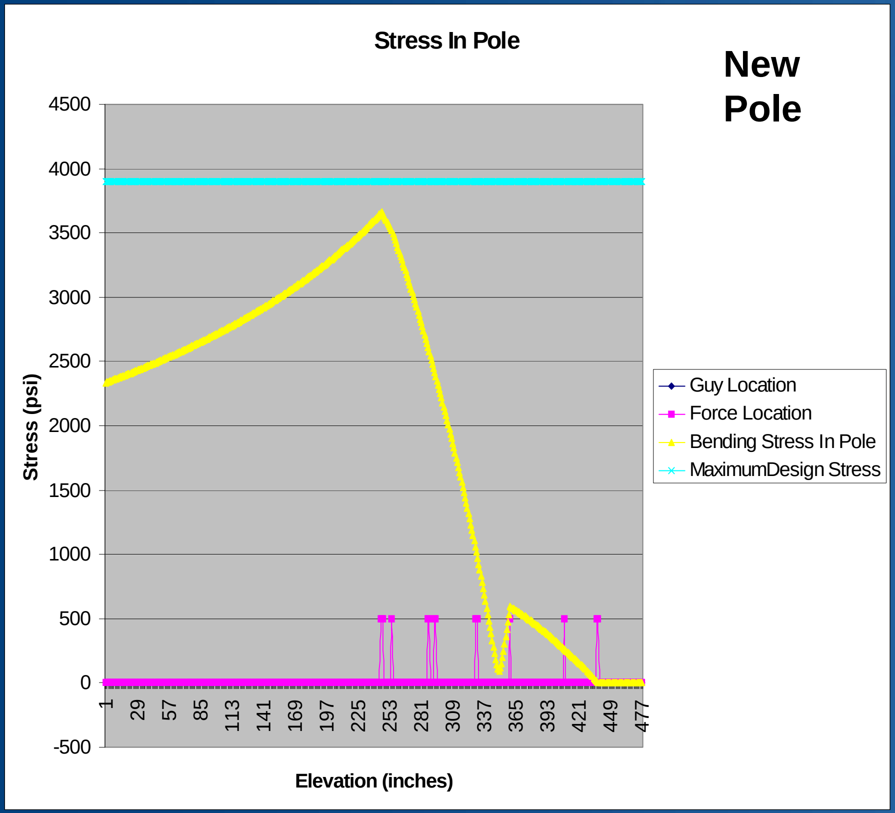
Specialized Loading Model for Evaluating Programs and Policies

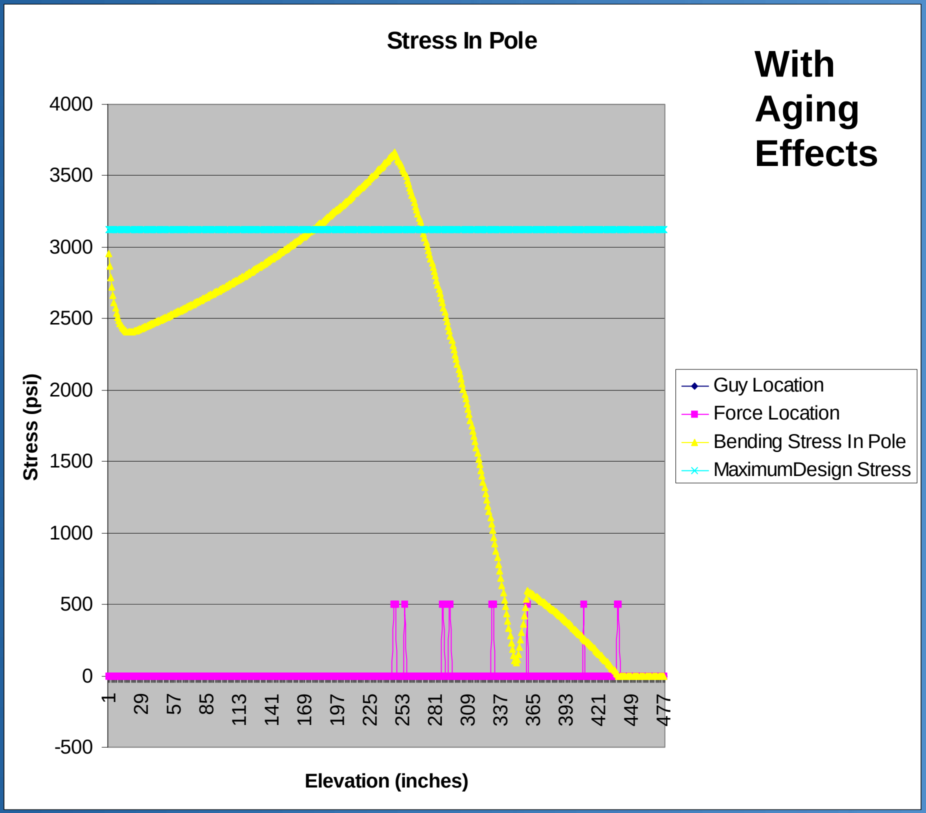
- Comprehensive models for pole line design and loading analyses are commercially available

- To support policy analysis, a screening model was designed that:
  - Considers only the dominant forces – conductors and guys
  - Identifies the nature and extent of the safety and program issues
  - Provides a tool to develop mitigation tactics and a remediation strategy
  - Documents pole characteristics under normal “measured” conditions in the field and inventory data
  - Projects loadings under “design” conditions by attaching entity and cumulatively

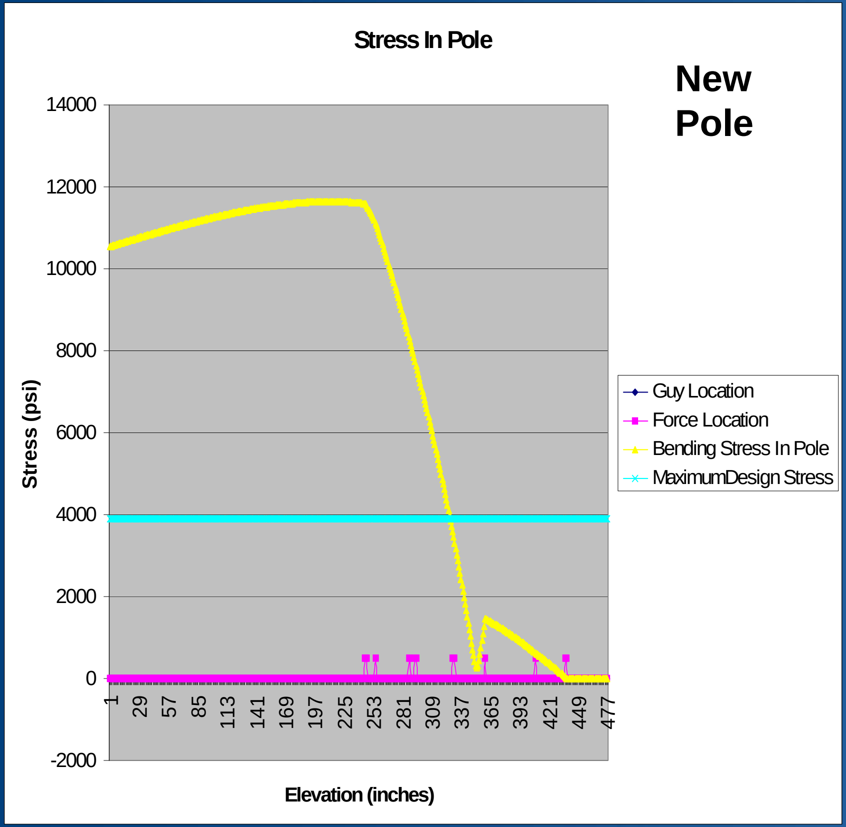
Case Study A

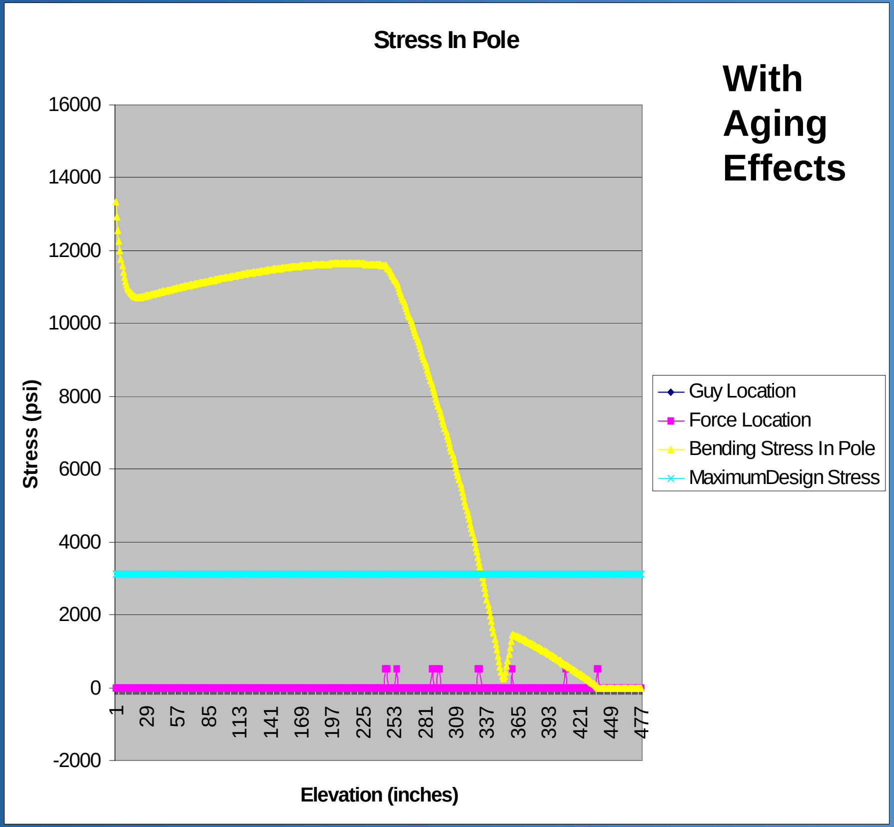

Case Study A: Measured Load Condition



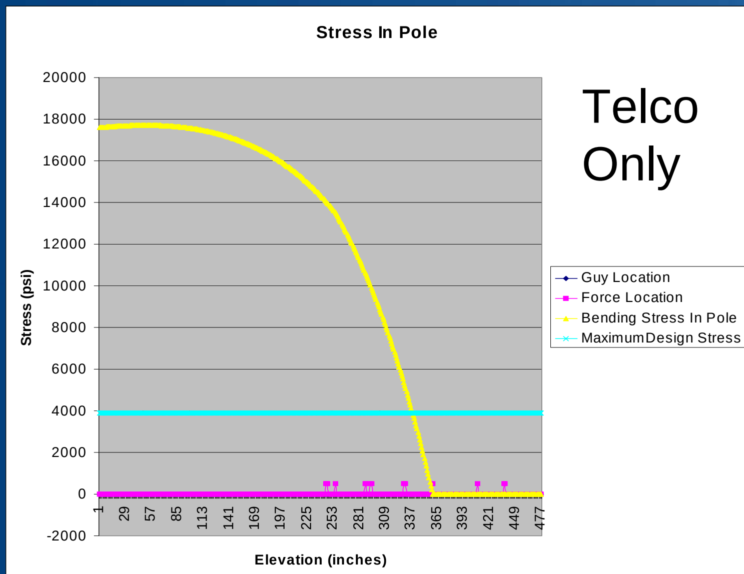


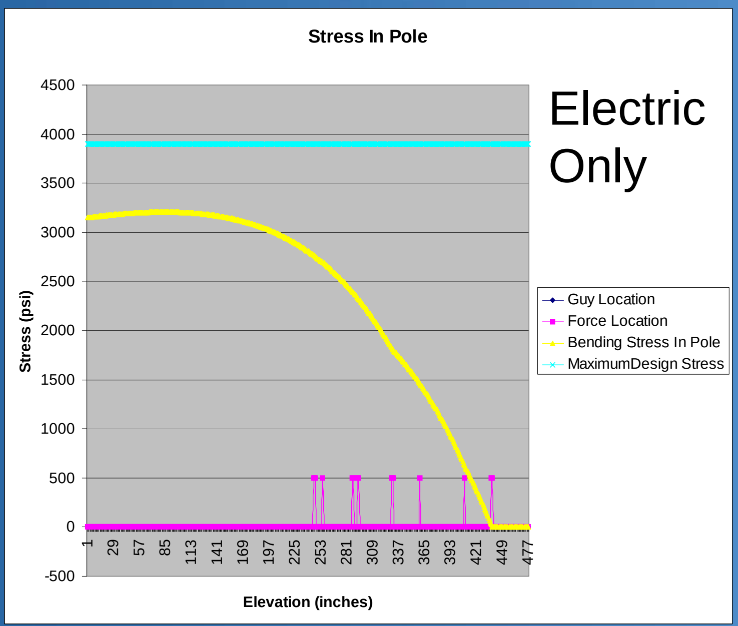
Case Study A: Design Load Conditions

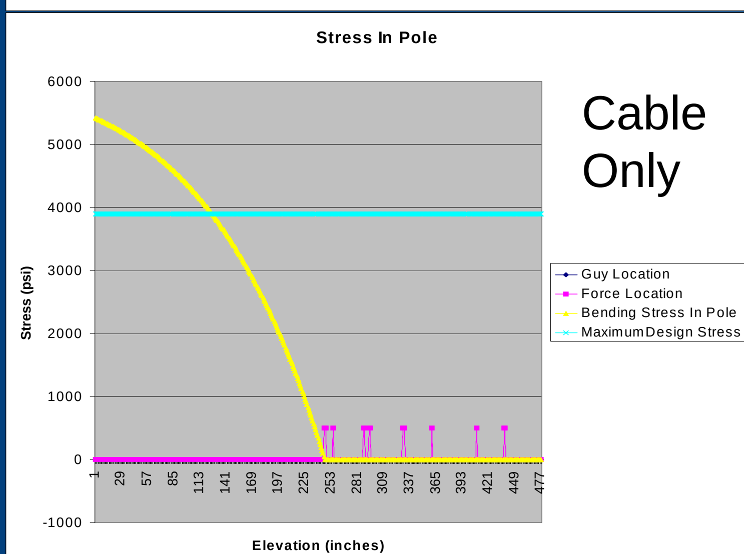




Case A: Separate Stresses - Design Load







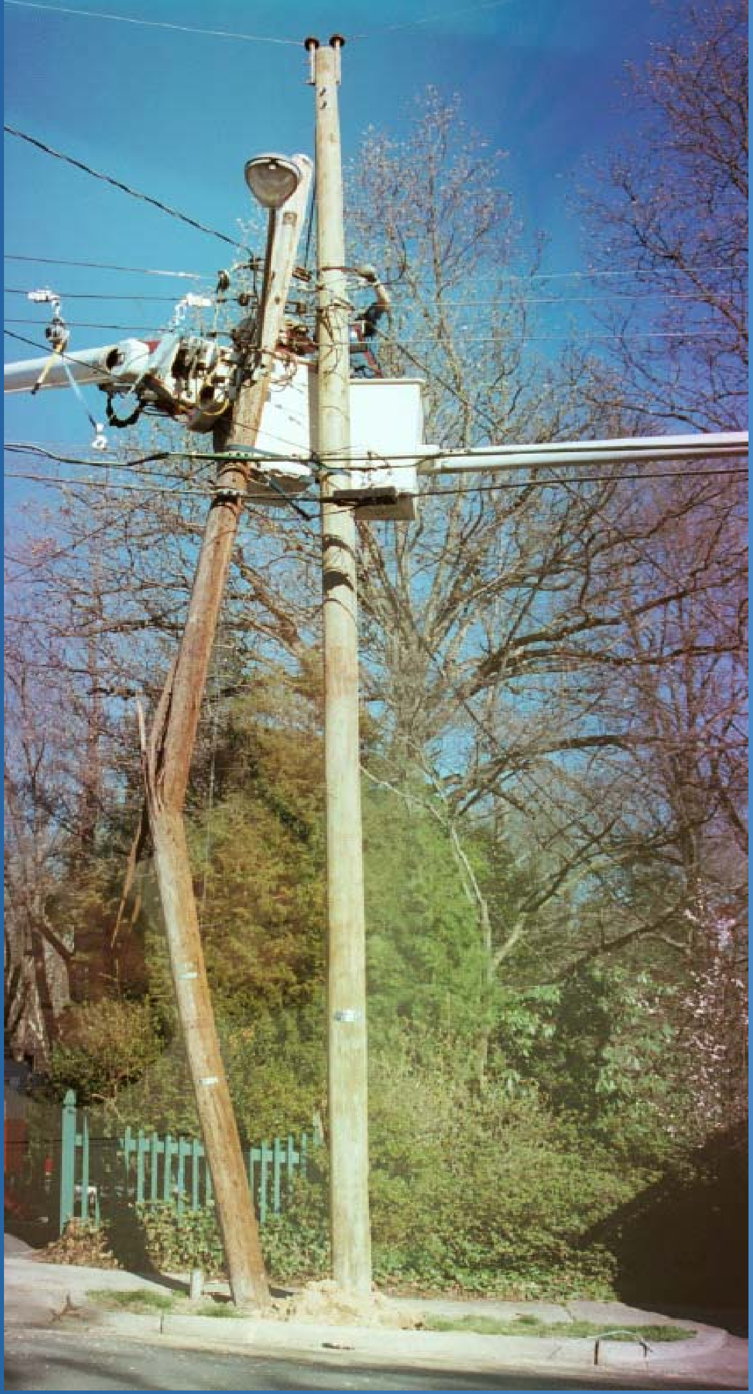
Case Study A: Findings

- Aging would significantly increase the likelihood of pole failure given the heavy loading of this pole
- Cumulative stresses exceed maximum threshold under design loads making structural failure likely in “design” storm conditions
- Loading of electric, telecom, cable and fiber counter balance each other to some extent
- Taut cable conductor is significant contributing factor.

Mitigation Options

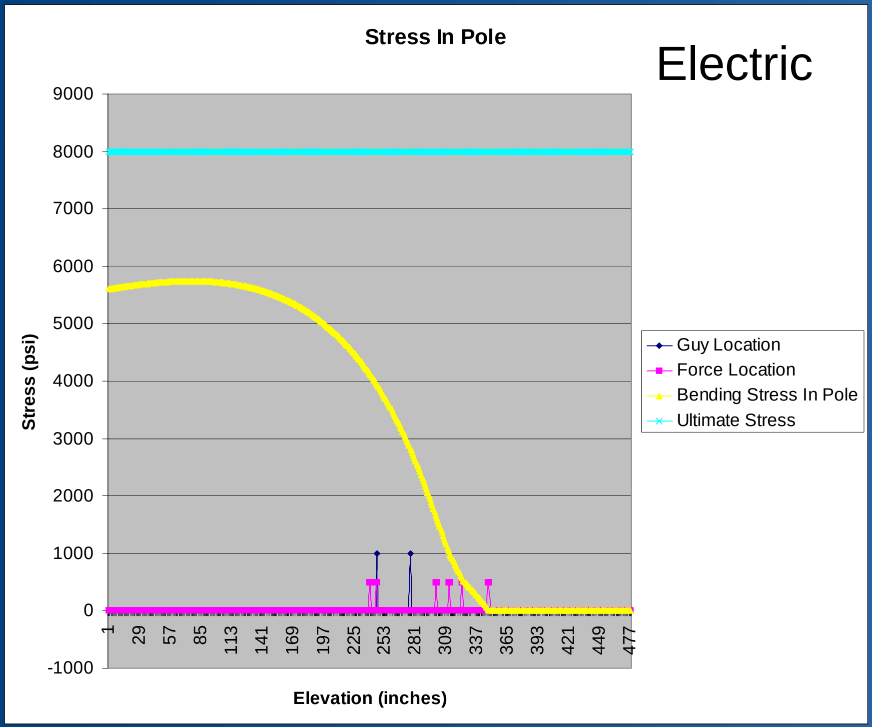
- Reconfigure guying to reduce stress
- Increase cable conductor sag
- Replace pole with larger pole when opportunity is afforded.

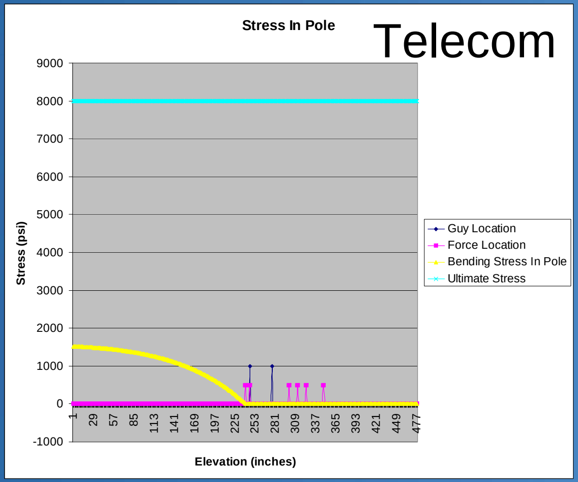
Case B: Broken Pole from Auto Accident

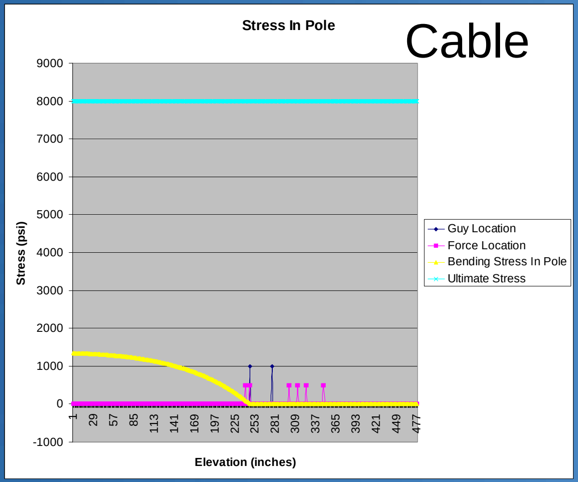


Case Study B: Combined Measured Load

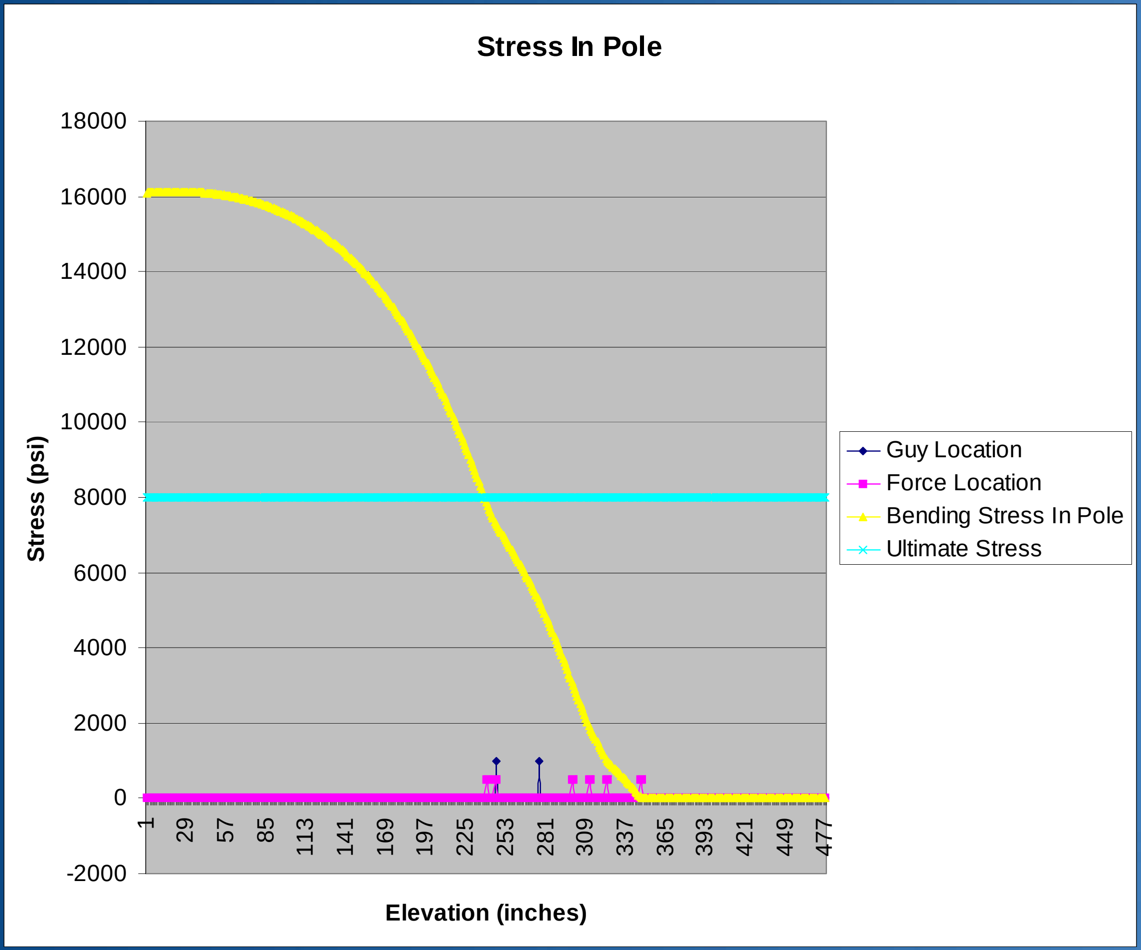
Case B: Separate Measured Loads







Case B: Combined Design Load



Case Study B: Findings

- Measured loads bordered maximum design load under normal conditions and were imbalanced
- Age of pole was likely a contributing factor – estimated 35 to 45 yrs
- Cumulative stresses exceed maximum threshold under design loads and would be vulnerable in a severe storm
- Heavily loaded condition was the “the straw that broke the camel’s back” contributing to the structural failure after the collision

<u>Mitigation Options</u>

- Improved load-balancing of conductors
- Review poles with similar characteristics in nearby area for aging and potential overloading

Overview Findings

- Loading problems are often precipitated by larger conductors that are more susceptible to extreme wind loadings
- The tautness of conductors installed by non-utility users are a major source of structural stress on poles.
- Pole failures in storm conditions are heavily influenced by loading characteristics and aging as well as pole maintenance
- When aging is considered, maximum allowed stresses must be reduced to maintain the same safety margin
- Poles with overloading and safety problems
  - Often occur in clusters along popular “corridors”, but may also occur in isolation
  - Usually have more complex facilities than average.

Examples of Financial Impacts of Non-Utility Loadings on Poles

- Capital investment - pole inventory sizes increased by one class to accommodate joint use
  - Estimated rise in pole costs of 15%
  - Labor and installation costs another 15%
- Capital investment and revenues – pole height increased to provide additional space for communications
  - Increased capital costs for poles placed
  - Decreased revenues under FCC formulas when “usable space” on pole is increased (cable -6.9%/ft; telecom -2.6%/ft)
- Operating costs – Second “truck roll” to remove poles stubs after non-utility transfers to replacement poles
  - Second roll can cost $500 to $1,000 per pole

Impacts on Utility Operations

- Heavily loaded poles impact operations by:
  - Requiring additional time to perform routine maintenance due to increased pole complexity, taller poles, etc.
  - Increasing cost of repairs – more extensive, time consuming
  - Creating additional reliability and safety risks that demand attention
  - Increased administration and monitoring to deal with overload situations
  - “Hidden costs” on entire distribution organization can add to overall carrying charges
- Loss of “good will” due to:
  - Increased number of outages of longer durations
  - Unnecessarily unsightly poles, conductor configurations, guying, etc.

Options for Utilities Addressing Overloading Issues

- Assess nature and extent of overloading due to non-utility uses.
- Conduct "root cause" analyses on sample of pole failures across service territory
- Design remediation programs that offer benefits/cost ratios that responsibly balance consumer rates against reliability and safety considerations.
- Develop pole loading monitoring criteria for use in routine maintenance and repair activities, and more thorough "spot checking" programs
- Request funding for necessary capital and operating costs of overloading remediation programs in routine rate adjustments.
- Establish information base on the direct and indirect costs of non-utility use of infrastructure

Options for State Regulators Addressing Overloading Issues

- Evaluate the nature and extend of overloading across the state
  - Compile readily available data from all parties using utility infrastructure
  - Based on findings regarding severity and location of problem, determine what programs are needed
- Create incentives/penalties for all non-utility pole users that ensure compliance with engineering and safety standards
- Require notification and approval before access to poles by non-utility user to assure safety..
- Allow cost recovery for programs that identify and remediate overloading associated with non-utility uses.

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