Background

• Utility poles are one of the more substantial objects intentionally placed on roadside
• U.S. has 88 million utility poles within highway rights-of-way
Crashes Experienced

- Fatal crashes with utility poles = 1,008
- Fatal crashes - ~1% of all pole crashes
- Injury crashes – 40% of pole crashes
- Adverse weather crashes – 25% of pole crashes
- Daylight crashes – 50% of pole crashes
- Nighttime crashes – 25% of pole crashes

Utility Pole
Objective 1

Treat specific utility poles in high-crash and high-risk spot locations
Strategy A

- Remove Poles in High-Crash Locations
  - Prospective locations based on
    - History of pole crashes (responsive)
    - Likely pole crashes (proactive)
  - Criteria for removal;
    - Is pole necessary?
    - Is there another way to serve the same need?

Strategy B

- Relocate Poles in High-Crash Locations
  - Farther from roadway and/or to less vulnerable locations
  - Michigan study –
    - Vehicles likely to run off the road or outside of curves
EXHIBIT V-4
Curve Direction and Crash Frequency
Source: O'Day, 1979

RIGHT CURVE
LEFT DEPARTURE
(41 Accidents, 15 Fatal)

LEFT CURVE
RIGHT DEPARTURE
(76 Accidents, 31 Fatal)

LEFT CURVE
LEFT DEPARTURE
(28 Accidents, 6 Fatal)

Crossover
Countermeasure to reduce hazard

- Use a small number of breakaway strain poles on outside of curves
- Use compression struts on inside of the curve
- Reference
Vulnerable Locations

• Lane drops, intersections and sections where the pavement narrows
Thoughtful Pole Placement?

EXHIBIT V-7
T-Intersection that Has Experienced Frequent Utility Pole Crashes when Left-Turning Vehicles Lose Control and Run Off the Road
Effectiveness

- Studies have found crashes decrease in relation to the distance between the pavement edge and the pole (Zegeer, Parker, Cynecki, 1984)
**EXHIBIT V-9A**

Percent Reduction in Crashes for Moving Poles Farther from the Roadway  
*Source: Zegare and Cynechi (1984)*

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<th>Pole Line Before Removal (Ft)</th>
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Relocated – Year 1

6 Months Later!!
Strategy C

- Use Breakaway Devices
  - Studies show that 31% of non-breakaway poles are knocked down or severely damaged upon impact
  - Breakaway poles allow vehicles to pass through on impact
  - Initial cost, $2000-$3000/pole
  - Annual maintenance, $1000/pole

Breakaway Pole Criteria for Use

- Pole is in clear zone
- Removing or relocating pole is not practical
- Pole is class 4-40 or smaller, without attached heavy devices
- Safe recovery area behind pole, free of hazards
Breakaway Pole Criteria for Use

• No significant pedestrian activity
• Final pole position and wires create no hazards for pedestrians, vehicles or property owners

Strategy D

• Shield drivers from poles in high-crash Locations
  Guardrails and Other Roadside Barriers-
  – Aim is to direct errant vehicles away from pole
  – Cost-effectiveness study of barrier and end treatment
  – AASHTO Roadside Design Guide or ROADSIDE 5.0 software (2002)
Guardrails and Other Roadside Barriers

• Criteria for use;
  – Pole is in clear zone area
  – Removing or relocating pole is impractical
  – Breakaway poles can’t be used
  – Guardrail and end treatment provides less hazard
  – Guardrail will not redirect vehicles into higher crash area
  – Guardrail is 2 or more feet from edge of travel lane
  – Guardrail will not deflect into pole on impact

Crash Cushions

• Purpose: to shield vehicle occupants from rigid objects
  – Cost-benefit/cost effectiveness analysis should justify their use
  – Crash cushions absorb impact energy in controlled crash
Crash Cushions

• Criteria for use;
  – Pole is located in clear zone
  – Removing or relocating pole is impractical
  – Adequate space between travel lane and pole to accommodate crash cushion
  – Crash cushion does not cause a hazard to other vehicles
  – Sufficient clear zone area to provide for redirected vehicles

Strategy E

• Improve the driver’s ability to see poles in high-crash locations
  – Where previous strategies don’t work, delineate
• AASHTO Roadside Design Guide order of priority;
  – Redesign the facility to reduce ROR crashes
  – Remove or relocate the object
  – Redesign the object or shield it to lessen impact
  – Delineate the object
Strategy F

• Apply traffic calming measures to reduce speeds on high-crash highway sections
  – Use Traffic calming measures to reduce speeds, thus severity
  – Information or traffic calming techniques: http://www.ite.org/traffic/index.html
Objective II

Do Not Place Utility Poles in High-Crash Locations

– Control or relocate pole placement during:

New construction
Widening projects
Other projects

Strategy G

• Develop, revise and implement policies to prevent placing or replacing poles within the recovery area

– Policy must be reasonable to gain acceptance

– Issues to be addressed

• Function of roadway
• Lateral displacement of encroaching vehicles
• Location of underground utilities
• Roadside conditions
• Prevailing roadway speed
• Volume of traffic
Objective III

- Treat several utility poles along corridor to minimize likelihood of crashing into utility pole
  - This objective has a corridor orientation
  - Pole crashes are often spread along, not at one pole or cluster of poles

Strategy H

Place Utilities Underground

- Obvious strategy
- Possible results of replacing a pole underground
  - Roadside has suitable recovery area without pole, which gives sizeable effect
  - In many cases, many objects exist in area so pole is less important
  - If poles support street lights, loss of lighting could reduce safety
    - 34% urban utility poles have street lights attached
Strategy I

• Relocate poles along corridor farther from roadway and/or to less vulnerable locations
  – Increasing distance from pavement edge to pole
    • Poles at curbs, three times more likely to be struck than at 10 ft. (Mak & Mason, 1980)
  – Relocating a line of poles farther from the pavement edge gives crash reduction factors in next exhibit

Strategy J

• Decrease number of poles along corridor
  – Strategy is to reduce pole density
  – Jones & Braun (1980) found pole density has highest correlation to pole crashes
  – With poles placed farther apart, openings between poles get larger
Too Many Poles?

EXHIBIT V-18
Schematic showing how increasing the pole spacing provides large areas for errant vehicles to pass through without striking a pole.
Estimation of Pole Crashes/Mi/Yr

• Expected number of pole crashes/mile/yr
  – Depends on
    • Average daily traffic (ADT)
    • Pole density (Den)
    • Average pole offset from roadway (OFF)

\[ \text{Acc/Mi/Yr} = \frac{9.84 \times 10^{-5} (\text{ADT}) + 0.0354 (\text{Den})}{(\text{OFF})^{0.6}} - 0.04 \]
Questions?