

NOTICE:

Bids to be opened at 2:00 P.M.
at the
office of
Officer in Charge Of Construction
Jacksonville, North Carolina Area
Building 1005, Marine Corps Base
Camp Lejeune, North Carolina 28542

STAINLESS STAIN XFMRS

CONTRACT N62470-85-B-6365

NAVFAC SPECIFICATION
NO. 05-85-6365

REWORK ELECTRICAL DISTRIBUTION, ONSLOW BEACH AREA

at the

MARINE CORPS BASE, CAMP LEJEUNE, NORTH CAROLINA

(BMO Project 5C52, 6C18)

DESIGN BY:

Design Branch, Public Works Division
Marine Corps Base, Camp Lejeune, North Carolina

SPECIFICATION PREPARED BY:

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21 July 1986

SPECIFICATION APPROVED BY:

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05-85-6365

April 1985

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This Invitation for Bids, IFB No. N62470-85-B-6365, consists of the following documents:

- (I) Bidding Instructions
 - (1) Solicitation, Offer and Award (Standard Form 1442 (Rev. 4-85))
 - * (2) Instructions to Bidders (Construction Contract) April 1985

- (II) Bid Submittal Documents
 - (1) Solicitation, Offer and Award (Standard Form 1442 (Rev. 4-85))
 - * (2) Representations and Certifications, April 1985
 - (3) Bid Guaranty (Standard Form 24 (Rev. 4-85))

- (III) Contract Documents
 - (1) Solicitation, Offer and Award (Standard Form 1442 (Rev. 4-85))
 - (2) Performance Bond (Standard Form 25 (Rev. 10-83))
 - (3) Payment Bond (Standard Form 25A (Rev. 10-83))
 - * (4) Contract Clauses (Construction Contract) January 1986
 - (5) Labor Standards Provisions, November 1979 (Rev. 8-83)
 - * (6) NAVFAC Specification No. 05-85-6365
 - (7) Drawings identified in Section 01011 of the Specification
 - ** (8) Wage Determination, Secretary of Labor Decision No. NC86-9, Heavy Construction (including water and sewer lines)

* These items are bound within the Specification at the front

** The Wage Determination is attached as the last page of the Specification

NOTE: All other items are attached on top of the Specification

NOTE:

INQUIRIES

PLANS AND SPECIFICATIONS: Questions regarding the plans and Specification occurring prior to bid opening shall be presented to the Public Works Design Division, Building 1005, Marine Corps Base, Camp Lejeune, North Carolina 28542, telephone (919) 451-5507. Questions requiring interpretation of drawings and the Specification must be submitted at least ten days before bid opening. Interpretations or modifications to specifications made as a result of questions will be made by amendment only, and unless so done, all bidders should base their bids on the plans and Specification as issued.

BIDDING PROCEDURES: All questions concerning the bidding procedures shall be presented to OICC-ROICC Contract Branch, Room 26, Building 1005, Marine Corps Base, Camp Lejeune, North Carolina, telephone (919) 451-2582.

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SECTION 16302
OVERHEAD ELECTRICAL WORK

PART 1 - GENERAL

1.1 APPLICABLE PUBLICATIONS: The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI):

B 16.11-80	Forged Steel Fittings, Socket-Welded and Threaded
C 2-84	National Electrical Safety Code
C 29.2-83	Wet Process Porcelain Insulators and- Toughened Glass Insulators (Suspension Type)
C 29.3-80	Wet Process Porcelain Insulators (Spool Type)
C 29.4-77	Wet Process Porcelain Insulators (Strain Type)
C 29.6-84	Wet Process Porcelain Insulators (High Voltage Type)
C 29.7-83	Wet Process Porcelain Insulators (High Voltage Line-Post Type)
C 37.42-81	Distribution Cutouts and Fuse Links
C 37.43-69(74)	Distribution Fuse Cutout Links for Use in Distribution Enclosed, Open, and Open-Link Cutouts
C 57.12.20-81	Overhead Type Distribution Transformers 500 KVA and Smaller: High Voltage 67,000 Volts and Below: Low Voltage, 15,000 Volts & Below
O 5.1-79	Specifications and Dimensions for Wood Poles

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM):

A 120-83	Pipe, Steel, Black and Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless, for Ordinary uses
A 153-82	Zinc-coating (Hot-Dip) on Iron and Steel Hardware
A 475-78	Zinc-Coated Steel Wire Strand
A 582-80	Free Machining Stainless and Heat Resisting Steel Bars, Hot Rolled or Cold Finished
B 1-81	Hard-Drawn Copper Wire
B 2-81	Medium Hard-Drawn Copper Wire
B 3-74(80)	Soft or Annealed Copper Wire
B 8-81	Concentric-Lay-Stranded Copper Conductors, Hard, Medium Hard, or Soft
B 399-81	Concentric-Lay-Stranded Aluminum-Alloy 6201-T81 Conductors

AMERICAN WOOD PRESERVER'S ASSOCIATION (AWPA):

C 4-81	Standard for the Preservative Treatment of Poles by the Pressure Process
C 25-70	Standard for the Preservative Treatment of Crossarms by the Pressure Process

NATIONAL ELECTRICAL MANUFACTURER'S ASSOCIATION (NEMA):

LA 1-76(80)	Surge Arresters
TR 1-80(83)	Transformers, Regulators, and Reactors

RURAL ELECTRIFICATION ADMINISTRATION (REA):

44-3 Wood Crossarms (Solid and Laminated),
(Dec 1975) Transmission Timbers and Pole Keys (DT-5B/PE-16)
43-5-81 List of Materials Acceptable for Use on Systems of REA
Electrification Borrowers

UNDERWRITER'S LABORATORIES (UL):

UL 510-82 Insulating Tape

1.2 GENERAL REQUIREMENTS: Section 16011, "Electrical General Requirements, applies to this section with additions and modifications specified herein.

1.2.1 Electrical Characteristics: Electrical characteristics for this project shall be 12.47 kV primary, three phase, three wire, 60 hertz, delta connected and secondary connected as indicated. Final connections to the power distribution system at the existing power poles shall be made by the Contractor as directed by the Contracting Officer.

1.2.2 Connections to Existing Electrical Systems: Notify the Contracting Officer in writing at least 15 days prior to the date the connections are required; approval shall be received before any service is interrupted. Furnish all material required to make connections into the existing systems, and perform all excavating, backfilling, and other incidental labor as required.

1.2.3 Submittals: Submit the following information for approval:

1.2.3.1 Catalog Information:

- / a. Conductor (list each size and type)
- / b. Insulator (list each size and type)
- / c. Wire marker
- / d. Cutouts
- / e. Transformers
- / f. Tapes
- / g. Steel poles

1.2.3.2 Shop Drawings:

- a. Steel pole including connection to piles

1.2.3.3 Manufacturer's Certification:

- a. Transformer tests: Certify that routine tests per NEMA TR 1 have been made on each transformer.
- b. Aluminum/copper splices, connectors, lugs & fittings
- c. Steel Pole

1.2.3.4 Manufacturer's Directions:

- ✓ a. Aluminum/copper connection make-up directions
- ✓ b. Manufacturer's directions for use of ground megger with proposed method indicated

1.2.3.5 A set of Manufacturer's erection drawings and information will be supplied by the Contractor, for the use of the inspector on job site.

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT: Materials specified herein or shown on the contract drawings which are identical to materials listed in REA 43-5 shall be considered as conforming to all requirements.

2.2 WOOD POLES: Wood poles machine trimmed by turning, Southern Yellow Pine conforming to ANSI 05.1. Poles shall be gained, bored and roofed before treatment. Poles shall be full length pressure treated with Chromated Copper Arsenate (CCA) or Ammoniacal Copper Arsenite (ACA) conforming to AWPA C4. Poles shall be branded by the manufacturer with his mark and date of treatment, height and class of pole, wood species, preservation code, and retention. Place the brand so that the bottom of the brand or disc is 10 feet from the pole butt for poles up to 50 feet long and 14 feet from the butt for poles over 50 feet long.

2.3 WOOD CROSSARMS: Wood crossarms conforming to REA 44-3. Crossarms shall be pressure treated with Chromated Copper Arsenate (CCA) or Ammoniacal Copper Arsenite (ACA). Treatment shall conform to AWPA C25.

2.3.1 Crossarm Braces: Flat steel for 28-inch span with 8-foot crossarms and steel angle 60-inch span with 10-foot cross arm.

2.4 STEEL POLES: Guyed steel poles, including overhead power line supporting arms, shall be designed and provided to conform to the requirements of ANSI C2 (NESC) for Grade B construction in Medium Loading District with Extreme wind pressure of 31 pounds per square foot, and to withstand, but not limited to the assumed minimal loads as follows:

- a. Horizontal wind load of 1,200 pounds per conductor acting in the transverse direction;
- b. Longitudinal load of 3,000 pounds tension of conductor to produce maximum stress;
- c. Longitudinal load of 3,000 pounds tension of outboard conductor to produce maximum axial load.

The factor of safety of two shall be applied in the determination of the required column strength of the guyed steel pole to withstand all calculated axial and vertical loads. Provide compatible corrosion-resisting type of steel fasteners and other miscellaneous connectors as required. Provide pole grounding connections designed to prevent electrolysis when used with copper ground wires; sizes of ground wires are as indicated. Height of pole shall be

as shown. Steps shall be spaced at 15-inch maximum intervals on alternating sides of pole; handholds and personnel anchoring points shall be provided as required to perform pole line maintenance and installation. Steel pole including arms, steps, and connectors shall have minimum coating of 3 ounces of zinc per square foot; exposed finishes shall be the manufacturer's standard coatings that are compatible for coastal environments. Twist and deflection limits shall be shown on the manufacturer's drawings. Steel pole shall be rigidly mounted and secured to timber piles to withstand imposed loads prior to wrapping piles.

2.5 **HARDWARE:** Pole line hardware shall be hot dip galvanized conforming to ASTM A 153.

2.6 **INSULATORS:** Wet-process porcelain insulators which are radio interference freed.

- ✓ a. Line post type insulators shall be class 57.2 per ANSI C 29.7
- b. Suspension insulators shall be class 2/52-4 per ANSI C29.2
Deviation: 3/52-1
- ✓ c. Spool insulators shall be class 53-2 per ANSI C29.3
- ✓ d. Guy strain insulators shall be class 54-2 per ANSI C29.4, except they shall be fiberglass type when used with underground terminal or when other interference problems exist
- e. Ground wire and suspension insulator shall have a minimum mechanical and electrical strength of 15,000 pounds and a 60 Hertz dry flashover voltage of 25 kV.
- ✓ f. Pin insulators shall be class 55-6 per ANSI C29.6 and shall be radio interference freed.

2.7 **CONDUCTORS:** Overhead primary conductors of bare copper and aluminum alloy and overhead secondary-service conductors of the sizes and types indicated.

2.7.1 **Solid Copper:** Solid copper conductors, hard-drawn, medium-hard-drawn, and soft drawn shall conform to ASTM B 1, ASTM B 2, and ASTM B 3 respectively. Stranded conductors shall conform to ASTM B 8.

2.7.2 Aluminum alloy conductors shall conform to ASTM B 399.

2.7.3 **Secondary-Service Conductors:** Aerial Service and Secondary conductors shall be copper, with 300 volt cross-linked polyethylene insulation covered weatherproof on the phase wires and the neutral shall be bare copper messenger. Minimum size shall be No. 4 AWG stranded.

2.8 **GUY STRAND:** Conforming to ASTM A 475 Grade High - Strength Class B, galvanized Strand Steel Cable. Guy strand shall be 7/16-inch in diameter with a minimum breaking strength of 12,000 pounds. Provide automatic or factory-formed guy terminations designed for use with the particular strand and developing at least the ultimate breaking strength of the strand.

2.8.1 Guy Guards will be plastic, yellow colored, 8 feet long and resistant at sub-zero temperatures.

2.8.2 Guy Attachment: Thimble eye guy attachment with a lift plate on the down side.

2.9 ANCHORS AND ANCHOR RODS: Anchor rods shall be 2-inch diameter sectional type extra heavy pipe rods conforming to ASTM A 120, Schedule 80, and couplings conforming to ANSI B 16.11, fitting class 6000. Eye nuts shall be capable to dead end 2 guy strands with a minimum holding strength of the anchor. Screw type swamp anchors shall be 15 inches in diameter with a minimum rating by the manufacturer of not less than 15,000 pounds in "Loose-Dry" soil.

2.10 GROUND RODS: Shall be of copper-encased steel or copper clad steel sectional type ground rods at least 3/4 inch in diameter and 20 feet. Die-stamp each near the top with the name or trademark of the manufacturer and the length of the rod in feet. The rods shall have a hard, clean, smooth, continuous, surface throughout the length of the rod.

2.10.1 Ground Wire: Soft drawn copper wire ground conductors shall be no smaller than No. 6 AWG. Ground wire protectors may be either PVC or half round wood molding.

2.11 SURGE ARRESTERS: Valve type surge arrestors shall be conforming to NEMA LA-1 arranged for pole and crossarm mounting as required or as indicated. Rating shall be 9 kV ungrounded.

✓ 2.12 FUSED CUTOUTS: Fused cutouts shall be heavy enclosed fused cutouts rated 100 amperes at 14.4 kV ungrounded, conforming to ANSI C 37.42 and type t fuses conforming to ANSI C 37.43 with ampere ratings equal to 150 percent of the transformer full load rating. Open link type fuses and fuse cutouts are not acceptable.

✓ 2.13 TRANSFORMERS (POLE TYPE): ANSI C57.12.20 self-cooled, 65 degrees C continuous temperature rise, mineral oil-immersed type. Transformers shall be rated as indicated, 95 kV BIL, 12.47 kV class for operation on a 12.47 kV delta system. Minimum impedance shall be 1-1/2 percent. Transformers shall have four 2-1/2 percent rated kVA high voltage taps, two above and two below rated primary voltage. Primary bushings shall have a minimum leakage distance of 12 inches. All exposed metals shall be corrosion resistant to withstand coastal environments of salt fog and spray. Casings, covers, bases, cover bands, and support and lifting lugs shall be SAE 51409 stainless steel. Pipe plug flanges, cover and tank ground nuts shall be ASTM A582, Type 416 stainless steel. Exposed finishes shall be the manufacturer's standard coatings that are compatible for coastal environments.

✓ 2.14 AERIAL WIRE MARKERS: Nomial 20-inch diameter spherical wire markers shall be of fiberglass construction, international orange colored and resistant at sub-zero temperature. Markers shall be suitable for use on overhead primary conductors; attachment clamps shall be designed for use with the particular conductors of the sizes and types indicated.

2.15 ELECTRICAL TAPES: Tapes will be UL listed for electrical insulation and other purposes in wire and cable splices. Terminations, repairs and miscellaneous purposes. Electrical tapes shall comply with UL-510.

PART 3 - EXECUTION

3.1 INSTALLATION: Provide overhead pole line installation conforming to the requirements of ANSI C2 (NEC) for Grade B construction of overhead lines in medium loading districts and NEC for overhead services. Regard NESC statements using the term "should" as mandatory unless an exception therefrom in writing is granted by the Contracting Officer. All streets, alleys, roads, and drives shall be considered "public". Pole configurations shall be as indicated and as shown on the following sketches:

<u>NUMBER</u>	<u>TITLE</u>
TS-16302L-1.1	Symbol Legend and General Notes
TS-16302L-1.2	List of Symbols
TS-16302L-1.3	Method of Showing Symbols
TS-16302L-1.3a	Explanation of Notes Symbols
TS-16302L-1.4	Basic Vertical Spacing Requirements
TS-16302L-1.5	Pole Line Material List
TS-16302L-1.5a	Pole Line Material List
TS-16302L-2	X-FB, X-AB
TS-16302L-11	LPDE
TS-16302L-16	FDE3-N, FDE2, FQE2-N, FDE3 (0-50KV)
TS-16302L-24	VDDE3-N, VDDE1, VDDE1-N, VDDE2, VDDE2-N, VDDE3 (0-50KV)
TS-16302L-26	LP3-N, LP3 (0-50KV)
TS-16302L-27	ALP3-N, ALP3 (0-50KV)
TS-16302L-28	TF
TS-16302L-29	TV
TS-16302L-30	TVLP
TS-16302L-31	TTT
TS-16302L-35	GUY
TS-16302L-36	Span Guy
TS-16302L-37	Conduit Riser
TS-16302L-38	S3, S2, S1, SDE3, SDE2, SDE1 (0-600V)
TS-16302L-39	ST or SQ (0-600V)
TS-16302L-40	ST-SLACK, SQ-SLACK, ST-A, SQ-A (0-600V)
TS-16302L-41	STDDE (tangent), SQDDE (tangent) (0-600V)
TS-16302L-42	STDDE, SQDDE, STDE, SQDE (0-600V)
TS-16302L-43	GROUND

3.1.1 Pole Setting: Pole holes shall be at least as large at the top as at the bottom and shall be large enough to provide 4 inch clearance between the pole and the side of the hole.

3.1.1.1 Pole setting depths shall be as follows:

<u>Length of Pole (feet)</u>	<u>Setting in Soil (feet)</u>
30	5.5
40	6.0
45	6.5
60	8.0

3.1.1.2 "Setting in Soil" depths shall apply where pole holes are in soil, sand, or gravel or any combination of these; where the soil layer over solid rock is more than 2 feet deep; where the hole in solid rock is not substantially vertical; or where the diameter of the hole at the surface of the rock exceeds twice the diameter of the pole at the same level. At corners, dead ends and other points of extra strain, poles 40 feet or more long shall be set 6 inches deeper.

3.1.1.3 On sloping ground, always measure the depth of the hole from the low side of the hole.

3.1.1.4 Thoroughly tamp pole backfill for the full depth of the hole and mound the excess fill around the pole.

3.1.1.5 Set poles so that alternate crossarm gains or insulator brackets face in the opposite directions, except at terminals and dead ends where the gains or brackets of the last two poles shall be on the side facing the terminal or dead end. On unusually long spans, set the poles so that the crossarm comes on the side of the pole away from the long span. Where pole top pins are used, they shall be on the opposite side of the pole from the gain, with the flat side against the pole.

3.1.1.6 Set poles in alignment and plumb except at corners, terminals, angles, junctions, or other points of strain, where they shall be set and raked against the strain, not less than 2 inches for each 10 feet of pole length above grade, nor more than 4 inches for each 10 feet of pole length after conductors are installed at the required tension.

3.1.1.7 Provide plastic pole caps with 1/4-inch sealing rings and four nailing tabs. Place on pole top and nail each tab down with a 1-1/4-inch nail.

3.1.2 Anchors and Guys: Place anchors in line with the strain and as nearly as possible a distance from the pole equal to the vertical distance from the pole ground line to the point of guy attachment on the pole.

3.1.2.1 Set anchors in place with the anchor rod aligned with, and pointing directly at, the guy attachment on the pole with the anchor rod projecting 6 to 9 inches out of the ground to prevent burial of the rod eye.

3.1.2.2 Install screw type swamp anchors by torquing with boring machine or wrenches, adding sections of pipe as required until the anchor helix is fully engaged in firm soil. Anchor rod eye shall extend 6 to 9 inches above grade.

3.1.2.3 Complete the anchor and guy installation, dead end to dead end, and tighten the guy before wire stringing and sagging is begun on that line section. Provide strain insulators at a point on the guy strand 8 feet (minimum) from the ground and 6 feet (minimum) from the surface of the pole. Effectively ground and bond guys to the system neutral.

3.1.3 Hardware: Install hardware with washer against the wood and with nuts and lock nuts applied wrench tight. Use locknuts on all threaded hardware connections. Locknuts should be M-F style and not the palnut style.

3.1.4 Grounding: Provide grounding for pole lines conforming to ANSI C2 except that each separate ground electrode shall have a resistance to the solid earth not exceeding 25 ohms. When work in addition to that indicated or specified, is directed in order to obtain the specified ground resistance the provisions of the contract covering "changes" shall apply.

3.1.4.1 Make ground rod connections on pole lines by thermit weld for all ground wire or wire to rod connections.

3.1.4.2 Make thermit welds strictly in accordance with the manufacturer's written recommendations. Welds which have puffed up or which show convex surfaces indicating improper cleaning, are not acceptable. No mechanical connectors are required at thermit weldments.

3.1.4.3 Ground noncurrent carrying metal parts of equipment or enclosures.

3.1.4.4 Separate surge arrester grounds from other grounds.

3.1.4.5 The secondary neutrals and the tank of each transformer shall be interconnected and connected to ground.

3.1.4.6 Protect grounding conductors which are run on the surface of wood poles by wood molding or plastic molding of equal mechanical strength extending from the ground line throughout communication and transformer spaces.

3.1.5 Conductors: Conductors shall be handled with all care necessary to prevent nicking, kinking, gouging, flattening, or otherwise deforming or weakening the conductor or impairing its conductivity. Remove all damaged sections of conductor and splice the conductor.

3.1.5.1 Conductor splices, as installed, shall exceed the ultimate rated strength of the conductor and shall be of the type recommended by the conductor manufacturer. No splice shall be permitted within 10 feet of any support.

3.1.5.2 Ties on pin insulators shall be tight against the conductor and insulator and ends shall be turned down flat against the conductor so that no wire ends project.

3.1.5.3 Existing conductors to be reinstalled or resagged shall be strung to "FINAL" sag table values for the particular conductor type and size involved.

3.1.5.4 String new conductors to "INITIAL" sag table values recommended by the manufacturer for the conductor type and size of conductor and ruling span indicated.

3.1.5.5 Protect Aluminum conductors by armor rod at pin insulators and by flat aluminum wire at attachments made of galvanized or coated iron or steel.

3.1.5.6 Dead end fittings, clamp or compression type, shall conform to the written recommendations of the conductor manufacturer and shall develop the full ultimate strength of the conductor.

3.1.5.7 Make aluminum connections to any other material using only splices, connectors, lugs, or fittings designed for that specific purpose. Submit the manufacturer's directions for applying these fittings for reference and one additional copy maintained at the job site for the use of the inspector. Environmentally seal and make watertight aluminum splices and connections.

3.2 FIELD TESTS: As an exception to requirements that may be stated elsewhere in the contract, the Contracting Officer shall be given 5 working days notice prior to each tests.

3.2.1 Ground Rod Tests: Do not connect the ground rods until they have been tested for ground resistance value. Use a portable ground testing megger to test each ground or group of grounds. Follow the directions provided by the equipment manufacturer for proper use of the equipment. Provide one copy of the directions for the use of the observing inspectors.

3.2.2 Test Transformer: Test transformer secondary voltages and adjust the voltage at the transformer to provide secondary voltages as indicated. NEMA TR-1.

3.2.3 Devices Subject to Manual Operation: Each device subject to manual operation shall be operated at least three times, demonstrating satisfactory operation each time.

SYMBOL LEGEND

A	-----	ANGLE
AB	-----	ANGLE BRACE
D	-----	DOUBLE
DE	-----	DEADEND
F	-----	FLAT (HORIZONTAL)
FB	-----	FLAT BRACE
LP	-----	LINE POST
N	-----	NEUTRAL
R	-----	RIDGE OR POLE TOP PIN
S	-----	SECONDARY, OPEN WIRE
St	-----	SECONDARY, TRIPLEX
SQ	-----	SECONDARY, QUADRUPLEX
T	-----	TRANSFORMER
TERM	-----	TERMINAL
UG	-----	UNDERGROUND
V	-----	VERTICAL
X	-----	CROSSARM, 8'
X10	-----	CROSSARM, 10'

GENERAL NOTES:

1. Symbols comprising the overhead sketches are not intended to be "all inclusive" for use on every distribution pole line configuration. Only sketches which reflect typical arrangements are included. For other desired arrangements, sketches should be modified or separate details drawn to reflect the specific conditions.
2. Each sketch contains material items which comprise a part of each individual symbol referenced by that sketch. These items are indicated by circled numerals which are identified by Sketches TS-16302L-1.5 and TS-16302L-1.5a.
3. Spacing requirements related to individual components of a symbol are indicated on the appropriate sketch. Vertical spacing requirements between circuits and/or systems are indicated on Sketch TS-16302L-1.4. All other separations between circuits, equipment, etc., shall conform to the National Electrical Safety Code - ANSI C2.

Symbol Legend & General Notes

SKETCH TS-16302L- 1.1

05 85 6365
16302 - 10