

AMERICAN NATIONAL STANDARD

NECA 200-2002



Recommended Practice
for Installing and Maintaining

Temporary Electrical Power at Construction Sites



Published by
National Electrical
Contractors Association



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**An American
National Standard**



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(This foreword is not a part of the standard)

Foreword

National Electrical Installation Standards® are intended to improve communication among specifiers, purchasers, and suppliers of electrical construction services. They define a minimum baseline of quality and workmanship for installing electrical products and systems. *NEIS*® are intended to be referenced in contract documents for electrical construction projects. The following language is recommended:

Temporary electric power installations at construction sites shall be installed and maintained in accordance with NECA 200-2002, *Recommended Practice for Installing and Maintaining Temporary Electrical Power at Construction Sites* (ANSI).

Use of *NEIS* is voluntary, and the National Electrical Contractors Association assumes no obligation or liability to users of this publication. Existence of a standard shall not preclude any member or non-member of NECA from specifying or using alternate construction methods permitted by applicable regulations.

The installation and maintenance practices recommended by this publication are intended to comply with the edition of the National Electrical Code (NEC) in effect at the time of publication. It is the responsibility of users of this standard to comply with state and local electrical codes when installing electrical products and systems.

Suggestions for revisions and improvements to this standard are welcome. They should be addressed to:

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1. Scope

1.1 Product and Applications Included

This publication describes installation procedures at construction sites for temporary power operating at voltages of 600 volts or less. It covers the planning, installation, expansion, maintenance, cutover, and removal of the temporary power system. The objective of this recommended practice is to ensure a safe, adequate, functional, and reliable temporary electrical power distribution system for all trades on site.

All information in this publication is intended to conform to the National Electrical Code (ANSI/NFPA standard 70). Installers should always follow the NEC, applicable state and local codes and manufacturers' instructions. Temporary power systems at construction sites should also be installed

and maintained in accordance with current Occupational Safety and Health Administration (OSHA) *Safety And Health Regulations For Construction – Electrical* (29 CFR Part 1926 Subpart K).

Only qualified persons familiar with the construction and operation of power distribution systems should perform the work described in this publication.

1.2 Regulatory and Other Requirements

Other *National Electrical Installation Standards* provided additional guidance for installing particular types of electrical products and systems. A complete list of *NEIS* is provided in Annex C.

2. Temporary Construction Power

Temporary construction power is required where a power distribution system does not exist or is not adequate to support construction operations.

Construction operations in this standard refer not only to new construction but also renovation, repair, demolition, maintenance, and other similar operations in existing facilities. Temporary construction power is provided for the sole purpose of supporting construction operations and is to be removed at the end of construction.

3. Responsibilities

3.1 Installation and Maintenance

Install and maintain the temporary construction power distribution system throughout construction and remove it at the end of construction. The exact scope and responsibilities are governed by the contract documents but generally includes the following:

- Design
- Permits and approvals
- Moves, adds, changes, and repairs
- Outages
- Equipment owned and operated by others

3.2 Design

Where the temporary construction power distribution system is not designed by the architect or engineer of record, design the temporary construction power distribution in accordance with the NEC, the contract documents, and Federal, state, and local laws, regulations, and statutes. The design of the temporary construction power distribution system should be performed under the supervision of a person qualified by license in the jurisdiction where the construction project is located.

3.3 Permits and Approvals

Submit necessary documentation and obtain necessary permits and approvals for the installation of the temporary construction power distribution system from the local authority having jurisdiction (AHJ), the utility in whose service area the construction project is located, and any other authority required by Federal, state, or local law, regulation, or statute or by the contract documents.

The electrical contractor is not responsible for obtaining property surveys, right-of-ways, easements, environmental permits, or other similar requirements.

3.4 Moves, Adds, Changes, and Repairs

The electrical contractor will be reimbursed in accordance with the contract documents for moves, adds, changes (MAC), and repairs required during construction that were not part of the original contract documents, or the approved temporary construction power distribution system and could not have been reasonably anticipated.

3.5 Outages

The electrical contractor is not responsible for the effects of power outages caused by others, or by external factors beyond its control that could not be reasonably anticipated.

3.6 Equipment Owned and Operated By Others

The electrical contractor is not responsible for the installation, maintenance, repair or removal of equipment owned and operated by others. This includes, but is not limited to, portable power tools, extension cords, power distribution boxes, and task lighting. Unless otherwise required by the contract documents, equipment owned and used by others at the construction site is the responsibility of those who own and use it.

4. Planning the Installation

4.1 Project Plan and Schedule

Install temporary construction power in accordance with the overall project plan and schedule. Work with the party responsible for the overall project coordination to ensure that temporary power is available when needed to support construction operations. Identify the following project milestones:

- a) When temporary power must be available at the construction site.
- b) When the temporary power supply needs to be increased, modified, or extended to meet the needs of specific construction operations.
- c) When the temporary power distribution must be transferred to the permanent building distribution system.
- d) When all or part of the temporary construction power distribution system is to be removed.
- e) Other milestones during construction that require a change, expansion, or removal of the temporary construction power distribution system.

4.2 Construction Phasing Requirements

When planning the temporary construction power installation, consider construction phasing requirements to ensure adequate, convenient, and serviceable power supply throughout construction. The temporary power distribution system should be laid out in such a way that disruption and rework of the temporary power distribution system during construction will be kept to a minimum.

4.3 Site Plan

Work with the party responsible for the overall project coordination to develop a site plan for construction showing property boundaries and planned construction areas as well as the planned location and/or routing of the following that may affect the installation of the temporary electric power distribution system:

- a) Access roads and temporary parking.
- b) Other temporary and permanent utility services.
- c) Existing and planned underground tanks and structures.
- d) Fixed and movable construction equipment and structures.
- e) Material delivery and storage areas.
- f) Construction offices and facilities.
- g) Other structures or areas that will conflict with or impact the layout, installation, or maintenance of the temporary construction power distribution system.
- h) The extent and classification of all areas on the construction site that are or will be hazardous (classified) locations due to the properties of the flammable vapors, liquids, or gases, or the combustible dusts or fibers that may be present and the likelihood that a flammable or combustible concentration or quantity will be present during construction.
- i) Location of permanent electrical service.

Where construction will be phased and the use of different areas on the construction site will change

over the course of construction, develop a series of site plans indicating the change of use so that the temporary construction power can be coordinated with the planned site development. Site plans should be keyed to milestones in the project schedule.

4.4 Coordination With Other Trades

Notify other trades of the planned temporary electrical service as soon as possible after receiving notice to proceed (NTP) with construction and request information on any special electrical requirements or coordination needs. Special electrical requirements include the testing of installed equipment such as pumps, compressors, chillers, elevators, and other equipment using the temporary electrical power distribution system.

4.5 Utility Coordination

4.5.1 Utility Contact

Where temporary construction power will be supplied totally or partially from the electric utility in whose service area the construction project is located, contact the utility to determine the following:

- a) The utility's ability to provide the needed temporary electrical power.
- b) Schedule for providing the needed temporary electrical power.
- c) Preparatory work required at the construction site prior to utility construction or energization of the temporary electrical service.
- d) Cost to provide temporary electrical power including aid to construction and any other charges related to the installation, maintenance, cutover to permanent service, and removal of temporary service.
- e) Rate schedule for temporary service.
- f) Required service contracts, easements, and other documents that need to be drafted, reviewed, and/or executed prior to start of utility installation work or energization of the temporary electrical service.

- g) Available symmetrical short-circuit current with X/R ratio or equivalent information at the point of connection to temporary electrical service.

4.5.2 Service Point

Identify the point on site where temporary electrical service will be provided by the serving utility and the routing of overhead or underground utility lines from the property line to the service point. Coordinate the temporary electrical service with the permanent electrical service when possible.

4.6 System Documentation

4.6.1 Preparation

Prepare a set of record drawings for the temporary power system. Maintain and update these drawings throughout construction. Include the following information on these drawings:

- a) One-line diagram of temporary power distribution system.
- b) Location and configuration of service grounding system.
- c) Available short-circuit current obtained from the serving utility in 4.5.1.
- d) Rating, type, size, configuration, and insulation of all conductors and/or cables.
- e) Protective device type, continuous rating, and interrupting rating.
- f) Location, type, arrangement, and rating of all switchboards, panelboards, disconnect switches, motor starters, and other electrical equipment.
- g) Location, NEMA WD 6-2002 receptacle configuration, and point of supply for outlets serving cord- and plug-connected equipment.
- h) Temporary lighting system luminaire (fixture) type, lamp type, support, arrangement and control where installed for use until permanent lighting is installed.

- i) Electrical equipment installation and physical protection details.
- j) Notes and legend as required.

4.6.2 Submission

Submit documentation to the overall project supervisor, the serving utility, and/or the local authority having jurisdiction (AHJ) for review and/or approval if required.

4.6.3 Record Documents

Maintain a permanent updated set of record documents showing the layout and arrangement of the temporary power distribution system throughout construction.

4.6.4 Document Control

Mark all temporary electric power distribution system documentation with the date and revision number. Keep the latest revised document revision available at the project site. Maintain all previous revisions on file with other project documentation for reference.

4.6.5 Document Dissemination

Disseminate latest revision of system documentation as follows:

- a) Provide one set of record documents to the party responsible for overall project coordination.
- b) Provide one set of record documents to each trade contractor that requests them.
- c) Post one set of record documents in the electrical contracting firm's field office.
- d) Where the arrangement of the temporary distribution system is not obvious, post one set of record documents in a weatherproof display at the temporary service location.

5. Load Estimate

5.1 Load Survey

Perform a load survey to identify and estimate anticipated loads on the temporary power distribution system including temporary lighting based on available information. Gather the following information for significant loads:

- a) Nameplate amperage and/or power required [voltamperes (VA), voltage and current, watts (W) and power factor (pf), or horsepower (hp)].
- b) Voltage required.
- c) Number of phases required.
- d) NEMA WD 6-2002 receptacle configuration required for cord- and plug-connected equipment. Standard NEMA configurations for general-purpose nonlocking and locking plugs and receptacles are provided in Annex A.
- e) Special power supply requirements (e.g., power quality and reliability).

5.2 Load Estimate

Estimate the total load to be served by the temporary power distribution system based on the load survey and experience with similar installations.

5.3 Spare Capacity

Provide an allowance for spare capacity based on anticipated changes during construction, uncertainty about planned construction means and methods, and experience with similar installations.

6. Power Source Selection

6.1 Utility Supply

Obtain information from the serving utility as described in 4.5.1.

6.2 Existing Building Distribution System

6.2.1 Permanent Distribution System

Where available, the temporary construction power distribution system should use as much of the permanent power distribution system as possible. Permission to use the permanent power distribution system should be obtained from the owner.

6.2.2 Verification of Capacity

Where using an existing building distribution system to provide temporary construction power, verify that there is sufficient spare electrical capacity to provide adequate temporary construction power based on the load estimate. Verify the capacity of the existing building distribution system as follows:

- a) For an existing building service where the existing permanent load has not appreciably changed, use actual demand data for a one-year period to determine the maximum load on the existing service.
- b) Where demand data is not available for a one-year period for the existing service or where construction power will be added to the load on an existing feeder, estimate the load on the existing service or feeder as follows:
 - Place a recording ammeter or power meter on the highest loaded phase of the service or feeder and measure the load for thirty days. The highest loaded phase is the phase that has the highest load when the recording ammeter or power meter is installed.

- If not included in the measurement, estimate the larger of either the heating or cooling equipment load and other loads that may be periodic in nature due to seasonal or similar conditions. Add this load to the measured load.
 - Add in any other existing or anticipated loads that may not have been included in the measurement.
- c) The sum of the maximum demand of the building service or feeder load plus 125 percent of the estimated construction load should not exceed the capacity of the service or feeder.

6.2.3 Supply Methods

(a) Spare Space In Existing Switchgear

If a spare circuit breaker or fused-disconnect switch of correct size is not available in the existing switchgear and there is spare space available, obtain the correctly sized circuit breaker or fused-disconnect manufactured and listed for use in the switchgear. Install it in accordance with manufacturer instructions. Fuse or set adjustable trip circuit breaker trip settings as required.

(b) Existing Busway

If an existing plug-in busway is available, install correctly sized fused disconnect switch manufactured and listed for use with the busway. For feeder busway, install fittings manufactured and listed for use with existing feeder busway to permit the installation of a fused disconnect switch or bus tap fitting. Fuse as required.

(c) Bus Tap

Where physical space is not available in existing switchgear for an additional fused disconnect switch or circuit breaker, a feed may be tapped from the existing switchgear bus using a listed bus tap kit. A temporary fused safety switch can then be installed on or adjacent to the switchgear. Install the safety switch and bus tap as follows:

- 1) Install a heavy-duty fused safety switch with equipment grounding terminal. The safety switch should have the appropriate voltage class, current and horsepower rating, number of poles, and enclosure suitable for the installation. Provide a solid neutral for systems requiring a neutral. Fuse as required.
- 2) Locate the safety switch as near as practical to the switchgear and install tap conductors in a raceway suitable for the application. Ensure that the safety switch is readily accessible and working space is maintained around it.
- 3) Tap the bus using a listed tap kit. Maintain phase-to-phase and phase-to-ground clearances as required at the tap point inside the switchgear.

6.2.4 Ground Fault Protection of Equipment

Coordinated ground-fault protection of equipment (GFPE) should be provided wherever a temporary construction power feeder is fed from a bus where all feeders have GFPE. This provides selectivity in the event of an arcing ground fault on the construction feeder. Coordinate the ground-fault relay (GFR) with the main GFPE protecting the bus.

Wherever a temporary construction power feeder is fed from a bus in a health care facility that has GFPE, the temporary construction power feeder should have GFPE and its GFR should be set to coordinate with the main GFPE protecting the bus in accordance with NEC Sections 517.17(A) and (B). Test the construction power GFPE device as required by 517.17(C).

6.3 Supply From Another Building

When planning to obtain temporary construction power from another building that is either not owned by the owner of the construction project, or that requires the temporary service to cross a public thoroughfare; do the following:

- a) Obtain permission from the utility whose service area the construction site is located.
- b) Obtain permission from the local authority having jurisdiction (AHJ) as required.
- c) Verify that the existing building distribution system that will provide temporary construction power has adequate capacity based on the load estimate as described in 6.2.2.
- d) Provide coordinated GFPE in accordance with 6.2.4, where applicable.

6.4 On-Site Generation

Size and install any fixed or vehicle mounted motor-generator sets in accordance with NECA/EGSA 404 and supplier/manufacturer recommendations.

6.5 Interconnection of Power Sources

Where multiple power sources are used to provide temporary power at the construction site, never interconnect the sources unless the system is designed to have multiple power sources interconnected. If multiple power sources are intended to be interconnected and operated in parallel, be sure that all sources are synchronized as required and all safety precautions followed before interconnecting sources.

7. Distribution System Layout

7.1 System Layout

The temporary construction power distribution system should be of radial design unless reliability concerns dictate that it be primary selective, secondary selective, spot network, loop or other arrangement.

7.2 Temporary Service Equipment

7.2.1 Location

Locate and install temporary service equipment in accordance with the NEC and any serving utility requirements.

7.2.2 Transfer To Permanent Service

As soon as the permanent service is installed, energized, tested, and accepted, transfer electric service from the temporary service equipment to the permanent service equipment. Immediately after cutover, de-energize and remove temporary service equipment and conductors.

7.3 Downstream Distribution Equipment

7.3.1 Location

Locate downstream distribution equipment at points of concentrated load where distribution equipment is separated by distance (e.g., different buildings), physical barriers (e.g., building floors), or for convenience. Install the distribution equipment so that it is readily accessible and ensure that proper working space is maintained around it.

7.3.2 Local Disconnecting Means

Provide downstream distribution equipment with a readily accessible, local disconnecting means dedicated to that equipment that simultaneously disconnects

all ungrounded feeder conductors from the distribution equipment. The disconnecting means should be either integral to the distribution equipment or immediately adjacent to the equipment.

7.3.3 Transfer To Permanent System

As soon as the permanent distribution system is installed, tested, accepted, and energized in an area served by the temporary distribution system, immediately de-energize and remove the temporary distribution system in that area, including temporary distribution equipment, feeders, branch circuits, and wiring devices.

7.4 Coordinate With Construction Plan

Coordinate the installation of downstream distribution equipment with the construction plan.

7.5 Voltage Drop Considerations

Layout the temporary construction distribution system to minimize voltage drop. Size feeders and branch circuits so that the maximum calculated voltage drop on either does not exceed three (3) percent and the total voltage drop of both does not exceed five (5) percent between the service and outlet, in accordance with NEC recommendations.

These recommended voltage drop percentages are for steady-state operation and do not address transient conditions such as motor starting. Where large motors are powered from the temporary construction distribution system, a motor starting study should be performed to determine the impact of motor inrush on the distribution system voltage and the ability of motors to start properly.

7.6 Minimize Flexible Cord Length

Locate temporary construction outlets to keep the length of flexible cords required for portable tools and task lighting to a reasonable length and to comply with 7.5.

7.7 Accessibility and Protection of Outlets

Outlets should be accessible. Outlets should be reasonably protected from possible damage by location, guards, height, or other means.

8. Grounding and Bonding

8.1 System Grounding

Verify that each power source is properly grounded.

8.2 Grounding Electrodes and Grounding Electrode Conductors

Where system grounding is required for temporary services and separately derived sources, install them so that they are protected from physical damage by location and/or physical guards. Install the grounding electrode conductor so that the connections are accessible. Where subject to physical damage, the grounding electrode conductors should be protected from physical damage.

8.3 Equipment Grounding

For feeders and branch circuits, install a separate equipment grounding conductor in all raceways and include a separate equipment grounding conductor in all cable assemblies.

8.4 Bonding

Bond all noncurrent-carrying metal equipment or frames that are supporting and/or enclosing electrical equipment to the equipment grounding system.

9. Equipment Installation and Protection

9.1 Equipment Physical Protection

9.1.1 Enclosures

All distribution equipment enclosures should be deadfront and completely enclose the distribution equipment. Install only distribution equipment enclosures that are suitable for the environment in accordance with NEMA Standard 250-1997.

9.1.2 Protection From the Elements

When possible, locate temporary construction power equipment where it will be protected from the elements. If distribution equipment must be installed outdoors in an unprotected area, install protective covers or canopies over the distribution equipment to reduce incident solar radiation, internal and external heat build up, snow and ice accumulation, and water build up on equipment.

If the operating temperature of the distribution equipment exceeds its nameplate rating, derate or modify the equipment in accordance with the manufacturer's recommendations for the higher operating temperature.

9.1.3 Physical Barriers and Fencing

Provide physical barriers and fencing around electrical equipment where required for damage protection and/or to restrict access.

9.2 Hazardous (Classified) Locations

When possible, avoid installing electrical equipment in hazardous (classified) locations. If the temporary power distribution system must pass through or serve equipment in hazardous (classified) locations, the installation of the temporary power distribution system shall be installed in accordance with NEC Articles 500 through 516.

9.3 Equipment Support

Securely support distribution equipment to existing structures or construct a rigid free-standing support for the equipment. Mount distribution equipment so that it is level and plumb.

9.4 Equipment Accessibility and Working Space

In an effort to ensure that distribution equipment remains readily accessible and sufficient working space is maintained around distribution equipment throughout construction, post appropriate signage and conduct regular inspections of the area around the temporary electrical equipment. Working space should be level and clear of obstructions.

9.5 Equipment Illumination

Provide temporary lighting around all distribution equipment when other lighting is not available, or is insufficient to light the area around the equipment.

9.6 Equipment Marking and Labeling

Mark or label all switchboards and panelboards as designated on the temporary power distribution system one-line diagram. Mark or label all switches, disconnects, circuit breakers, and other control devices with the purpose, circuit, or equipment served. A completed directory located at the panelboard is sufficient for panelboard circuit breakers. Mark or label each receptacle cover plate with the panelboard designation and circuit serving the receptacle. Use a marking or labeling method that is durable and suitable for the environment.

10. Ground-Fault Circuit Interrupter (GFCI) Protection for Personnel

10.1 GFCI Protection Requirement

GFCI protection for personnel shall be provided for all temporary construction power outlets in accordance with NEC Section 527.6.

10.2 GFCI Installation

GFCI circuit breakers, GFCI receptacles, or other approved GFCI devices should have enclosures that minimize moisture build up around the device. Install GFCI protected branch-circuit conductors and wiring devices in a manner that minimizes moisture build up around the conductors or device. Use sealing locknuts on connectors or use weatherproof connectors wherever possible.

10.3 Use Permanent Receptacles

When receptacles that are part of the permanent distribution system and not GFCI protected are used for temporary construction power, provide GFCI protection in one of the following ways:

- a) Use listed cord sets with integral GFCI protection.
- b) Use portable GFCI devices and assemblies.
- c) Temporarily replace the permanent non-GFCI receptacles with temporary GFCI-protected receptacles.
- d) Temporarily replace the permanent non-GFCI circuit breakers protecting the branch circuits used for construction power with temporary GFCI circuit breakers.

10.4 GFCI Testing

Test GFCI circuit breakers, GFCI receptacles, or other approved GFCI devices upon installation and on a regular basis in accordance with manufacturer recommendations. Immediately de-energize and tag any branch circuit or device whose GFCI protection fails the test or exhibits physical damage. Do not reenergize the branch circuit or device until the defective GFCI device is replaced and/or the physical damage has been repaired. Keep a permanent written record of all testing and repair work performed.

10.5 Assured Equipment Grounding Conductor Program

Receptacles other than 125-volt, single-phase, 15-, 20-, or 30-ampere may either GFCI have protection or be installed and maintained in accordance with a written assured equipment grounding conductor program in accordance with NEC 527.6(B)(2) and OSHA 29 CFR 1926.404(b)(1)(iii).

11. Wiring Methods

11.1 Ungrounded Conductor Identification

Color code all ungrounded feeder and branch circuit conductors by system and phase. Post the color code scheme at all switchboards and panelboards. Where factory assembled cables are used for branch circuit wiring, color coding conductors is not specified except as required by the NEC.

11.2 Branch Circuits

11.2.1 General-Purpose Receptacles and Hardwired Equipment

Supply general-purpose receptacles and/or hardwired equipment from branch-circuits dedicated to this purpose. Do not connect temporary construction lighting that provides general illumination to these branch circuits. Cord- and plug-connected task lighting that is connected only when in use may be plugged into general-purpose receptacles.

11.2.2 Temporary Construction Lighting

Do not connect general-purpose receptacles or hardwired equipment to the temporary lighting circuits. Supply temporary construction lighting from branch circuits dedicated to this purpose.

11.3 Raceway Systems

11.3.1 Raceway Types

Select and install raceways that are approved for the application and environment.

11.3.2 Raceway Installation

Install raceways installed plumb and level, securely supported at regular intervals, and run parallel or perpendicular to structural members, walls, and ceilings wherever possible. Conduit and tubing bends should not be kinked or flattened.

11.3.3 Boxes and Conduit Bodies

Boxes should be plumb, level, and securely supported independently of the raceway system. All unused box and conduit body openings should be effectively closed or plugged to provide protection substantially equivalent to the wall of the box or conduit body.

11.4 Flexible Cords and Cables

Install flexible cords and cables where flexibility may minimize the risk of damage. Where flexible cords and cables may be subject to damage due to their location, relocate them or provide barriers and guards for protection.

11.5 Underground Installation Marking

Mark all underground feeders and those underground branch circuits operating at more than 120 volts to ground with a warning ribbon placed at least 12 inches above the conductors.

11.6 Overhead Conductor Installation

Install overhead conductors in accordance with the NEC. Do not support overhead conductors from trees or other live vegetation. For overhead conductor installations not covered by the NEC, refer to the National Electrical Safety Code (NESC).

12. Receptacles

12.1 Configuration

Provide NEMA WD 6-2002 receptacle configuration that is compatible with the cord- and plug-connected equipment anticipated to be used at that location. Standard NEMA configurations for general-purpose nonlocking and locking plugs and receptacles are provided in Annex A.

12.2 Enclosure and Support

Provide enclosures suitable for the environment in which the receptacles are located. Securely attach the enclosure to a surface or other structure that provides rigid support.

12.3 Covers

All receptacles located in a damp or wet location shall be provided with covers that are weatherproof when the plug is plugged into the receptacle.

12.4 Location

Locate receptacles so that they are accessible and reasonably protected from physical damage.

12.5 Protection

Where receptacles are likely to be subject to damage due to their location, provide barriers and guards for protection.

13. Temporary Lighting

13.1 Layout

Layout temporary lighting in accordance with the contract documents and/or the approved temporary construction power distribution system design.

Except where specifically required by the contract documents, it is not the electrical contracting firm's responsibility to ensure that temporary lighting fulfill the illumination requirements of OSHA 29 CFR Part 1926, Subpart D, Section 1926.56 (*see Annex B*). It is the responsibility of each employer at the construction site to ensure that its workers have adequate illumination to perform their work.

13.2 Selection

Select luminaires and lamps suitable for the environment, in accordance with the way they are listed and labeled. Protect lamps from accidental breakage by installing luminaires with lenses, guards, or other suitable lamp protection.

13.3 Installation

13.3.1 Support

Securely support luminaires in an approved manner from boxes, structural members, building surfaces, ceiling grid, cables, chains, poles, or other support means. Do not support luminaires by power supply conductors or cords unless they are approved to be supported in this way. Outdoor luminaires should not be supported from trees or other live vegetation.

13.3.2 Location

Locate luminaires where they are reasonably protected from physical damage. Where this is not possible due to lighting needs, provide barriers and guards for protection.

13.4 Cutover To Permanent Lighting

As soon as the permanent lighting has been installed in an area, energized, and fully tested, remove the temporary lighting and use the permanent lighting.

14. System Maintenance

Perform regular inspections and routine maintenance on the temporary construction power distribution system throughout construction.

- a) Immediately de-energize and tag any equipment that is found to be defective or physically damaged.
- b) Do not reenergize the feeder or branch circuit until the defective or damaged equipment has been removed, repaired, or replaced.
- c) Keep records of all inspections and maintenance performed.

15. System Removal

15.1 System Cutover

Coordinate the system cutover from temporary construction power to permanent power to minimize disruption of construction operations and others that may be impacted by a shutdown.

15.2 Removal of Temporary System

15.2.1 Removal

Immediately after cutover to the permanent power distribution system, completely disconnect and remove all temporary equipment, raceway, conductors, and other materials installed as part of the temporary power distribution system not used as part of the permanent installation.

15.2.2 Penetrations

Seal all penetrations of building surfaces after removal of temporary equipment, raceways, and conductors. Use only approved materials and methods to maintain the fire rating of the surface.

(This annex is not part of the standard)

Annex A: Plug and Receptacle Configurations

The following figures are excerpted from *ANSI/NEMA WD 6-2002, Wiring Devices - Dimensional Requirements*

NEMA CONFIGURATIONS FOR STRAIGHT BLADE PLUGS AND RECEPTACLES

DESCRIPTION		NEMA SYMBOL	15 AMPERE		20 AMPERE		30 AMPERE		50 AMPERE		60 AMPERE	
			RECEPTACLE	PLUG	RECEPTACLE	PLUG	RECEPTACLE	PLUG	RECEPTACLE	PLUG	RECEPTACLE	PLUG
2-POLE 2-WIRE	125V	1										
	250V	2										
	277V AC	3										
	600V	4										
2-POLE 3-WIRE GROUNDING	125V	5										
	125V	6ALT										
	250V	6										
	250V	6ALT										
	277V AC	7										
	347V AC	24										
	480V AC	8										
	600V AC	9										
3-POLE 3-WIRE	125 / 250V	10										
	3 □ 250V	11										
	3 □ 480V	12										
	3 □ 600V	13										
3-POLE 4-WIRE GROUNDING	125 / 250V	14										
	3 □ 250V	15										
	3 □ 480V	16										
	3 □ 600V	17										
4-POLE 4-WIRE	3 □ Y 120 / 208V	18										
	3 □ Y 277 / 480V	19										
	3 □ Y 347 / 600V	20										
4-POLE 5-WIRE GROUNDING	3 □ Y 120 / 208V	21										
	3 □ Y 277 / 480V	22										
	3 □ Y 347 / 600V	23										

NOTE: BLANK SPACES RESERVED FOR FUTURE CONFIGURATIONS.

Figure A-1: NEMA Non-locking Plug and Receptacle Configurations

NEMA CONFIGURATIONS FOR LOCKING PLUGS AND RECEPTACLES												
DESCRIPTION		NEMA SYMBOL	15 AMPERE		20 AMPERE		30 AMPERE		60 AMPERE		90 AMPERE	
			RECEPTACLE	PLUG	RECEPTACLE	PLUG	RECEPTACLE	PLUG	RECEPTACLE	PLUG	RECEPTACLE	PLUG
2-POLE 2-WIRE	125V	1										
	250V	2										
	277V AC	3										
	600V	4										
3-POLE 3-WIRE GROUNDING	125V	5										
	250V	6										
	277V AC	7										
	347V AC	24										
	480V AC	8										
	600V AC	9										
3-POLE 3-WIRE	125 / 250V	10										
	3 ∅ 250V	11										
	3 ∅ 480V	12										
	3 ∅ 600V	13										
3-POLE 4-WIRE GROUNDING	125 / 250V	14										
	3 ∅ 250V	15										
	3 ∅ 480V	16										
	3 ∅ 600V	17										
4-POLE 4-WIRE	3 ∅ Y 120 / 208V	18										
	3 ∅ Y 277 / 480V	19										
	3 ∅ Y 347 / 600V	20										
4-POLE 3-WIRE GROUNDING	3 ∅ Y 120 / 208V	21										
	3 ∅ Y 277 / 480V	22										
	3 ∅ Y 347 / 600V	23										

NOTE: BLANK SPACES RESERVED FOR FUTURE CONFIGURATIONS

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Figure A-2: NEMA Locking Plug and Receptacle Configurations

(This annex is not part of the standard)

Annex B: OSHA 29 CFR 1926.56 Minimum Light Levels for Construction Work

(a) General. Construction areas, ramps, runways, corridors, offices, shops, and storage areas shall be lighted to no less than the minimum illumination intensities listed in Table D-3 while any work is in progress:

(b) Other areas. For areas or operations not covered above, refer to the American National Standard A11.1-1965 (R1970), *Practice for Industrial Lighting*, for recommended values of illumination.

Table D-3: Minimum Illumination Intensities in Foot Candles

FOOT CANDLES	AREA OF OPERATION
5	General construction area lighting.
3	General construction areas, concrete placement, excavation and waste areas, access ways, active storage areas, loading platforms, refueling, and field maintenance areas.
5	Indoors: warehouses, corridors, hallways, and exitways.
5	Tunnels, shafts, and general underground work areas. (Exception: minimum of 10 footcandles is required at tunnel and shaft heading during drilling, mucking, and scaling. Bureau of Mines approved cap lights shall be acceptable for use in the tunnel heading.)
10	General construction plant and shops (e.g., batch plants, screening plants, mechanical and electrical equipment rooms, carpenter shops, rigging lofts and active store rooms, mess halls, and indoor toilets and workrooms.)
30	First aid stations, infirmaries, and offices.

(This annex is not part of the standard)

Annex C: Reference Standards

This publication, when used in conjunction with the National Electrical Code and product manufacturers' literature, provides sufficient information to install and maintain temporary power systems at construction sites. The following publications may also provide useful information:

National Fire Protection Association
1 Batterymarch Park
P.O. Box 9101
Quincy, Massachusetts 02269-9101
(617) 770-3000 tel
(617) 770-3500 fax
www.nfpa.org

NFPA 70-2002, *National Electrical Code* (ANSI)

Institute of Electrical and Electronics Engineers
445 Hoes Lane
P.O. Box 1331
Piscataway, NJ 08855-1331
(800) 678-4333 tel
(732) 981-9667 fax
www.ieee.org

ANSI/IEEE C2-2002, *National Electrical Safety Code*

National Electrical Manufacturers Association
1300 North Seventeenth Street, Suite 1847
Rosslyn, VA 22209
(703) 841-3200 tel
(703) 841-3300 fax
www.nema.org

ANSI/NEMA WD 6-2002, *Wiring Devices – Dimensional Requirements*

NEMA 250-1997, *Enclosures for Electrical Equipment (1000 volts Maximum)*

Occupational Safety and Health Administration
200 Constitution Avenue, NW
Washington, DC 20210
(202) 401-0721 tel
www.osha.gov

Safety and Health Regulations for Construction – Electrical, 29 Code of Federal Regulations (CFR) Part 1926, Subpart K

Ground-Fault Protection on Construction Sites, OSHA 3007 1998 (Revised)

Underwriters Laboratories Inc.
333 Pfingsten Road
Northbrook, IL 60062
(847) 272-8800 tel
(847) 509-6235 fax
www.ul.com

Marking Guide: Luminaires

National Electrical Contractors Association
3 Bethesda Metro Center, Suite 1100
Bethesda, MD 20814
301-215-4504
301-215-4500 fax
www.neca-neis.org

Other National Electrical Installation Standards™ published by NECA:

NECA 1-2000, *Standard Practices for Good Workmanship in Electrical Contracting* (ANSI)

NECA 100-1999, *Symbols for Electrical Construction Drawings* (ANSI)

NECA 101-2001, *Standard for Installing Steel Conduits (Rigid, IMC, EMT)*

NECA/AA 104-2000, *Recommended Practice for Installing Aluminum Building Wire and Cable* (ANSI)

NECA/NEMA 105-2002, *Recommended Practice for Installing Metal Cable Tray Systems* (ANSI)

NECA 202-2001, *Recommended Practice for Installing and Maintaining Industrial Heat Tracing Systems* (ANSI)

NECA/FOA 301-1997, *Standard for Installing and Testing Fiber Optic Cables*

NECA 305-2001, *Standard for Fire Alarm System Job Practices* (ANSI)

NECA 400-1998, *Recommended Practice for Installing and Maintaining Switchboards* (ANSI)

NECA 402-2001, *Recommended Practice for Installing and Maintaining Motor Control Centers* (ANSI)

NECA/EGSA 404-2000, *Recommended Practice for Installing Generator Sets* (ANSI)

NECA 405-2001, *Recommended Practice for Installing and Commissioning Interconnected Generation Systems* (ANSI)

NECA 407-2002, *Recommended Practice for Installing and Maintaining Panelboards* (ANSI)

NECA 408-2002, *Recommended Practice for Installing and Maintaining Busways* (ANSI)

NECA 409-2002, *Recommended Practice for Installing and Maintaining Dry-Type Transformers* (ANSI)

NECA/IESNA 500-1998, *Recommended Practice for Installing Indoor Commercial Lighting Systems* (ANSI)

NECA/IESNA 501-2000, *Recommended Practice for Installing Exterior Lighting Systems* (ANSI)

NECA/IESNA 502-1999, *Recommended Practice for Installing Industrial Lighting Systems* (ANSI)

NECA/BICSI 568-2001, *Standard for Installing Commercial Building Telecommunications Cabling* (ANSI)

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