



Symbols for Electrical Construction Drawings



Published by
National Electrical
Contractors Association



(This foreword is not a part of the American National Standard)

FOREWORD

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

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1.0 SCOPE

This publication describes graphic symbols used to represent electrical wiring and equipment on construction drawings. In this publication, the term “electrical” is used to include electrical, electronic, and communications systems covered by the National Electrical Code (NFPA 70). This publication also summarizes recommended drawing practices for electrical construction drawings.

1.1 SYMBOLS INCLUDED

This standard is limited to North American symbols for electrical wiring and equipment.

1.2 SYMBOLS NOT INCLUDED

Symbols from publications of the International Electrotechnical Commission (IEC) are not included in this standard.

Symbols for equipment and systems not covered by the National Electrical Code are not included in this standard.

2.0 PURPOSE OF SYMBOLS

Symbols are a shorthand way of showing the locations, types, and sizes or ratings of electrical wiring and equipment, and the interrelationships between these items. It should be emphasized that drawings need to be supplemented with specifications in order to establish the details of the electrical systems.

2.1 ORGANIZATION OF THIS STANDARD

This standard contains symbols commonly and primarily used on electrical construction drawings. Related symbols are organized into different groups, and each symbol within a group has its own unique identifying number. The group and symbol numbers are not significant except as a convenient way to identify individual symbols.

SYMBOL GROUPS

- 1.0 Raceways
 - 1.1 Raceways - Indicators
 - 1.2 Raceways - Boxes and Busways
- 2.0 Lighting Fixtures
- 3.0 Outlets and Receptacles
- 4.0 Switches and Sensors
- 5.0 Motorized & HVAC Equipment - Controls
 - 5.1 Motorized & HVAC Equipment
- 6.0 Security
- 7.0 Fire Alarm Communications & Panels
 - 7.1 Fire Alarm Indicators
 - 7.2 Fire Alarm Sensors
- 8.0 Power Distribution Equipment
- 9.0 Communications - Teledata
 - 9.1 Communications - Audio/Visual
 - 9.2 Communications - Equipment
- 10.0 Site Work
- 11.0 Schematic and One-Line Diagram Symbols
 - 11.1 One-Line Diagram Symbols - Switchboard Meters
 - 11.2 Schematic and One-Line Symbol Diagrams - Switches
- 12.0 Miscellaneous
- 13.0 Abbreviations

2.2 ALTERNATE FIRE SAFETY SYMBOLS

The fire protection industry has developed and published symbols, not all of which are currently in widespread use on electrical construction drawings. They are shown for reference in Annex A.

2.3 REFERENCES

This publication does not include every known North American symbol for electrical equipment shown on construction drawings. Some older symbols are either becoming obsolete over time or have been superseded by newer symbols (which are shown in this publication). Some electrical symbols are not widely used on construction drawings, but usually on wiring schematics and other types of more specialized drawings. Other drawing symbol standards and publications are listed for reference in Annex C.

3.0 DRAFTING PRACTICES FOR ELECTRICAL CONSTRUCTION DRAWINGS**3.1 SYMBOL DESIGN AND PRESENTATION**

1. The symbols in this standard are widely understood by those in the electrical design and construction field. Other symbols may also be used, provided that a suitable explanation of their meaning is included on the drawing where that symbol is used, or on a symbol legend sheet.
2. The orientation of a symbol on a drawing does not alter the meaning of the symbol.
3. Every symbol making up part of an electrical circuit must begin with and end with another symbol. When a circuit continues on a different drawing, the end of the circuitry symbol must be appropriately noted on both drawings. This circuitry continued notice is necessary for both vertical and horizontal circuits.
4. Circuitry symbols may cross one another at any angle.
5. The angle at which a circuitry symbol meets another symbol has no particular significance unless otherwise noted. Circuits normally meet one another at a junction box, pull box, or piece of electrical utilization or communications equipment.
6. Future circuits and future equipment should be indicated by dashed lines and clearly marked as future circuits or future equipment on every drawing where applicable.
7. Lighting symbols should be drawn whenever possible in their appropriate proportions, orientation, and shape. Where a lighting symbol drawn to scale is too small to reproduce clearly, the symbol may be enlarged to an appropriate size while maintaining proportion and orientation.

3.2 GENERAL DRAFTING PRACTICES

1. Electrical systems should be shown on plans separate from the architectural, structural, mechanical, and other systems. For clarity, it is recommended that the electrical symbols be drawn darker than the background drawing showing the building structure and/or other systems.
2. Different electrical systems such as power distribution, lighting, voice/data, fire alarm, and security/access control should be shown on separate plans if combining them on the same drawings would reduce clarity.

3. Electrical plans are generally drawn to scale. However, graphic symbols indicate only the approximate locations of electrical equipment. Provide dimensions, details, elevations, and sections where accurate locations of outlets, lighting fixtures, and other equipment are required.
4. Electrical wiring required for other systems such as HVAC, manufacturing equipment, data processing systems, etc, should be shown on the electrical drawings where practical, if the installation is included in the electrical contract.

3.3 CADD PRACTICES

The following drafting practices are recommended when using computer-aided design and drafting (CADD) systems to prepare electrical construction drawings.

1. All CADD electrical construction drawings should be created at full scale, (1" = 1"), and should be plotted at an appropriate scale on uniform sheets of sufficient size and separate from architectural, structural, mechanical or other drawings. Within a single drawing set, the drawing scale should be the same on as many drawings as possible.
2. All electronic files should include no more than one floor level of a building per electronic file. In no case should two different floors of any building be included in one electronic file.
3. Architectural, structural or mechanical items on the electrical construction drawings should be plotted with lighter weight lines than the electrical items.
4. Electronic files should use blocks (or cells) for all symbology. Blocks (or cells) should use a uniform scale. Non-uniformly scaled blocks and nested blocks should not be used. Instead of exploding blocks to achieve a desired graphic effect, create different variations of an existing block to accomplish the graphic symbol appearance needed.
5. No entities should reside on layer 0. This layer is used for referencing of blocks and wblocks only.
6. All entities should be placed on layers related to their disciplines as defined by the *CAD Layer Guidelines* published by the American Institute of Architects. These include Electrical, Plumbing, HVAC, Architectural, Structural, Civil/Site, Mechanical, Process Piping, and Telecommunications/Data. The purpose of using different layers is to rationally develop design using shared drawings. Therefore, it is suggested that the AIA layer naming convention be followed. Ordering information for *CAD Layer Guidelines* is shown in Annex C.

3.4 ELECTRICAL CONSTRUCTION DRAWING SET

A typical set of electrical construction drawings includes the following:

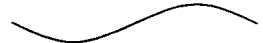
1. Plan for each floor, roof, surrounding site, and other area with electrical installations.
2. Site plan(s) showing incoming utility services and substations; exterior transformers; feeders, trunk lines and backbone cables between buildings; and site lighting.
3. Symbol list and abbreviation list.

4. Schedule(s) of lighting fixtures, mechanical equipment connections, transformers, etc. as appropriate. Typical schedules are shown in Annex B.
5. Riser and/or one-line diagram(s) for power distribution and other systems, as appropriate. Typical risers and one-line diagrams are shown in Annex B.

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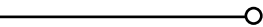
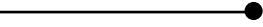
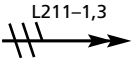
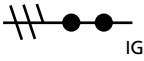
1.0 RACEWAYS

Number	Preferred Symbol	Description
1.001		Conduit concealed in construction in finished areas, exposed in unfinished areas.
1.002		Conduit concealed in or under floor slab.
1.003		Non-rigid raceway system.
1.004		Normal/emergency circuit.
1.005		Emergency battery system wiring, minimum #10 AWG.
1.006		Heat trace.
1.007		Keep warm trace.
1.008		Underfloor power raceway.
1.009		Underfloor telecommunications raceway.
1.010		Underfloor raceway for power and telecommunications.
1.011		Underfloor signal raceway.
1.012		Underfloor raceway for power, telephone, and data.
1.013		Undercarpet flat conductor cable (FCC) wiring system, power.

1.0 RACEWAYS

Number	Preferred Symbol	Description
1.014	-----UCT-----	Undercarpet flat conductor cable (FCC) wiring system, telephone.
1.015	-----UCD -----	Undercarpet flat conductor cable (FCC) wiring system, data.

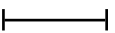
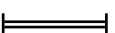
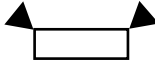
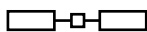
1.1 RACEWAYS—INDICATORS

Number	Preferred Symbol	Description
1.101		Conduit stub. Terminate with bushing or cap if underground.
1.102		Conduit turning up.
1.103		Conduit turning down.
1.104	SZ 2C,4#1&1#6GND. OR SZ 53mm,4#1&1#6GND.	Indicates trade size 2" or 53Cm conduit with (4) #1 AWG and (1) #6 AWG ground.
1.105	(2)SZ 2C,4#1&1#6GND. OR (2)SZ 53mm,4#1&1#6GND.	Indicates (2) trade size 2" or 53 Cm conduits with (4) #1 AWG and (1) #6 AWG ground conductors in each conduit.
1.106		Homerun to panelboard. Number of arrows indicates number of circuits. (Example: Homerun to panel L211 ckts. #1 and #3.)
1.107		Flexible connection to equipment.
1.108		Direct connection to equipment.
1.109		Branch circuit, full hashes indicate undergrounded-"hot" (or switch-LEG) circuit conductors. Half hashes indicates grounded neutral circuit conductors. (No hashes indicates 1 hot and 1 neutral.) Dots indicate grounding conductors. Equipment bond size U.O.I. "IG" indicates an isolated grounding conductor.

1.2 RACEWAYS—BOXES AND BUSWAYS

Number	Preferred Symbol	Description
1.201		Underfloor raceway system junction box, flush floor mounted.
1.202		Power pole with devices indicated in the specifications and on the drawings, "P" indicates type, "2" indicates circuit.
1.203		Telecom pole with devices indicated in the specifications and on the drawings, "T" indicates type.
1.204		Telecom/power pole with devices indicated in the specifications and on the drawings, "TP" indicates type, "2" indicates power circuit.
1.205		Pull box—size as indicated or required.
1.206		Cabletray size as indicated.
1.207		Cabletray size as indicated, concealed.
1.208		Busway with cable tap box, rating and type as indicated on drawings.
1.209		Busway with plug-in device as indicated, shown with fused disconnect.
1.210		Busway feeding up.
1.211		Busway feeding down.
1.212		Busway expansion joint.
1.213		Wireway, size as indicated or required.

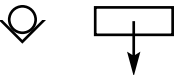
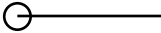
2.0 LIGHTING FIXTURES

Number	Preferred Symbol	Description
2.001		Luminaire: (drawn to approximate shape and to scale or large enough for clarity).
2.002		Luminaire strip type (length drawn to scale).
2.003		Fluorescent strip lighting.
2.004		Fixture—double or single head spotlight.
2.005		Exit lighting fixture, arrows and exit face as indicated on DWGS (mounting heights to be determined by job specifications).
2.006		Light track, length as indicated on the drawings, with number of fixtures as indicated on drawings, and as indicated in the fixture schedule.
2.007		Emergency battery remote lighting heads.
2.008		Emergency battery unit with lighting heads.
2.009		Single luminaire pole mounted site lighting fixture.
2.010		Twin luminaire pole mounted site lighting fixture.
2.011		Roadway luminaire—cobra head.
2.012		Bollard type site lighting.

2.1 LIGHTING FIXTURES—BASIC MODIFIERS-MOUNTING

Number	Preferred Symbol	Description
2.100		Surface mounted fixture.
		Recessed fixture.
		Wall mounted fixture.
		Suspended, pendant, chain, stem or cable hung fixture.
		Pole mounted with arm.
		Pole mounted on top.
		In-ground or floor mounted. (Box around symbol.)

2.2 LIGHTING FIXTURES—BASIC MODIFIERS-ORIENTATION

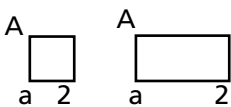
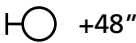
Number	Preferred Symbol	Description
2.200		Accent/directional arrow, with or without tail. (Drawn from photometric center in direction of optics or photometric orientation.)
		Directional aiming line. (Drawn from photometric center and may be extended to actual aiming point if required.)
		Track mounted; length, luminaire types and quantities as shown. (Track length drawn to scale.)

2.3 LIGHTING FIXTURES—BASIC MODIFIERS-EMERGENCY

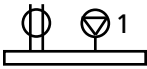
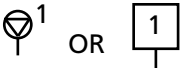
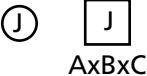
Number	Preferred Symbol	Description
2.300		Luminaire providing emergency illumination. (Filled in.)

Note: Modifiers are shown with specific base symbols for clarity. Each modifier can be used with any of the base symbols.

2.4 LIGHTING FIXTURES—EXTENDED MODIFIERS

Number	Preferred Symbol	Description
2.401		Standard designations for all lighting fixtures. "A" = Fixture type, refer to fixture schedule "2" = Circuit number "a" = Switch identification
2.402		Night light.
2.403		Mounting height.
2.404		Louvers.
2.405		Recessed, emergency fixture.

3.0 OUTLETS AND RECEPTACLES

Number	Preferred Symbol	Description
3.001	 F	Floor duplex receptacle. F=flush MTD. S=surface MTD.
3.002		Duplex convenience receptacle. 20A 125V. Wall mounted device, at 18" AFF, U.O.I.
3.003	EP-2 CKT.1 	Duplex convenience receptacle on emergency/standby circuit. Specify panelboard and circuit.
3.004		Single convenience receptacle.
3.005	EP-2 CKT.3 	Single convenience receptacle on emergency/standby circuit. Specify panelboard and circuit.
3.006		Double duplex convenience receptacle.
3.007	EP-2 CKT.5 	Double duplex convenience receptacle on emergency/standby circuit. Specify panelboard and circuit.
3.008	 A	Multi-outlet assembly with outlets on centers as indicated on the drawings and in the specifications, mounted 6 inches above counter or at height as directed, A - indicates type.
3.009	 1	Multioutlet assembly, devices as indicated.
3.010	 1 OR 1	Special receptacle - typical notation: 1— indicates example "1" = __A, __/___V., _ Pole, _ Wire, _ NEMA ___-__ "2" = __A, __/___V., _ Pole, _ Wire, _ NEMA ___-__ "3" = __A, __/___V., _ Pole, _ Wire, _ NEMA ___-__
3.011		Clock hanger outlet recessed mounted 8'-0" AFF or 8" below ceiling as appropriate and as directed.
3.012	 F	Flush mounted floor box, adjustable, with both power and voice/data receptacles.
3.013	 J AxBxC	Junction box. "AxBxC" indicates dimensions of junction box in either inches or centimeters.

3.0 OUTLETS AND RECEPTACLES

Receptacles And Outlets

Typical Outlet Notations:

"a"	=	Switched outlet, "a"—indicates switch control.
"B"	=	Pedestal mounted on bench top.
"BF"	=	Below floor.
"C"	=	Mounted 6" above counter of 42" AFF. Coordinate exact mounting height with architectural drawings.
"CLG"	=	Ceiling mounted.
"D"	=	Dedicated device on individual branch circuit.
"E"	=	Emergency.
"EXIST."	=	Existing device/equipment.
"F"	=	Flush floor box with fire/smoke rated penetration.
"GFCI"	=	Ground fault circuit interrupter, personal protection.
"GFPE"	=	Ground fault protection of equipment.
"H"	=	Horizontally mounted.
"IG"	=	Isolated ground receptacle with separate green ground conductor to isolated ground bus in panel.
"M"	=	Modular furniture service—provide flexible connection, coordinate exact location with furniture plans.
"PED"	=	Pedestal mounted with two hour fire/smoke rated penetration.
"PT"	=	Poke thru with two hour fire/smoke rated penetration.
"S"	=	Surface mounted floor box.
"SP"	=	Surge protection receptacle.
"T"	=	Tamper resistant safety receptacle.
"TL"	=	Twist-lock.
"W"	=	Wall mounted device at 48" AFF unless otherwise indicated.
"WP"	=	Weatherproof receptacle with "NRTL" listed coverplate for wet location with plug installed. MTD. 48" AFF unless otherwise indicated.
+XX	=	Dimensioned height.

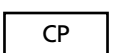
4.0 SWITCHES AND SENSORS

Number	Preferred Symbol	Description
4.001	\$ or S	Single pole switch.
4.002	\$ ₂ or S ₂	Double pole switch.
4.003	\$ ₃ or S ₃	Three way switch.
4.004	\$ ₄ or S ₄	Four way switch.
4.005	\$ _a or S _a	Switch control (lower case letter).
4.006	\$ _{CB} or S _{CB}	Circuit breaker switch.
4.007	\$ _{DT} or S _{DT}	Single pole/double throw switch.
4.008	\$ _G or S _G	Glow switch toggle, glows in off position.
4.009	\$ _H or S _H	Horizontally mounted—with on position to the left.
4.010	\$ _K or S _K	Key operated switch.
4.011	\$ _{KP} or S _{KP}	Key operated switch with pilot light on when switch is on.
4.012	\$ _{LV} or S _{LV}	Low voltage switch.
4.013	\$ _{LM} or S _{LM}	Low voltage master switch.

4.0 SWITCHES AND SENSORS

Number	Preferred Symbol	Description
4.014	$\$_{MC}$ or S_{MC}	Momentary contact switch.
4.015	$\$_{P}$ or S_{P}	Switch with pilot light on when switch is on.
4.016	$\$_{T}$ or S_{T}	Timer switch.
4.017	$\$_{WP}$ or S_{WP}	Weatherproof single pole switch.
4.018		Dimmer switch. Rated 1000W, unless otherwise indicated. "LV" = low voltage "FL" = fluorescent.
4.019		Occupancy sensor, wall mounted with off—auto override switch.
4.020		Occupancy sensor—ceiling mounted, "P"—indicates multiple switches wired in parallel.

5.0 MOTORIZED AND HVAC EQUIPMENT—CONROLS

Number	Preferred Symbol	Description
5.001	xxA 	Disconnect switch, unfused type, size as indicated on drawings. "xxA" indicates amperage.
5.002	$\frac{xxAF}{yyAT}$ 	Disconnect switch, fused type, size as indicated on drawings. "xxAF" indicates frame size. "xxAT" indicates trip size.
5.003	$\frac{xxAF}{yyAT}$ 	Enclosed circuit breaker, size as indicated. "xxAF" indicates frame size. "xxAT" indicates trip size.
5.004		Magnetic contactor, size as indicated on drawings.
5.005		Adjustable speed drive.
5.006	$\$M$	Motor starter switch.
5.007	RV  NEMA x	Magnetic motor starter. "RV" indicates reduced voltage. Starter size as indicated.
5.008	F  $\frac{NEMA\ x}{xxA-xP}$	Combination magnetic starter and disconnect switch. Starter size and fuse rating as indicated.
5.009		Automatic temperature control panel.
5.010		Equipment control panel.
5.011		Relay.
5.012		Toggle disconnect switch.
5.013	 _P	Thermal motor switch with handle guard and padlock capability. "P"—indicates pilot light.

5.0 MOTORIZED AND HVAC EQUIPMENT—CONROLS

Number	Preferred Symbol	Description
5.014		Emergency power shunt trip.
5.015		Pushbutton.
5.016		On/off pushbutton station.
5.017		Three function pushbutton switch (up/down/stop).
5.018		Aquastat.
5.019		Firestat.
5.020		Humidistat.
5.021		Line voltage thermostat.
5.022		Low voltage thermostat.
5.023		Thermostat.
5.024		Solenoid valve.
5.025		Time switch.
5.026		Air flow switch.

5.0 MOTORIZED AND HVAC EQUIPMENT—CONROLS

Number	Preferred Symbol	Description
5.027		Electric/pneumatic switch.
5.028		Hand/off/automatic selector switch.
5.029		Flow switch.
5.030		Irrigation control.
5.031		Limit switch.
5.032		Pneumatic/electric switch.
5.033		Photo cell or photo control.
5.034		Pressure switch.

5.1 MOTORIZED AND HVAC EQUIPMENT

Number	Preferred Symbol	Description
5.101		Water heater.
5.102		Motor "3"—indicates horsepower.
5.103		Motorized damper.
5.104		Baseboard heater.
5.105		Baseboard heater with box.
5.106		Pipe trace heater.
5.107		Resistance heater.
5.108		Unit type heater.
5.109		Ceiling fan.
5.110		Paddle fan.
5.111		Wall fan.

6.0 SECURITY

Number	Preferred Symbol	Description
6.001		CCVT camera. "WP" indicates weather-proof exterior camera.
6.002		CCTV Coaxial cable outlet and power outlet.
6.003		CCTV monitor outlet.
6.004		Doorbell.
6.005		Door buzzer.
6.006		Door chime.
6.007		Electric door opener.
6.008		Electric door strike.
6.009		Intercom unit—flush MTD.
6.010		Master intercom and directory unit.
6.011		Motion detector.
6.012		Security door alarm magnetic lock.
6.013		Security card reader. "WP" indicates weather-proof.

6.0 SECURITY

Number	Preferred Symbol	Description
6.014		Security control panel.
6.015		Security door contacts.
6.016		Security exit push button.
6.017		Security keypad.

7.0 FIRE ALARM COMMUNICATIONS AND PANELS

Number	Preferred Symbol	Description
7.001		Fire alarm master box.
7.002		Fire fighter's phone.
7.003		Coded transmitter.
7.004		Drill key switch.
7.005		Key repository (knox box).
7.006		Annunciator panel.
7.007		Fire alarm control panel.
7.008		Voice evacuation panel.
7.009		Fire alarm terminal cabinet.
7.010		Battery pack and charger.
7.011		Air sampling control/detector panel with associated air sampling piping network.
7.012		Transponder.
7.013		Individual addressable module.

7.0 FIRE ALARM COMMUNICATIONS AND PANELS

Number	Preferred Symbol	Description
7.014	ZAM	Zone adapter module.

7.1 FIRE ALARM INDICATORS

Number	Preferred Symbol	Description
7.101		Control relay.
7.102		Door holder.
7.103		Horn and strobe.
7.104		Mini horn and strobe.
7.105		Horn unit only.
7.106		Strobe unit only.
7.107		Bell and strobe.
7.108		Buzzer and strobe.
7.109		Chime and strobe.
7.110		Speaker and strobe.
7.111		LED pilot light.
7.112		Red indicating beacon. "WP" indicates weather-proof.

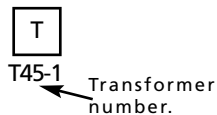
7.2 FIRE ALARM SENSORS

Number	Preferred Symbol	Description
7.201		Manual pull station.
7.202		Smoke detector.
7.203		Duct smoke detector with two auxilliary contacts.
7.204		Remote station for duct mounted smoke detectors.
7.205		Area type smoke detector used at duct work opening.
7.206		Elevator recall with auxilliary contacts.
7.207		Self-contained smoke detector—single station type.
7.208		Smoke detector—visual and audible signal.
7.209		Beam smoke detector "S"—indicates sending unit "R"—indicates receiver.
7.210		Carbon monoxide detector. Line voltage with battery backup.
7.211		Flame detector.
7.212		Automatic heat detector (135°F rate of rise).
7.213		Automatic heat detector. "F"—indicates fixed temperature 190°F.

7.2 FIRE ALARM SENSORS

Number	Preferred Symbol	Description
7.214		Hydrogen detector.
7.215		Motor operated fire/smoke duct damper.
7.216		Water flow switch.
7.217		Low pressure switch.
7.218		Tamper switch.
7.219		Post indicator valve.
7.220		End-of-line resistor.

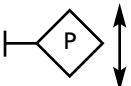
8.0 POWER DISTRIBUTION EQUIPMENT

Number	Preferred Symbol	Description
8.001		Lighting or power panel, recessed.
8.002		Lighting or power panel, surface.
8.003		Distribution panel.
8.004		Lighting or power panel on normal/generator feeder.
8.005		Distribution panel on normal/generator feeder.
8.006		Motor control center.
8.007		Dry type transformer, refer to transformer schedule, "T45"—indicates transformer type. Floor mounted unless otherwise indicated. "W"—indicates wall, "S"—indicates suspended. "K"—indicates K rating.
8.008		Transformer—pad mount.
8.009		Current transformer cabinet.
8.010		Generator. Size as noted.
8.011		Meter—single.
8.012		Meter and socket.
8.013		Transfer switch. "TS"—manual transfer switch. "ATS"—automatic transfer switch.

9.0 COMMUNICATIONS—TELEDATA

Number	Preferred Symbol	Description
9.001		Data outlet.
9.002		Data outlet floor type. "F" indicates flush mounted. "S" indicates surface mounted.
9.003		Telephone/data outlet.
9.004		Telephone/data outlet floor type. "F" indicates flush mounted. "S" indicates surface mounted.
9.005		Telephone outlet.
9.006		Telephone outlet—wall mounted.
9.007		Telephone outlet floor type. "F" indicates flush mounted. "S" indicates surface mounted.

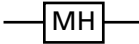
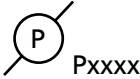
9.1 COMMUNICATIONS—AUDIO/VISUAL

Number	Preferred Symbol	Description
9.101		Call in switch.
9.102		Cable antenna system outlet. (CATV)
9.103		Master antenna system outlet. (MATV)
9.104		Microphone outlet—floor mounted.
9.105		Microphone outlet—wall mounted.
9.106		Speaker—ceiling mounted.
9.107		Speaker—wall mounted.
9.108		Speaker horn.
9.109		Speaker bi-directional paging—wall mounted.
9.110		Speaker bi-directional paging—ceiling mounted.
9.111		Intercom unit—flush mounted.
9.112		Master intercom and directory unit.
9.113		Volume control.

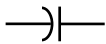
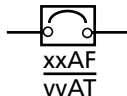
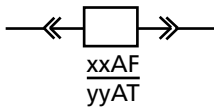
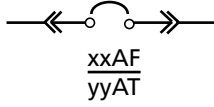
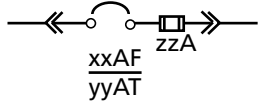
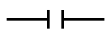
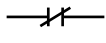
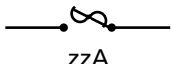
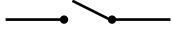
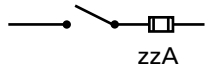
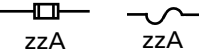
9.2 COMMUNICATIONS—EQUIPMENT

Number	Preferred Symbol	Description
9.201		Equipment cabinet.
9.202		Equipment rack—wall mounted.
9.203		Equipment rack—free standing.
9.204		Terminal cabinet with 3/4" plywood backing.
9.205		Plywood backboard.

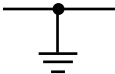
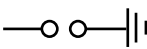
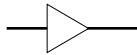
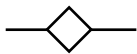
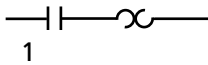
10.0 SITE WORK

Number	Preferred Symbol	Description
10.001	----- UF -----	Underground feeder.
10.002	----- UT -----	Underground telephone.
10.003	----- UFA -----	Underground fire alarm.
10.004	----- UTV -----	Underground television (CATV).
10.005	——— E ———	Above ground pole mounted electrical.
10.006	——— T ———	Above ground pole mounted telephone.
10.007	——— F ———	Above ground pole mounted fire alarm.
10.008	——— TV ———	Above ground pole mounted television (CATV).
10.009		Manhole.
10.010		Handhole.
10.011		Utility pole. "Pxxxx" indicates pole number.

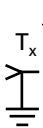
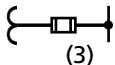
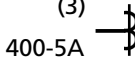
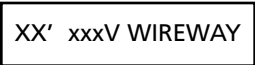
11.0 SCHEMATIC AND ONE-LINE DIAGRAM SYMBOLS

Number	Preferred Symbol	Description
11.001		Capacitor.
11.002		Circuit breaker (open). "xxAF" indicates frame size. "yyAT" indicates trip size.
11.003		Circuit breaker (enclosed). "xxAF" indicates frame size. "yyAT" indicates trip size.
11.004		Primary draw out type circuit breaker. "xxAF" indicates frame size. "yyAT" indicates trip size.
11.005		Low voltage draw out type circuit breaker. "xxAF" indicates frame size. "yyAT" indicates trip size.
11.006		Low voltage draw out type circuit breaker with current limiting fuses. "xxAF" indicates frame size. "yyAT" indicates trip size. "zzA" indicates fuse rating.
11.007		Contact, normally open (NO) ("TC"—with timed closing).
11.008		Contact, normally closed (NC). ("TO"—with timed opening).
11.009		Current transformer cabinet.
11.010		Fused cutouts. "zzA" indicates fuse rating.
11.011		Disconnect switch unfused.
11.012		Disconnect switch air break with fuse. "zzA" indicates fused rating.
11.013		Fuse. "zzA" indicates fuse rating.

11.0 SCHEMATIC AND ONE-LINE DIAGRAM SYMBOLS

Number	Preferred Symbol	Description
11.014		Overload relay.
11.015		Grounding connection—system and or equipment.
11.016		Kirk key interlock system. "2"—indicates related kirk keys.
11.017		Lightning arrester and grounding to protect all phases.
11.018		Motor and label. "3" denotes horsepower.
11.019		Motor operator for circuit breakers or switches.
11.020		Network protector.
11.021		Panelboard.
11.022		Pothead.
11.023		Stress cone.
11.024		Resistor.
11.025		Shunt trip.
11.026		Magnetic starter with NEMA size indicated.

11.0 SCHEMATIC AND ONE-LINE DIAGRAM SYMBOLS

Number	Preferred Symbol	Description
11.027		Ground fault circuit interrupter, personnel protection.
11.028	 xxx KW xxxV-xØ GENERATOR	Generator.
11.029	 xxx KVA xxxV xØ xW PRI xxxY/xxxV xØ xW SEC	Transformer, dry type. Unless otherwise indicated.
11.030		Potential transformer. "3"—indicates quantity.
11.031		Current transformer. "3"—indicates quantity, "400-5A" indicates ratio.
11.032		3-phase, 3-wire delta connection.
11.033		Corner grounded delta.
11.034		3-phase, 4-wire wye connection (grounded neutral).
11.035		Adjustable frequency drive. ③ references detail number.
11.036		Busduct or busway.
11.037		Wireway.

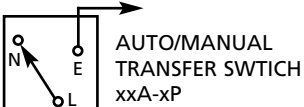
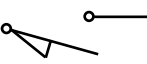
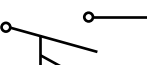
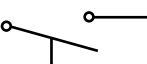
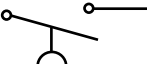
11.1 ONE-LINE DIAGRAM SYMBOLS—SWITCHBOARD METERS

Number	Preferred Symbol	Description
11.101		Customer meter.
11.102		Totalizing watt hour meter.
11.103		Varmeter.
11.104		Ammeter.
11.105		Ammeter phase switch.
11.106		Demand meter.
11.107		Ground detector.
11.108		Synchroscope.
11.109		Power factor meter.
11.110		Frequency meter.
11.111		Voltmeter.
11.112		Volt-ammeter.
11.113		Voltmeter phase switch.

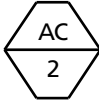
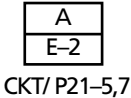
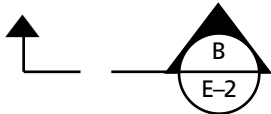
11.1 ONE-LINE DIAGRAM SYMBOLS—SWITCHBOARD METERS

Number	Preferred Symbol	Description
11.114		Wattmeter.
11.115		Watthour meter.

11.2 SCHEMATIC AND ONE-LINE DIAGRAM SYMBOLS—SWITCHES

Number	Preferred Symbol	Description
11.201		Transfer switch.
11.202		Push button (start).
11.203		Push button (stop).
11.204		Limit switch.
11.205		Flow switch.
11.206		Pressure switch.
11.207		Float switch.
11.208		Pilot light. Letter indicates color. Example: R=red.
11.209		Solenoid.

12.0 MISCELLANEOUS

Number	Preferred Symbol	Description
12.001	— G —	Ground bar. Length to be noted.
12.002		Mechanical equipment tag number, refer to mechanical equipment schedule.
12.003		Equipment tag number, refer to equipment schedule, "K"—indicates kitchen, "C"—indicates computer.
12.004		Note symbol, refer to note as indicated.
12.005		Feeder number, refer to "feeder schedule"
12.006		Typical/similar room or area layout symbol. "A"—indicates layout type.
12.007		Typical layout symbol—refer to layout type. "A" on drawing E-2, circuits to be used are as indicated.
12.008		Detail header, indicating detail No. 2 on drawing E-4.
12.009		Section identifier, indicating section "B" on drawing E-2. Left or right arrow.
12.010		Detail identifier, indicating detail No. 2 on drawing E-4.
12.011		Capacitor.

13.0 ABBREVIATIONS

Abbreviation	Description	Abbreviation	Description
1P	One pole	EOL	End of line
2P	Two pole	EWC	Electric water cooler
3P	Three pole	EXIST.	Existing
4P	Four pole	F	Flush
1P1W	One pole, one wire	FA	Fire alarm
1P2W	One pole, two wire	FBO	Furnished by others
2P2W	Two pole, two wire	FC	Fire protection contractor
2P3W	Two pole, three wire	FDN	Foundation
3P2W	Three pole, two wire	FLA	Full load amps
3P3W	Three pole, three wire	FMC	Flexible metallic conduit
3P4W	Three pole, four wire	FRE	Fiberglass reinforced epoxy conduit
4P4W	Four pole, four wire	GC	General contractor
A	Ampere	GFCI	Ground fault circuit interrupter
AC	Alternating current	GFPE	Ground fault protection equipment
AF	AMP frame	GND	Grounded
AFF	Above finished floor	GRC	Galvanized rigid conduit
AFG	Above finished grade	HP	Horsepower
AIC	Ampere interrupting capacity	HV	High voltage
AL	Aluminum	HVAC	Heating, ventilating and air conditioning
AS	AMP switch	Hz	Hertz (cycle) per second
AT	AMP trip	IAM	Individual addressable module
ARCH	Architect	IG	Isolated ground
ATS	Automatic transfer switch	IMC	Intermediate metal conduit
AUD	Audiometer box connection	JB	Junction box
A/V	Audio visual	KCMIL	Thousand circular mils
BLDG	Building	K/O	Knock-out
C	Conduit (Generic term for raceway. Provide as specified.)	KVA	Kilovolt ampere
CAM	Camera	KVAR	Kilovolt ampere reactive
CAT	Catalog	KW	Kilowatt
CATV	Cable television	LFMC	Liquidtight flexible metallic conduit
CB	Circuit breaker	LFNC	Liquidtight flexible nonmetallic conduit
CKT	Circuit	LP	Lighting panelboard
COL	Column	LS	Limit switch
C.T.	Current transformer	LTG	Lighting
CU	Copper	LV	Low voltage
☒	Centerline	MC	Metal clad cable
DC	Direct Current	MCB	Main circuit breaker
Δ	Delta	MCC	Motor control center
DISC	Disconnect	MDP	Main distribution panel
DWG	Drawing	MISC	Miscellaneous
DT	Dusttight(*)	MLO	Main lugs only
E	Wired on emergency circuit	MOD	Motor operated disconnect switch
EC	Electrical contractor	MTD	Mounted
EMT	Electric metallic tubing	MTG	Mounting

13.0 ABBREVIATIONS CONTINUED

Abbreviation	Description	Abbreviation	Description
MTS	Manual transfer switch	TERM	Terminal(s)
N/A	Not applicable	TYP	Typical
NC	Normally closed	UG	Underground
NEC	National Electrical Code	UTP	Unshielded twisted pair
NIC	Not in contract	V	Volt
NL	Night light	VT	Vaportight(*)
NM	Nonmetallic sheathed cable	U.O.I.	Unless otherwise indicated
NO	Normally open	Y	Wye
NRTL	Nationally recognized testing lab	W	Watt
#	Number	WH	Watthour
NTS	Not to scale	WP	Weatherproof
P	Pole	WT	Watertight(*)
PB	Pull box	XFMR	Transformer
PC	Plumbing system contractor	XP	Explosion proof(*)
PH $\emptyset$	Phase	ZAM	Zone adapter module
PNL	Panel(board)	+72	Mounting units to centerline above finished floor or grade
PIV	Post indicating valve		
PP	Power panel		
PR	Pair		
PRI	Primary		
PT	Potential transformer		
PVC	Polyvinyl chloride conduit		
PWR	Power		
REC	Recessed		
RT	Raintight(*)		
RSC	Rigid steel conduit		
S	Surface mounted		
SEC	Secondary		
SIG	Signal		
SN	Solid neutral		
SP	Spare		
SPL	Splice		
SS	Stainless steel		
STP	Shielded twisted pair		
STL	Carbon steel		
SUSP	Suspended		
SW	Switch		
SWBD	Switchboard		
TC	Telephone cabinet		
TCI	Telecommunications cabling installer		
TEL/DATA	Telephone/data		
TEL	Telephone		

(*) It is recommended that the appropriate NEMA designation be used in place of this abbreviation.

(This annex is not part of the American National Standard)

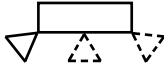
ANNEX A: ALTERNATE FIRE SAFETY SYMBOLS

Not all of the following fire safety symbols are in common use on electrical construction drawings at this time. They are reprinted here for reference with permission from NFPA 170-1996, Fire Safety Symbols (ANSI). This excerpt does not represent the official position of the National Fire Protection Association, which is represented only by the standard in its entirety. The following symbols are copyright 1996, National Fire Protection Association, Quincy, MA.

5-5 Symbols for Control Panels

505.1	Control Panel		Basic shape.
(a)		Fire Alarm Control Panel	
(b)		Fire System Annunciator	
(c)		Fire Alarm Transponder or Transmitter	
(d)		Elevator Status/Recall	
(e)		Fire Alarm Communicator	
(f)		Halon Control Panel	
(g)		Control panel for heating, ventilation, air conditioning, exhaust stairwell pressurization or similar equipment.	

5-6 Symbols Related to Means of Egress

5-6.1	Emergency Light, Battery-Powered		Number of lamps on unit to be indicated. Indicate if light head(s) [lamp(s)] is remote from battery.
5-6.2	Illuminated Exit Sign, Single Face		Indicate direction of flow for the face.
5-6.3	Illuminated Exit Sign, Double Face		Indicate direction of flow for each face.
5-6.4	Combined Battery-Powered Emergency Light and Illuminated Exit Sign		Number of lamps on unit to be indicated. Indicate if light head(s) [lamp(s)] is remote from battery. Indicate direction of flow for the face.

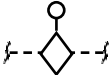
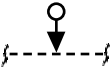
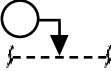
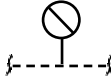
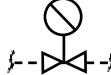
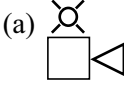
Fire Safety Symbols

5-7 Symbols for Fire Alarms, Detection, and Related Equipment

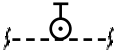
5-7.1 Signal Initiating Devices and Switches.

	Referent (Synonym)	Symbol	Comments
5-7.1.1	Manual Stations		Basic shape
		(a)  H	Halon
		(b)  C	Carbon Dioxide
		(c)  D	Dry Chemical
		(d)  F	Foam
		(e)  W	Wet Chemical
		(f)  P	Pull Station
5-7.1.1.1*	Fire Service or Emergency Telephone Station		
		(a)  A	Accessible
		(b)  J	Jack
		(c)  H	Hand-set
5-7.1.1.2	Abort Switch		
5-7.1.2	Automatic Detection and Supervisory Devices		Basic shape
5-7.1.1.1†	Heat Detector (Thermal Detector)		
		(a)  R/F	Combination—Rate of Rise and Fixed Temperature
		(b)  R/C	Rate Compensation
		(c)  F	Fixed Temperature
		(d)  R	Rate of Rise Only

† Symbol orientation not to be changed.

	Referent (Synonym)	Symbol	Comments
5-7.1.2.2†	Smoke Detector		(a)  P Photoelectric Products of Combustion Detector (b)  I Ionization Products of Combustion Detector (c)  BT Beam Transmitter (d)  BR Beam Receiver
5-7.1.2.3	Smoke Detector in Duct		
5-7.1.2.4	Gas Detector		
5-7.1.2.5†	Flame Detector (Flicker Detector)		Indicate ultraviolet, infrared, or visible radiation-type detector.
5-7.1.2.6	Flow Detector/Switch		
5-7.1.2.7†	Pressure Detector/Switch		Specify type—water, low air, high air, etc.
5-7.1.2.8†	Level Detector/Switch		
5-7.1.2.9	Tamper Detector		Alternate term—tamper switch.
5-7.1.2.10	Valve with Tamper Detector/Switch		
5-7.2	Indicating Appliances		
5-7.2.1	Speaker/Horn (Flicker Detector)		(a)  M Mini-Horn
5-7.2.2	Bell (Gong)		
5-7.2.3	Water Motor Alarm (Water Motor Gong)		Shield optional.
5-7.2.4	Horn with Light	(a)  (b) 	Horn with light as separate assembly. Horn with light as one assembly.

† Symbol orientation not to be changed.

	Referent (Synonym)	Symbol	Comments
5-7.2.5†	Light (Lamp, Signal Light, Indicator Lamp, Strobe)		
5-7.3	Related Equipment		
5-7.3.1	Door Holder		

(This annex is not part of the American National Standard)

ANNEX B: TYPICAL RISERS, ONE-LINE DIAGRAMS, AND SCHEDULES

This annex provides examples of typical schedules, riser diagrams, and one-line diagrams that are included in electrical construction drawings. A given set of drawings will not necessarily include every typical example included here. This annex includes the following:

<u>Type</u>	<u>Page</u>
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Lighting fixture schedule	52
Transformer schedule	53
Mechanical equipment schedule	54
Feeder schedule	55
Electrical one-line diagram	56
Fire alarm riser	57

Panel Schedule

Panel: _____ Voltage: _____ Phase: _____ Wires: _____ Mains: _____
Mount: _____ Enclosure: _____ Location: _____

Load Name	Load (VA)	Bkr. Frame	Trip	Ckt. No.	A	B	C	Ckt. No.	Trip	Bkr. Frame	Load (VA)	Load Name
				1				2				
				3				4				
				5				6				
				7				8				
				9				10				
				11				12				
				13				14				
				15				16				
				17				18				
				19				20				
				21				22				
				23				24				
				25				26				
				27				28				
				29				30				
				31				32				
				33				34				
				35				36				
				37				38				
				39				40				
				41				42				

Phase A: _____ Phase B: _____ Phase C: _____ Total VA: _____
Mfg./Type: _____ Modifications: _____ Amps RMS. Sym.: _____

Lighting Fixture Schedule

[illegible]

Transformer Schedule

[illegible]

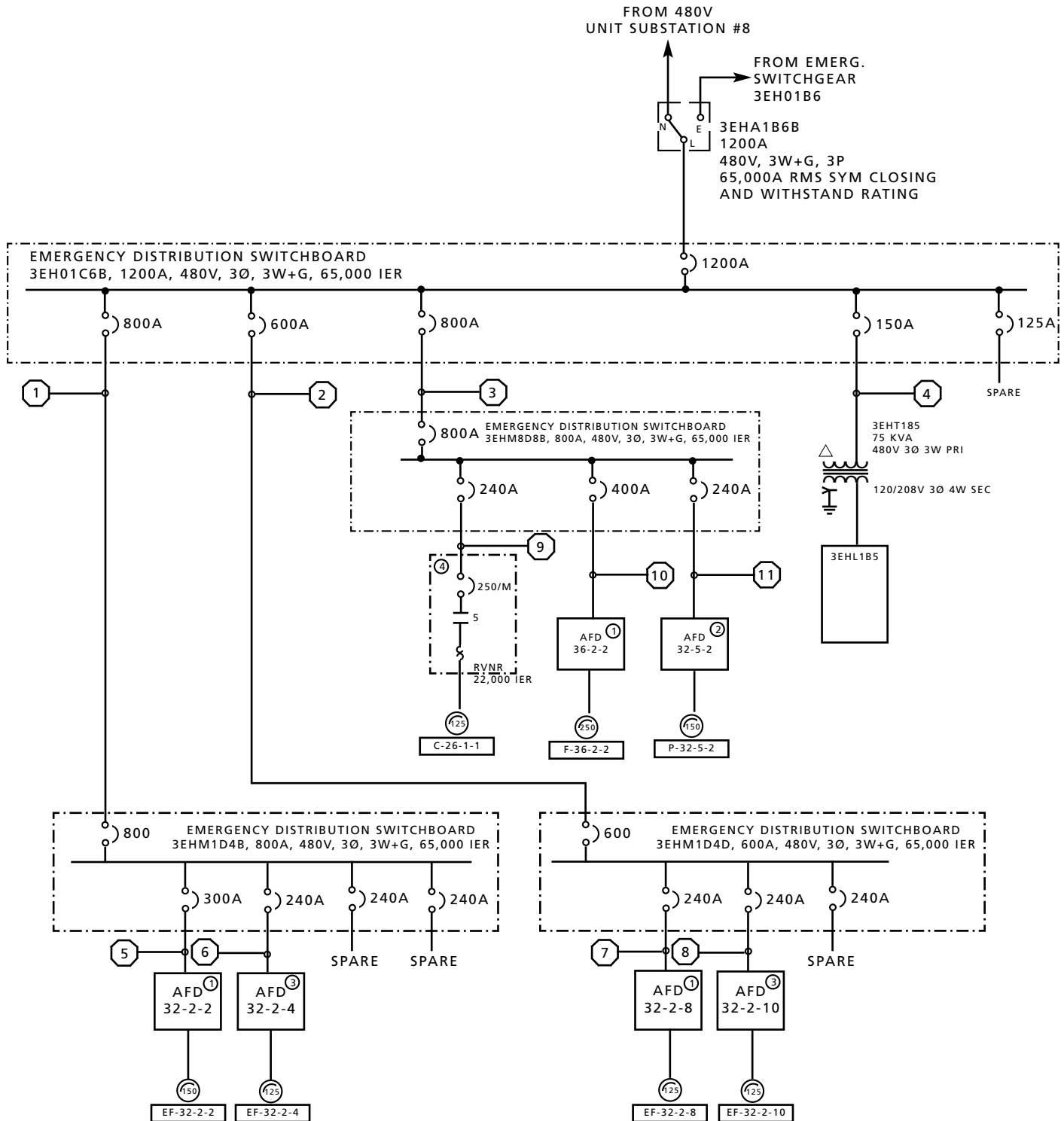
Mechanical Equipment Schedule

[illegible]

#

[illegible]

Electrical One-Line Diagram



[illegible]

NOTES:
1. ADDRESSES LISTED ON THIS RISER ARE PRELIMINARY AND TO BE USED FOR PLANNING PURPOSES ONLY. ACTUAL ADDRESSED MUST BE OBTAINED VIA THE OPERATING FIRE ALARM CONTROL PANEL.

(This annex is not part of the American National Standard)

ANNEX C: REFERENCE PUBLICATIONS

This annex includes standards referenced this publication, as well as other electrical symbol references that are not specifically referred to in NECA 100

American Institute of Architects (AIA)

1735 New York Avenue, NW
Washington, DC 20006
(202) 626-7300
(202) 626-7587 fax
www.aiaonline.com

CAD Layer Guidelines

American Society for Testing and Materials (ASTM)

100 Barr Harbor Drive
West Conshohocken, PA 19428-2959
(610) 832-9500
(610) 832-9555 fax
www.astm.org

ASTM F967-87 (R1995), *Standard Practice for Security Engineer Symbols*

Institute of Electrical and Electronics Engineers (IEEE)

445 Hoes Lane
PO Box 1331
Piscataway, NJ 08855-1331
(800) 678-4333
(732) 981-9667 fax
www.ieee.org

ANSI/IEEE 91-1991, *Standard Graphic Symbols for Logic Functions*

ANSI/IEEE 280-1997, *Letter Symbols for Quantities Used in Electrical Science and Electrical Engineering*

ANSI/IEEE 315-1975 (R1994), *Standard Graphic Symbols for Electrical and Electronics Diagrams*

ANSI/IEEE 991-1986 (R1994), *Standard for Logic Circuit Diagrams*

Illuminating Engineering Society of North America (IESNA)

120 Wall Street, Floor 17
New York, NY 10005-4001
(212) 248-5000
(212) 248-5017 fax
www.iesna.org

ANSI/IESNA DG-3-1994 (R2000),
Application of Luminaire Symbols on Lighting Design Drawings

National Fire Protection Association (NFPA)

P.O. Box 9101
One Batterymarch Park
Quincy, MA 02269-9101
(617) 770-3000
(617) 770-3500 fax
www.nfpa.org

NFPA 70-1999, *National Electrical Code* (ANSI)

NFPA 170-1999, *Fire Safety Symbols* (ANSI)

Security Industry Association (SIA)

635 Slaters Lane, Suite 110
Alexandria, VA 22314
(703) 683-2075
(703) 683-2469 fax
www.siaonline.org

SIA Architectural Graphics - CAD Symbols for Security System Layout Release 2.0

**Other *National Electrical Installation Standards*
Published by NECA**

National Electrical Contractors Association

3 Bethesda Metro Center, Suite 1100

Bethesda, MD 20814

(301) 215-4504

(301) 215-4500 fax

www.neca-neis.org

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

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

NECA 402-2000, *Recommended Practice for
Installing and Maintaining Motor Control
Centers*

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

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

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



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Standards & Safety
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