TxDOT Statewide Arc Flash Study

Lessons Learned

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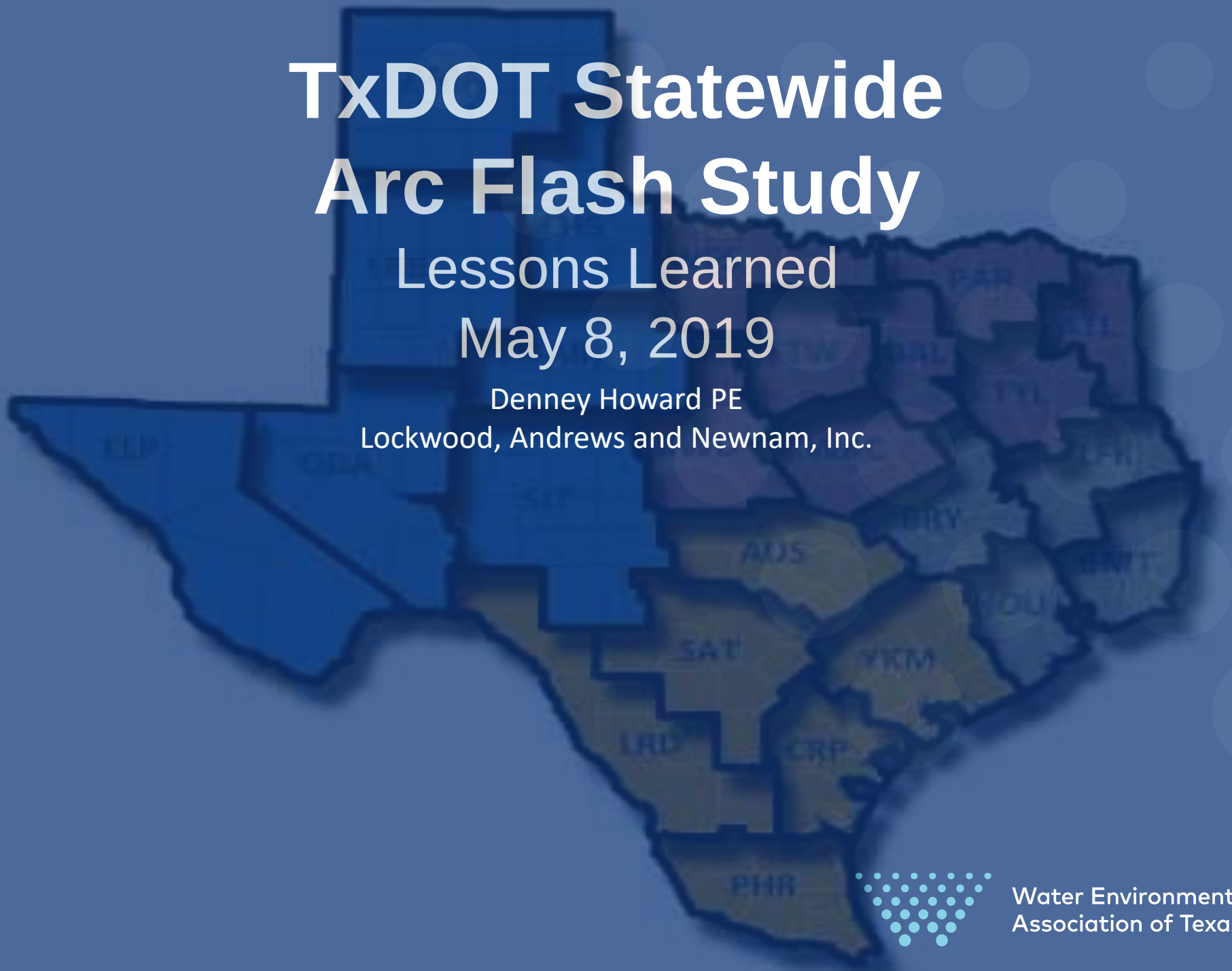

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What is Arc Flash

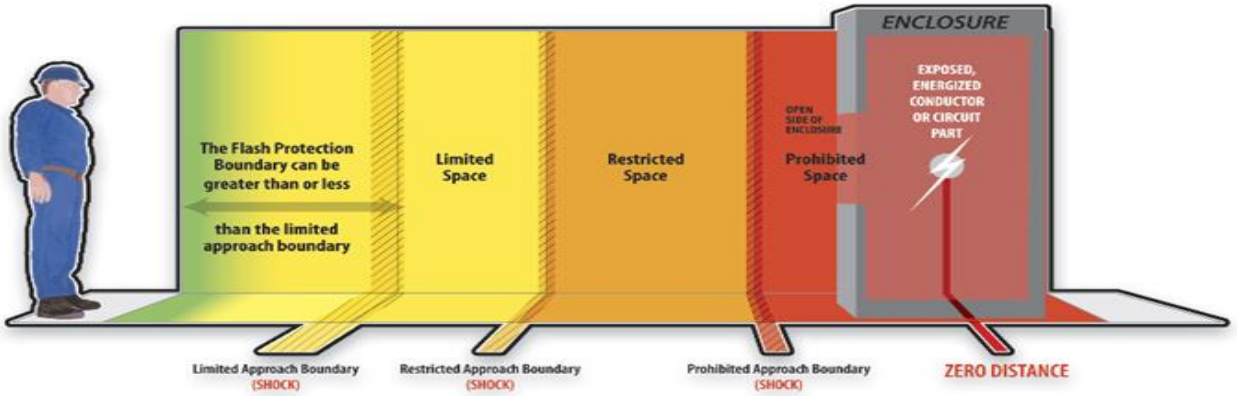
A Brief Description and Why it is Important

- Arc Flash - A release of energy created by a fault that can cause injury. Amount of energy released dependent on distance from flash hazard, size of fault current, voltage of the system, and time required of OCP to clear the fault.

- Arc Flash Study - Evaluation of electrical distribution system to define safe approach distances and appropriate types of PPE. Defined approach distances from exposed energized conductors or circuits are used as an effective means of maintaining electrical safety and mitigating injuries.

What is Arc Flash

A Brief Description and Why it is Important



- Arc Flash Boundary: When an Arc Flash hazard exists, an approach limit from an arc source at which incident energy equals 1.2 cal/cm^2. Note: an exposure of 1.2 cal/cm^2 for 1 second would likely cause a second degree burn.
- Limited Approach Boundary: An approach limit at a distance from an exposed energized conductor or circuit part within which a shock hazard exists. Unqualified personnel can enter with qualified personnel.
- Restricted Approach Boundary: An approach limit at a distance from an exposed energized conductor or circuit part within which there is an increased likelihood of electrical shock, due to electrical arc-over combined with inadvertent movement. Only qualified personnel allowed within boundary.
- ~~Prohibited Approach Boundary: Considered as making contact with energized electrical conductor or circuit.~~ Omitted from NFPA 70E-2018

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Safety

- Utilized professional licensed electricians on the field teams.
- De-energized equipment prior to removing covers, etc.
- Electricians utilized proper field-testing equipment.
  - Impressed signal sensing helped locate circuit sources.
  - Electrical multimeters helped determine whether electrical parts in panels were energized.

Safety

- Team knew the dangers of energized equipment and respected the electrician's working space.
- Respected field safety procedures and boundaries.
- Team wore safety vests & safety glasses at all times and hard hats when required.
- No injuries while visiting 350+ facilities.

Project Planning

- Defined processes early.
- Utilized site drawings from previous TxDOT statewide efforts.
- Used critical path management to eliminate bottle necks, such as requesting electrical data from utility companies.
- Researched sites prior to visiting.

Project Planning (cont.)

- Dedicated resources for:
  - Scheduling site visits with TxDOT site coordinators, resulting in consistent communication.
  - Travel scheduling and reservations, able to make changes promptly and efficiently.
  - Report writing, ensuring a consistent report from the first to last report.

Staff Adaptability

- Listened to each other and embraced fresh ideas.
- Utilized **OneNote** checklists to help coordinate tasks between team members.
- Team members were interchangeable.
- Adequate staff that allowed rotation without burnout.
- Quality control provided at each step.

Cloud Based OneNote Checklist

Comparable Breakers | Checklists | Schedule | Lubbock | + | 02 - Fort Worth | 14 -Austin | 16 - Corpus Christi | Beaumont | Dallas | Laredo | Pharr | San Antonio

Lufkin District

Monday, July 23, 2018 9:36 AM

Site	Site Val Team	Field Notes and Photos uploaded	Modeler	One Line completed	Draft One Line QC'D (Gaspar, Mason, Steve, Denney, or Ken)	Draft Fault Current, Protective Device, and Arc Flash Table Exhibits Printed	Code Violations Complete	Utility Fault Received	Utility Fault Inputted in Model	Final One Line QC'd with updated utility info	Final Fault Current, Protective Device, and Arc Flash Table Exhibits Printed	Label Spreadsheet Complete	Labels printed	Report Complete
Lufkin DHQ & AE&M		☑	Jim	☑	☑ Kim	☑	☑	☑ Infinite	☑ Jim	☑ MDM	☑ MDM	☑	☑	☑
Groveton MO		☑	Adrian	☑	☑ Kim	☑	☑	☑	☑ Jim	☑ MDM	☑ MDM	☑	☑	☑
Livingston AE&M		☑	Koby	☑	☑ Kim	☑	☑	☑ Infinite	☑ Jim	☑ MDM	☑ MDM	☑	☑	☑
Shepherd MO		☑	Koby	☑	☑ Kim	☑	☑	☑	☑	☑ MDM	☑ MDM	☑	☑	☑
Hemphill Mo		☑	Adrian	☑	☑ Kim	☑	☑	☑ Infinite	☑ Jim	☑ MDM	☑ MDM	☑	☑	☑
Bronson MY		☑	Adrian	☑	☑ Kim	☑	☑	☑ Infinite	☑	☑ MDM	☑ MDM	☑	☑	☑
San Augustine AE&M		☑	Koby	☑	☑ Kim	☑	☑	☑ Infinite	☑ Jim	☑ MDM	☑ MDM	☑	☑	☑
Nacogdoches AE&M		☑	Koby	☑	☑ Kim	☑	☑	☑ Infinite	☑ Jim	☑ MDM	☑ MDM	☑	☑	☑
Center MO		☑	Adrian	☑	☑ Kim	☑	☑	☑ Infinite	☑ Jim	☑ MDM	☑ MDM	☑	☑	☑
Lufkin MO		☑	Koby	☑	☑ Kim	☑	☑	☑ Infinite	☑ Jim	☑ MDM	☑ MDM	☑	☑	☑
Crockett MO		☑	Adrian	☑	☑ Kim	☑	☑	☑	☑ Jim	☑ MDM	☑ MDM	☑	☑	☑
Corrigan MSS		☑	Adrian	☑	☑ Kim	☑	☑	☑	☑ Jim	☑ MDM	☑ MDM	☑	☑	☑
Timpson MSS		☑	Jim	☑	☑ Kim	☑	☑	☑ Infinite	☑ Jim	☑ MDM	☑ MDM	☑	☑	☑
Zavalla MSS		☑	Koby	☑	☑ Kim	☑	☑	☑ Infinite	☑ Jim	☑ MDM	☑ MDM	☑	☑	☑

Learning Opportunities

- Contacted utilities prior to site visits rather than after.
- Gained better understanding of the NEC.
- Adapted to uniform modelling techniques.
- Implemented lessons learned on the go.
- Took multitudes of legible photos (80,000+).

Learning Opportunities (Cont.)

- Young Engineers were motivated to learn from new experiences.
- Great mentoring experience in the field and office. PE's mentored EIT's on:
  - how electrical equipment worked,
  - where facilities did not comply with the NEC,
  - how to develop proper one-line diagrams, and
  - what information was critical.

Questions?

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