Temporary Power in Construction
Anything Goes?

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- NFPA-70E
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Objectives

- Review requirements for installation of temporary power in construction
  - OSHA 1926, Subpart K
  - National Electrical Code
  - NFPA 70E
  - NECA 200-2010, Recommended Practice for Installing and Maintaining Temporary Electric Power at Construction Sites (ANSI)
- Product Standards
- Safe, efficient design & installation
OSHA 1926 Subpart K, Electrical

- Serious OSHA fines have a ceiling of $7,000.00
- Once an employer receives a serious fine, they have a five year window in which a similar violation could be categorized as a “repeat” or “willful” violation
- Repeat and willful violations have a ceiling of $70,000.00
- OSHA has significantly moved towards the ceiling

OSHA 1926 Subpart K Electrical

- Installation requirements
  - 1926.402 through 408
- Safety related work practices
  - 1926.416 & 417
- Maintenance & Environmental
  - 1926.431 & 1926.432
- Special Equipment
  - 1926.441
- Definitions
  - 1926.449

OSHA 1926 Subpart K, Electrical

- 1926.402, clarifies that subpart K applies to all temporary and permanent power used on jobsite
- However, existing, permanent installations, in place before construction, are not covered
- Subpart K is not applicable to generation, transmission, distribution
OSHA 1926 Subpart K, Electrical

• 1926.403(a), all conductors and equipment shall be approved

• This means accepted, certified, listed, or labeled by qualified testing laboratory (NRTL)

• 1926.403(b)(2), listed labeled equipment shall be used accordingly
OSHA 1926 Subpart K, Electrical

- 1926.403(h), all disconnecting means and circuits shall be legibly marked to indicate purpose unless evident (110.22)

OSHA 1926 Subpart K, Electrical

- 1926.404(b), GFCI in (b)(1)(ii) or AEGCP shall be employed
- (b)(1)(ii) requires GFCI for 120-v, 15/20 amp temporary receptacle outlets
- OSHA recognizes either, not the NEC
- Cord and Plug connected equipment at other than 120-v, 15/20 amp requires GFCI or AEGCP
- Two wire generator 5 kW or less
OSHA 1926 Subpart K, Electrical

- 1926.404(f)(8) requires an EGC in all raceways, cables or cords, contradicted in 1926.405(a)(2)(ii)(C)
- The NEC recognizes some raceways and metallic cable sheaths as an EGC
- 1926.405(a)(2), temporary wiring shall be removed when task is complete

OSHA 1926 Subpart K, Electrical

- 1926.405(a)(2)(ii)(B), branch circuits installed in multiconductor cord, cable assemblies, raceways or open conductors
- Note that the use of open conductors is prohibited by 1926.403(b)(2), the NEC and product standards
OSHA 1926 Subpart K, Electrical

- 1926.405(a)(2)(ii)(B), branch circuits shall not be on the floor
- 1926.405(a)(2)(ii)(C), receptacles shall not be supplied by circuits supplying temporary lighting
- All lamps for general illumination shall be guarded

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Note that this permits cable assemblies such as NM, to be spliced without a box
Note that 1926.405(b)(2) requires all boxes to have covers
OSHA 1926 Subpart K, Electrical

- 1926.405(a)(2)(ii)(J), all extension cords shall be three wire type and be designed for hard or extra-hard usage
- Flat extension cords are prohibited, see NEC Article 400

OSHA 1926 Subpart K, Electrical

- 1926.405(b)(1), all conductors entering boxes, cabinets or fittings, shall be protected
- This means using a connector listed for the purpose
- All unused holes shall be closed
- Duct tape, does not cut it!
OSHA 1926 Subpart K, Electrical

- 1926.405(d), panelboards shall be dead-front
- Dead-front covers are typically multiple pieces, all of the dead-front must be installed when the panelboard is energized
- This means no cardboard or plastic covers with magnets
OSHA 1926 Subpart K, Electrical

- 1926.405(f), OSHA requires color code for all conductors (no specific colors)
- 1926.405(g)(2)(iii) prohibits the splicing or repair of an extension cord
  - Extension cords may be repaired by a qualified person
  - Letter of interpretation
  - Qualified person
  - Hard or extra hard-use cord caps
  - Cord repair i.e., tape not permitted
OSHA 1926 Subpart K, Electrical

- 1926.405(j)(1)(ii), requires receptacles be securely supported
- 1926.405(j)(2)(ii), requires receptacles installed in damp or wet locations be designed for the location
OSHA 1926 Subpart K, Electrical

- 1926.406 Specific purpose equipment and installations
  - Cranes/hoists, Elevators/escalators
  - Welders, X-ray equipment
- 1926.407 Hazardous locations
- 1926.408 Special systems
  - Over 600 volts
  - Class 1, 2, 3 remote control, signaling, power limited, communications systems

OSHA 1926 Subpart K, Electrical

- 1926.416(a)(1), literally prohibits energized work
  - Deenergize
  - Ground
  - Effective guarding with insulation or other means

OSHA 1926 Subpart K, Electrical

- 1926.416(a)(3)
  - Before work is begun the employer shall ascertain by inquiry or direct observation, or by instruments, whether any part of an energized electric power circuit, exposed or concealed, is so located that the performance of the work may bring any person, tool, or machine into physical or electrical contact with the electric power circuit.
OSHA 1926 Subpart K, Electrical

- 1926.417 LOTO
- Performance based requirement
- Absolutely useless
- A written LOTO plan must include prescriptive steps to deenergize LOTO and to reenergize
- The electrical LOTO requirements in 1910.333(b)(2) should be utilized

1910-333(b)(2)

LOCKOUT/TAGOUT SUMMARY
1. Review established LOTO written procedures.
2. Disconnect all energy sources.
3. Release stored electrical energy.
4. Release or block non-electrical energy sources.
5. Apply Lock & Tag.

LOCKOUT/TAGOUT REMOVAL SUMMARY
1. Conduct Tests & Visual Inspections of work area.
2. Notify other affected employees.
3. Removal of each lock & tag by the employee who applied them.
4. Visual determination that the area is clear.
OSHA 1926 Subpart K, Electrical

- 1926.431 Maintenance
  - Hazardous locations
- 1926.432 Environment deterioration of equipment
  - Equipment identified for the use
  - Damp, wet, exposure to vapor, chemical, heat
  - Protect against corrosion
- 1926.441 Batteries & charging
- 1926.449 Definitions
NECA 200-2010

- Temporary Electric Power at Construction sites
  - NEIS Standard
  - National Electrical Installation Standards
    - Designed to improve communication
    - Define minimum baselines for quality workmanship
    - Intended to be referenced in contracts

NECA 200-2010

- Temporary electric power installations at construction sites shall be installed and maintained in accordance with NECA 200-2010, Standard for Installing and Maintaining Temporary Electric Power at Construction Sites (ANSI).
- An American National Standard (ANSI)

NECA 200-2010

- 600 volts or less
- Does not address generators
- Does not address installation requirements, see NFPA 70, NEC
- Does not address safe work practices. See NFPA 70E, Standard for Electrical Safety in the Workplace
NECA 200-2010
- Planning
- Location, location, location!
  - Service equipment
  - Feeders
  - Receptacle outlets
  - Lighting
- Minimize disruption
- Minimize rework
- Facilitate cutover
- Requires qualified persons

NECA 200-2010
- Design of temporary system
  - Engineer of record or
  - The electrical contractor (EC)
- EC will install, maintain & remove
- EC will be reimbursed for moves, adds, changes
- EC not responsible for equipment owned and operated by others

NECA 200-2010
- EC request information on any special electrical requirements
- EC contact utility or owner of existing building
- EC prepare & maintain/update drawings
- Perform load survey
- Consider spare capacity
NECA 200-2010

- Plan to transfer to building power as system is energized.
- Protect equipment
  - Suitable for the environment, 110.28
  - Barriers/fences where necessary
  - Accessibility
- Equipment illumination
- Marking/Labeling, 1926.403(h)/110.22

NECA 200-2010

- Wiring methods
  - Summary of basic NEC/OSHA
- Receptacle outlets
  - Summary of basic NEC/OSHA
- Lighting
  - Summary of basic NEC/OSHA
- Maintenance
- Removal

NECA 200-2010

- Annex A, light levels from 1926.56
- Annex B, referenced standards
NFPA 70, the NEC

- Article 590 Temporary Installations
- 90.3 Code Arrangement
- Chapters 1 through 4 apply generally
- Chapters 5, 6 & 7 are Special and supplement or modify the requirements in 1 through 4
- 590.2(A) All requirements for permanent wiring apply unless specifically modified in 590
NEC chapter 1 through 4

- Working space
- Location service disconnecting means
- Overcurrent protection
- System grounding
- Grounding electrode systems
- Transformers
- Motors
- And much more……………..

Article 590 Temporary Installations

- 590.3 Time Constraints
  - During the period of construction
  - 90 days, holiday decorative lighting etc
  - Emergencies and tests
- Temporary wiring must be removed immediately upon completion of construction or purpose

Article 590 Temporary Installations

- Feeders
  - Raceways, multi-conductor cords/cables identified in 400.4 as hard/extra hard use
  - NM/NMC, any building/structure without height or concealment limitations
  - Single insulated conductors permitted only for emergencies and tests, accessible only to qualified persons
**Article 590 Temporary Installations**

- Branch Circuits
- Must originate in an approved power outlet, switchboard, panelboard, MCC or fused switch enclosure


**Article 590 Temporary Installations**

- **Branch Circuits**
  - Raceways, multi-conductor cords/cables identified in 400.4 as hard/extra hard use
  - NM/NMC, any building/structure without height or concealment limitations
  - Single insulated conductors permitted for emergencies and tests or
  - Decorative lighting not over 150-v to ground, on insulators @ 10 ft and accessible only to qualified persons

- **Receptacles, grounding type**
  - All BC must contain an EGC except metal raceway recognized in 250.118
  - Receptacles are not permitted on a BC that supplies temporary lighting
  - All receptacles installed in wet locations must have an enclosure that is weatherproof whether or not the attachment plug cap is inserted
Article 590 Temporary Installations

- Disconnecting means required for all ungrounded conductors, legibly marked to indicate purpose, 110.22
- All lamps must be protected/guarded
- Splices do not require a box where non-metallic jacketed multi-conductor cord or cable assemblies are used
- A box is required wherever a raceway or metal sheathed cable is used
**Article 590 Temporary Installations**

- Flexible cords/cables require fittings designed for the purpose
- Cable assemblies may be supported “at intervals that ensure that they will be protected from physical damage”
- Vegetation can not be used to support temporary, except for holiday lighting
- All holiday lighting must be listed

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**Article 590 Temporary Installations**

- 590.6 GFCI protection for personnel
- Temporary wiring installations used to supply temporary power to equipment used by personnel during construction, remodeling, maintenance, repair, or demolition of buildings, structures, equipment, or similar activities.

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**Article 590 Temporary Installations**

- 590.6 GFCI protection for personnel
- Applies to power derived from an electric utility company or from an on-site-generated power source
Article 590 Temporary Installations

- Receptacles not part of permanent wiring
  - 125-v, 15, 20 & 30-amp, GFCI required
- Receptacles existing or installed as permanent wiring
  - 125-v, 15, 20 & 30-amp, GFCI required
  - Listed cord sets or devices with listed ground-fault circuit interrupter protection for personnel identified for portable use shall be permitted
- Open neutral protection
Article 590 Temporary Installations

- Receptacles on 15-kW or less portable generators
  - 125/250-v, 15, 20 & 30-amp, GFCI required
  - Generators in wet locations must have receptacle enclosures that are weatherproof whether or not the attachment plug cap is inserted
  - Listed cord sets or devices with listed ground-fault circuit interrupter protection for personnel identified for portable use shall be permitted built before 1/1/2011

Other outlets

- GFCI protection or an “assured equipment grounding conductor program” (AEGCP)
- Requires tests on all cord/plug connected equipment, cord sets, & receptacles not part of permanent wiring
- Before first use, damage, 3 months
Planning

- Rework
  - Location
  - Site plan, schedule
- Cutover
  - Location, facilitate removal
  - Facilitate efficient transfer

Planning

- Incident energy
  - Steps to reduce exposure
- ESWPP
  - Plan, build to allow expansion w/o exposure
- Access
- Exposure to weather

Electrical Safe Work Practices

- Plan electrical safe work practices into your temporary distribution
- Start at the source!
- Think the whole project all the way through
- Include, expansion and eventual cutover to permanent power
Electrical Safe Work Practices

- Take steps to reduce the level of incident energy
- Consider using multiple, smaller transformers to limit the available short circuit current

Electrical Safe Work Practices

- Use multiple service disconnects to utilize smaller ODPD’s and wire
- Plan means to isolate
- Permit only “qualified persons” to work on the temporary system
Questions?????

• Thanks!
• Jim Dollard