SUPPLEMENT TO

SPECIFICATIONS FOR

ELECTRICAL INSTALLATIONS

PRIMARY METER POLE

ELECTRIC SYSTEM BULLETIN No. 753

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(Supersedes issue dated March 1983 and incorporates Nov. 1999 Errata List)

Niagara Mohawk
A **National Grid** Company

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I. INTRODUCTION

A. Purpose

1. This Supplement to Electric System Bulletin (ESB) #750 provides specific Company guidance for those Customers whose service point is a customer owned primary meter pole.

2. **It is important that the Customer and their engineer or contractor obtain and refer to the Specifications for Electrical Installations book (ESB #750) in conjunction with this supplement for these installations.**

3. These requirements are to insure that the electric facilities will render satisfactory service to the Customer, and will not interfere with the electric supply to others served by the Company's system.

4. This type installation is available only for Overhead-to-Overhead Line connection.

B. Scope

1. This bulletin provides more complete information for electric service installations utilizing an Outdoor Receiving Installation served from an Overhead Line at 2400,4160, 4800, or 13,200 Volts.

2. These requirements do not cover the Customer's complete electrical installation design but concern only those points in which the Customer, architect, their Consulting Engineer, Electrical Contractor, Equipment Manufacturer, and the Company have a mutual interest.

3. Where appearance is a factor in the installation of this receiving structure, or a Customer is proposing an Underground Line Connection, a metal-enclosed switchgear installation is required, see *Electric System Bulletin No. 758.*

4. Where the Customer's demand is greater than the Company's allowable limit for the supply voltage, a substation or a metal-enclosed switchgear is required, see *Electric System Bulletin No. 752 or No. 758* as applicable.

5. Company Furnishes

   a. The Company will furnish and install the service lateral complete with dead end insulators, strain clamps and clevises.

   b. The Company will furnish instrument (metering) transformers with mounting frame, meter, and a meter trough.

   c. The Company will furnish the meter cable between the instrument transformers and the meter trough.

6. Customer Furnishes

   a. The Customer will furnish, install, own, and maintain all materials required to complete the installation not explicitly mentioned in I.B.5 above.

C. Customer's Responsibility

(Refer to Figures 1 & 2 for illustrated representation.)

1. The Customer, their Engineer, Contractor, and supplier should provide a safe, modern, adequate installation with ample provision for future needs.

2. The Customer shall obtain building permits and/or zoning variances as required for construction.

3. The Customer shall be responsible to have all electrical and physical design documents prepared by a design professional, in accordance with Section 1.7 of ESB 750, and as further detailed later in Section I.G of this bulletin.

D. Cooperation

1. For a specific installation it is essential the Company meet with the Customer or their representative.

2. The information the Customer or their contractor furnishes to the Company in regard to the Customer's proposed electrical installation shall be in **writing**.

3. If significant changes are made to the design or scheduling of the installation by the Customer, initial information furnished by the Company shall be subject to review and possible modification.

4. When an issue arises which is not contained in this booklet or *Electric System Bulletin #750,* the Company invites inquiries.

E. Codes and Standards

1. The Customer's electric service equipment and its installation shall conform to the requirements of the latest edition of the National Electrical Code (NEC), National Electrical Safety Code (NESC), Rural Electric Association (REA), National Fire Protection Association (NFPA), all local ordinances, building codes, and Company requirements and specifications.

2. Components shall conform to the latest editions of the following national standards and codes:

Component	Applicable National Standard
Cable	ICEA
Power Switches and Fuses	ANSI C37
Lightning Arresters	ANSI C62
Insulators	ANSI C29, EEI TD-17
Pole	ANSI O5.1, EEI TD-103
Crossarm	EEI TD-90
Guy Wire	ANSI C7, ASTM A475
Anchors	ANSI C135.2
Terminations	NEMA
Grounding	IEEE 80

3. The Customer should consult their insurance carrier for any special safeguards, which the carrier may require for the Customer's outdoor receiving installation.

F. Inspection

1. To protect the Customer's interest, as well as its own, the Company requires the Customer to furnish satisfactory evidence from the local authority having jurisdiction as to the safe condition of their entire electrical installation before energizing the service to a new installation of re-energizing a service that has been disconnected for more than twelve (12) months.

2. This may be in the form of an approval or certificate from the New York Board of Fire Underwriters or other inspection organization acceptable to the Company.

3. Catastrophic occurrences such as fire, flood, etc. shall require a new certificate as to the safe condition of the entire electrical installation.

4. Application for inspection should be made before the work is started.

5. When wiring is replaced, altered, or extended an approval or certificate shall also be obtained to assure compliance with safety requirements.

G. Compliance

1. Prior to the meeting indicated above (section D), the Customer shall provide three (3) copies of a fully dimensioned plot plan indicating property lines, building outlines and detail of the preferred location for electrical service equipment, as well as the proposed location of any buried facilities.

2. After the meeting, the Company will designate the pole location from which the primary service will be extended.

3. The Company will respond, indicating the route of the service lateral.

4. The Company's Consumer Relations Department will advise the Customer concerning any contribution required in accordance with the Company's filed tariff.

5. **THE CUSTOMER SHALL SUBMIT THEIR PLANS AND SPECIFICATIONS TO THE COMPANY BEFORE ORDERING EQUIPMENT OR STARTING WORK to insure that the proposed design for the electric service installation conforms to Company requirements.**

6. For general compliance with these specifications, the Company normally limits its review to the details of the service lateral, the service disconnect and protective device, the primary meter pole location, and the location of the metering equipment.

7. Required Documents and Submission Process

   The required delivery of the design documents shall be as described in submittal stages "a" through "d" below. Drawings shall be originals prepared by the Customer's retained design professional and comprehensively detail the design of the electrical facility on a single sheet to permit full interpretation and understanding of all aspects. The drawings shall be prepared in conformance with ANSI Y32.2, IEEE 141 and IEEE 446 symbol and drafting nomenclature. All devices specified shall be of power utility grade and not industrial grade.

   In order to speed and efficiently facilitate review, no portion of a submission should be sent until every element of the package is complete, final and deliverable in a single package in any of the following stages. Unless otherwise requested and at the sole discretion of the Company, no individual document, or partial design, of a submission will be accepted for Company review until the Customer has declared that the package is complete. In all instances, six (6) complete sets of design documents shall be submitted for Company review and acceptance.

   a. PRELIMINARY SUBMITTAL

      Along with the completed service application, the following shall be submitted:

      - Plot plan
      - Functional single line diagram with proposed ratings of disconnecting devices, overcurrent protection, transformer size and impedance.

   b. DETAILED ELECTRICAL DESIGN SUBMITTAL

      Along with the Customer's written notice to proceed, the following shall be submitted:

      - Complete functional single line detailing all devices up to, and including, the Customer's secondary protective device. It should include: all protective relays in sufficient detail to show intended operation; all instrument transformers with ratios, including excitation curves; power and station service transformers with ratios; etc.
      - Specifications:

        Switch.

Lightning Arresters.

Fuses and Fuse Cutouts, or Circuit Breaker or High Voltage Interrupter if used.

Conductors.

Insulators.

Pole and Hardware.

Power transformer.

- The switch manufacturer's certification documents:

  Switch manufacturer's certification to ANSI standard test requirements for load break capability.

  Note: Ice Test shall be required to pass for 1/2" ice loading.

  A statement indicating that the switch has been tested and will operate properly with a 10,000 ft.-lb. (2000 lbs. tension per conductor) torque applied to the switch mounting frame.

  Note: For example, if one outer phase conductor disconnects, can the switch open in a fail-safe mode?

- Where circuit breakers or high voltage interrupters are used for the main overcurrent device:

  List of proposed relays.

  Electrical AC ELEMENTARY, if required by protective device, in sufficient detail to show the functional control operation of the station. The elementary schematic diagram shall be in three-line format and show, by means of graphic symbols, all devices having any interaction with the tripping function of the main protective device. Specifically, it shall include all individual items of equipment, devices within the equipment, their coils, contacts, windows, terminals, AC source, and each connection (wire, cable or bus) between equipment and devices.

  Electrical DC ELEMENTARY, if required by protective device, in sufficient detail to show the functional control operation of the station. The D.C. elementary schematic diagram shall show, by means of graphic symbols, all devices having any interaction with the tripping function of the main protective device. Specifically, it shall include all individual items of equipment including batteries, battery charger, devices within the equipment, their coils, contacts, windows, terminals, and each connection (wire, cable or bus) between equipment and devices. (Note – Ladder-type diagrams are not acceptable.)

  Relay panel drawings.

  Control house layout.

- Electrical Assembly and Layout drawings of the Primary Meter Pole.
- Manufacturer's switch detail drawings showing as a minimum:

  The proposed switch mounted as indicated in Figure 3, 3A or 4.

  Phase-to-phase and phase-to-ground clearances for switch components in the open and closed position.

  Should the installation have any accessory components, i.e. interrupter devices, outriggers, etc. the details of these shall also be included in this drawing.

  Expanded details of the hardware connections on the switch, mounting, and operating mechanism.

  A bill of material identifying the quantity, material, size, model, and catalog number of all components associated with the switch including the switch itself, mounting frame, and the operating mechanism and hardware.

  A table of electrical characteristics, B.I.L., Interrupting Amperes, Continuous Amperes, etc.

  The switch nameplate showing catalog number, switch ratings and certifications.

  A unique catalog number, which identifies the complete switch package as depicted.

- Grounding plans and details.
- Meter conduit and Meter Panel drawings, if meter is remote from the Primary Meter Pole.
- Transformer nameplate drawing.

c. FINAL, FOR-CONSTRUCTION SUBMITTAL

A complete set of all drawings and equipment specifications outlined above, marked final/for construction shall be submitted a minimum of four (4) weeks in advance of proposed energization. Also, at this time the manufacturers' test reports for the power transformer and, if used, circuit breaker or high voltage interrupter shall be submitted. When applicable, a list shall be submitted of proposed relay settings based on a formal relay coordination study. Settings shall not be shown on drawings. This is the end of the design process. The full set of design professional sealed final documents shall then be submitted for review in total by the Company.

d. FINAL, AS-BUILT IN FIELD SUBMITTAL

Once construction is complete and the service energized, a full set of the drawings in item c above shall be submitted within 90 days. They shall accurately document the as-built status of the project, including any deviation from the final for-construction design drawings, and again be sealed by the Customer's design professional.

8. The Company reserves the right to review the installation as it progresses.

9. An authorized representative of the Company will examine the Customer's installation before it is energized to insure compliance with these specifications.

10. The Customer shall maintain a ten (10) foot minimum clearance from an energized Company distribution line for work and structure placement.

11. See Figure 6 for required electrical installation clearances.

II. DEFINITIONS

Note: Definitions as used in this specification are provided in the **"Specifications for Electrical Installations" book (ESB#750), Section 2.**

III. GENERAL

A. Access

1. Facilities shall be provided so that authorized Company Employees and vehicles have access to the Customer's electric service installation and Company-owned Metering equipment.

2. The Customer shall insure that accessways are free of vehicles, equipment, or other obstructions.

B. Limits of Primary Services Available

1. Single phase, 60 Hz

Wires	Nominal Voltage	kVA Limit	Notes
2	2.4 kV, L-N	100	a, d
2	7.62 kV, L-N	100	
2	2.4 kV, L-L	100	a, d
2	4.8 kV, L-L	100	a

2. Three phase, 60 Hz

Wires	Nominal Voltage	kVA Limit	Notes
3	2.4 kV Delta	500	a, b, d
4	4.16 kV Wye-Grounded	1,000	a, b
3	4.8 kV Delta	1,000	a, b
3	12 kV Delta	1,000	a, b, d
4	13.2 kV Wye-Grounded	2,500	c

Notes to Section III.B.1 & 2 above:

a. Non-Standard service voltage.
b. New installations shall conform to clearances and ratings for 13.2 kV, three phase service.
c. Maximum limit may be less depending upon supply and location.
d. Where applicable.

IV. SERVICE CONNECTIONS

A. General

1. The Company reserves the right to designate the location of both ends of the service lateral.
2. The Company will construct, own and maintain overhead service laterals in the voltage range from 2,400 volts to 13,200 volts inclusive.
3. All connections, permanent or temporary between the Company's overhead service and the Customer's primary meter pole will be made by the Company.
4. The structure or riser shall be capable of withstanding 2000 lbs. tension for each service conductor.
5. The Customer shall furnish or obtain all right-of-way easements required by the Company between the Company's line and the Customer's primary meter pole on the Customer's premises.
6. The Company will provide an appropriate form for this right-of-way purpose upon request.
7. The Company's normal primary service voltage range measured at the point of delivery is between plus or minus five percent (±5%) of its nominal voltage rating and plus or minus ten percent (±10%) under abnormal conditions.
8. The Customer shall consider the installation of their own voltage regulation equipment if necessary.

B. Primary Meter Pole Location

Factors to Consider:

1. A field inspection by Company representatives will determine the location of the Customer's primary receiving structure.
2. Appearance and use of this structure should be seriously considered.
   a. The Company recommends that it not be used for schools, or installed near the front of a building.
   b. A metal enclosed switchgear installation should be considered for these locations.
3. The overhead primary lateral should be short, direct, and clear of trees, vegetation, buildings, storage space, or other possible occasion for work above ground level.
4. The Customer's overhead conductors shall have a minimum clearance of 22 feet from final grade.
5. Operation and future maintenance of the primary meter pole shall be considered.

V. CUSTOMER SERVICE EQUIPMENT

(See Figures 3, 3A and 4 for typical assembly.)

A. Rating Requirements

1. The service equipment shall be suitable for the maximum fault current available at its supply terminals.

2. The maximum fault available at the transformer primary is as follows:

Service Voltage	Available Fault
4.16 kV	25,000 kVA
4.8 kV	25,000 kVA
13.2 kV	150,000 kVA

B. Receiving Structure Requirements

1. Pole:
   a. The Pole shall be a Class 5, full length penta treatment, conforming to the standards of EEI TD-103 and ANSI O5.1.
   b. The field conditions will determine the required height.
   c. Pole shall be a minimum of 40 ft. in height, set 6 ft. minimum depth.

2. Crossarm:
   a. The crossarm shall have 6 pins.
   b. The crossarm shall measure 3-½" x 4-½" x 8'-0" minimum, conforming to specifications of EEI TD-90.

3. Associated Hardware:
   a. Insulator:
      (1) Top groove, porcelain (ceramic), pin type, conforming to ANSI C29.5.
      (2) Rated for 13.2 / 7.62 kV operation.
   b. Insulator Pin - bolt:
      (1) Bolt type conforming to EEI Standard TD-17 (without saddle).
      (2) Measurements: 5/8" x 10-¾", 1" cast lead pin thread.
   c. Insulator Pin - screw:
      (1) Screw type, with thread, conforming to EEI standard TD-17.
      (2) 1" cast lead pin thread.
   d. Guy Insulator shall conform to ANSI C29.4 Class 54-3.
   e. Guy Wire:
      (1) 16M, 7 strand, Utilities Grade, conforming to ANSI C7.46, ASTM A475.
      (2) 25 ft. minimum lead with insulator.
   f. Anchor:
      (1) 200 square inch expanding type.
      (2) Buried 6 ft. in ground minimum.
   g. Anchor Rods:
      (1) Shall conform to ANSI Standard C135.2.
      (2) Measurements: ¾" diameter by 8'-0" minimum.

4. All pole line hardware and connectors shall be utility grade.

5. Substitution of hardware other than that bearing Rural Electric Association or Edison Electrical Institute label is not acceptable.

C. Main Disconnect Switch

1. Electrical Requirements

1. The switch rating shall be 14.4 kV, 110 kV BIL Minimum.
2. Minimum ampacity shall be 400 A continuous.
3. Switch shall be able to withstand the full available short circuit fault conditions designated by the Company.
4. The switch shall be capable of opening under full load.
5. Arcing horns or arc interrupters shall be integral to the switch.
6. Manufacturer tested in conformance to ANSI standard C37.34 series and NEMA, UL, etc.
7. Clearances shall be in accordance with Figure 6, Outdoor Electrical Clearances.

2. Mechanical Requirements

1. The Switch shall be gang operated, three (3) pole (three phase) or two (2) pole (single phase L-L) or one (1) pole (single phase L-N), single throw type, complete with operating assembly.
2. The switch shall have a steel frame, suitable for horizontal mounting on a single wood pole.
3. The switch frame shall be capable of supporting a dead-end load of 2000 pounds per conductor for all phases.
4. The Customer shall provide a cable to flat terminal connectors to connect the Company's line to the switch.
5. The switch shall be capable of opening under 1/2" ice loading conditions, NESC "Heavy."
6. The switch shall be mounted so that the handle will be approximately 3'-6" above grade.
7. A 15" insulated outrigger will be required on the load side of the switch.

3. Identification Requirements

1. The switch nameplate shall show: nominal voltage, maximum voltage, BIL, continuous, momentary and interrupting amperes.
2. The switch nameplate shall include reference to certifications, i.e., ANSI, NEMA, UL, etc.
3. The switch nameplate shall be mounted on the switch and also near the operating handle.

4. Installation Requirements

1. After installation and before being energized, the switch must be thoroughly operationally tested in accordance with the manufacturer's instructions.
2. It is recommended after installation that the switch be maintained in accordance with ANSI C37.35.

D. Lightning Arresters

1. Lightning arresters shall be mounted with an EEI-NEMA TDJ-19 standard bracket.

2. Arrester rating is determined by primary service voltage.

LIGHTNING ARRESTER RATINGS

Primary Service Voltage	Arrester Rating (ANSI C62.1)	Max. Continuous Operating Voltage (MCOV)
4.16 kV Wye-Grounded	3 kV	2.55 kV
4.8 kV Delta	6 kV	5.1 kV
13.2 kV Wye-Grounded	10 kV	8.4 kV

E. Fuses & Fuse Cutouts

1. For systems operating with a primary voltage of 2.4, 4.16 or 4.8 kV, the fuse cutout value shall be 200 Amp., 5.2 kV, extra heavy duty, extra large bodied indicating cutout, with fuse size as required by ANSI C37.41.

2. For systems operating with a primary voltage of 13.2 kV, the fuse cutout value shall be 100 Amp, 15 kV extra heavy duty, open type with fuse size as required by ANSI C37.41.

3. The magnitude of fault current will be specified by the Company.

4. The fuse size will be specified by the Company.

5. Fuses shall be mounted in porcelain-enclosed or open-type cutouts.

6. The Customer should maintain a stock of four (4) spare fuses to be stored in a convenient dry place.

7. If the Customer uses a circuit breaker or high voltage interrupter in lieu of fuses for main overcurrent protection, refer to ESB #752 for requirements.

F. Operation and Maintenance Requirements

The following is in the mutual interest of the Company and the Customer where the Customer's service equipment is directly involved with the Company's System.

1. General Requirements

   a. The switching protocol procedure for the mutual interest of the Company and the Customer will be provided by the Company based on the following information from the Customer:

      - Contact personnel and telephone numbers and
      - Single-line diagram from Section I.G above of the Customer’s primary and secondary equipment directly involved with the Company’s system.

   b. The Customer is responsible for maintaining this information up-to-date and notifying the Company of any changes.

   c. The Customer shall notify the Company whenever switching is performed within the Customer's primary service equipment (i.e., above 2.2 kV and less than 15kV). The Customer is responsible for developing operating instructions for their electrical system.

   d. The Company can provide isolation and grounding guarantees at the Customer's service disconnect or Company isolation point on the supply line ahead of the Customer's service equipment. However, the Customer is responsible for their grounding provisions to work on their de-energized equipment.

   e. The Customer shall operate within established Company mark up rules in any switching operations with the Company for their equipment that both the Company and the Customer have a mutual interest. It is expected the Customer will provide a

qualified person as defined in the National Electrical Code and any other applicable codes.

f. The Customer must recognize and abide by the Company's mark up rules. The Customer shall conduct their switching based on their switching practices insuring that the Company's mark up is not jeopardized or modified.

g. References to minimum customer requirements for maintenance, operating, and safety of their high voltage installation include but are not limited to:

- NFPA 70B "Recommended Practice for Electrical Equipment Maintenance"
- NETA-MTS "Maintenance Testing Specifications for Electrical Power Distribution Equipment and Systems"
- NFPA 70E "Electrical Safety Requirements for Employee Workplaces"
- IEEE/ANSI C2 "National Electrical Safety Code"
- OSHA 29 CFR 1910.269

2. Specific Requirements

a. Service Personnel and Safety:

- The Customer is responsible for performing all switching and O&M functions for their equipment.
- The Customer shall arrange to have qualified personnel available at all times for the proper and safe operation of their equipment.
- "Qualified Personnel" training shall cover correct operating and safety procedures including, but not limited to:

  distinguishing exposed live parts,

  determining the nominal voltage of exposed live parts,

  determining of the minimum approach distance, and

  the use of precautionary techniques, personal protective equipment, insulating and shielding materials, and insulated tools for working on or near exposed live parts of electrical equipment.

b. The Company does not provide any operating tools for the Customer's use. The Customer shall provide their own operating equipment such as tongs, insulating switching sticks, insulated rubber gloves, grounds, ground bails, studs and grounding sticks; voltage detection equipment, etc. needed for the safe performance of operating functions. This operating equipment shall be properly maintained and tested according to the manufacturer's instructions.

c. Line terminations and the metering transformer compartments of the Customer's switchgear will be locked by the Company when the Company's work is completed and marked clear with the Controller.

3. Switching

a. All switching or other work on high voltage circuits shall be performed by qualified personnel fully equipped with safety equipment tested for the circuit voltage involved.

b. All Company directed switching within the Customer's primary meter pole service shall be done in accordance with Company-provided switching instructions.

c. The Company will provide nomenclature for Customer's labeling of the main disconnect switch and other electrical equipment referred to in the Company's switching instructions. The Customer shall make provisions for the labeling of this equipment and any necessary mark-up tag holder.

d. Tags shall be used to prohibit operation of electrical devices and shall indicate that employees are at work. Equipment shall be locked and rendered inoperable by locking and tagging unless its design does not so permit. Tags alone may be used when the equipment can not be rendered inoperable by locking.

e. NO WORK SHALL BE DONE ON AN AIR BREAK SWITCH WHILE THE INCOMING LINE IS ENERGIZED.

(1) Notify the Company and arrange for an interruption and a guarantee before doing any work at or near this section. Also, if requested, a grounding guarantee may also be provided.

(2) THE MAIN DISCONNECTING SWITCH SHALL BE LOCKED OPEN PRIOR TO CHANGING FUSES OR WORKING ON HIGH VOLTAGE EQUIPMENT.

(3) THE SAFETY PRECAUTIONS outlined in the NESC ANSI C2, OSHA and local requirements shall be strictly adhered to. The Customer shall ensure the circuit/equipment has been tested as deenergized and grounded prior to work.

4. Maintenance

a. The Customer is responsible for maintaining all equipment under their ownership.

b. Proper preventative maintenance is important to the operation of the equipment and shall be performed.

c. NFPA Standard No. 70B on "Electrical Equipment Maintenance" and NETA-MTS "Maintenance Testing Specifications for Electrical Power Distribution Equipment and Systems" are two publications that could be helpful in setting up a dynamic maintenance program. Copies of test records of major station equipment and protective devices that both the Company and the Customer have a mutual interest in shall be maintained on the premise and be made available to the Company upon request, e.g. breaker, transformer, outdoor switches, and relay devices.

d. The Company does not provide any spare parts for the Customer's installation. The Customer should determine their inventory of spare parts for circuit breakers, fault interrupters, switchgear, and other electrical equipment essential to minimize their interruption time.

e. Customer access to Company controlled electrical spaces within Customer-owned electric facilities:

The Company's control of electric spaces in Customer-owned electric facilities is for the sole purpose of protecting the integrity of the Company's energy supply and security of the utility metering equipment. Any costs shall be determined by the Company's filed tariff. In these requirements, "Customer" refers to the Customer or their agent. Under this and all other policies, it is expected and it is the Customer's responsibility to provide a qualified person as defined in the National Electrical Code and any other applicable codes.

(1) The Company can provide isolation and grounding guarantees at the Customer's service disconnect or Company isolation point on the supply line ahead of the Customer's service equipment. However, the Customer is responsible for their grounding provisions to work on their de-energized equipment.

(2) When the Customer does not require a guarantee on the supply line and needs access to Company-controlled electrical spaces for their maintenance purposes, the Company in its sole judgment may determine the ability to grant access to the Customer for the duration established by the Company. When granted, the Company will witness the Customer's placement of their lock immediately after the removal of the Company's lock. Upon notification by the Customer that their work is complete, the Customer shall relinquish access back to the Company and

the Company's lock shall be placed immediately upon the removal of the Customer's lock. In each case the transfer shall occur in the presence of both parties. The Company will check it's electrical equipment for any signs of tampering.

In the event that the required access is of short duration and the Company's representative remains on site, to avoid a second trip, it is understood they are doing so without any supervisory or oversight capacity relative to the Customer.

VI. GROUNDING

A. Requirements

1. The group-operated airbreak disconnecting switch mechanism shall be connected to the grounding grid near the operating handle by means of a flexible, tinned copper braid of at least 200 Ampere rating.
2. Bond all non-current carrying metallic parts on the receiving structure to equipment ground with a stranded #4AWG bare copper conductor.
   a. This includes switch frame, lightning arresters, guy wires, switch base, and the neutral (where furnished).
   b. Ground connections shall conform to those on the appropriate schematic diagram, Figure 1 or Figure 2, depending on the type of phase service.
3. At least 2 ground rods shall be used.
4. The ground rods shall be at least 5/8" x 8'-0" with clamps.
5. The down leads to the ground rods shall be affixed to the rods in a manner consistent with Figure 5.
6. The ground rods shall be buried at least 6 inches below grade.
7. The rods shall be spaced at a minimum distance of 3 ft. from the center of the pole, and at least 6 ft. minimum from each other.
8. The ground rods shall be bonded together with #4 AWG bare copper conductor.

B. Potential Equalizing Grid

1. A 5 feet x 6 feet grid of 8 inch x 8 inch copperweld mesh shall be installed below the operating handle to protect servicing personnel.
   a. The grid and the switch handle's ground strap shall be connected to the pole's grounding conductor.
   b. The grid shall have 3 inches of #2 crushed stone beneath it.
   c. The grid is to be laid 3 inches below grade, covered by #2 crushed stone.
   d. Installation shall conform to Figure 5.

C. Safety Precautions

1. EVEN WITH THE GROUNDING PROVISIONS SUGGESTED, IT IS IMPERATIVE THAT A PERSON OPERATING GROUP-OPERATED SWITCHES WEAR RUBBER GLOVES.

VII. METERING

A. Company's Responsibility

1. The Company will specify and provide the metering equipment.
2. The Company will make secondary connections to the meter.

3. The Company will install the meter.

B. Customer's Responsibility

1. The Customer will install the metering transformers and mounting frame, and an outdoor metering trough on the primary receiving structure in a manner consistent with Figures 1, 3 and 3A or Figures 2 and 4, depending on the type of phase service.

2. The Customer will make primary connections to the Company's metering transformers.

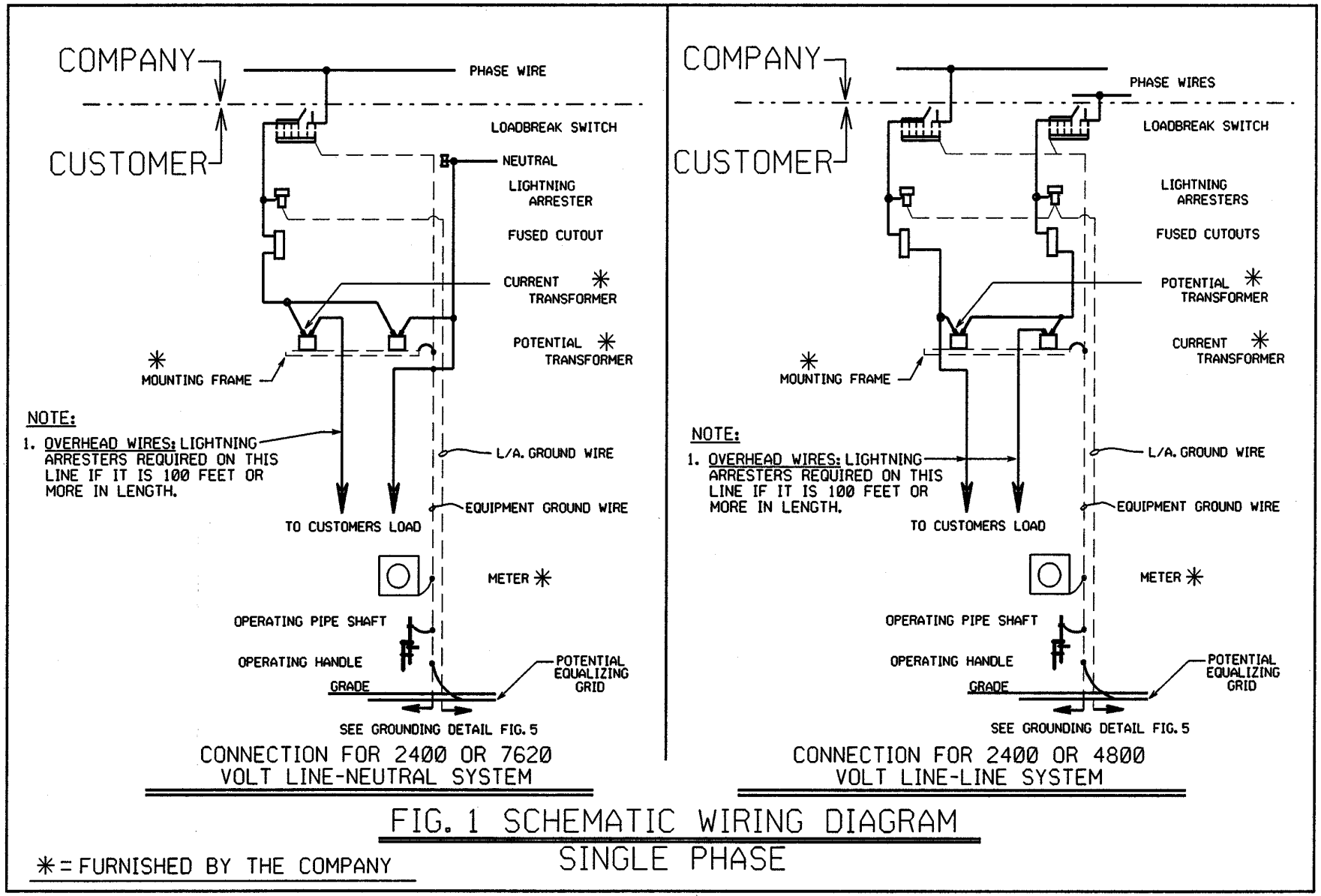


FIG. 1 SCHEMATIC WIRING DIAGRAM
SINGLE PHASE

✳ = FURNISHED BY THE COMPANY

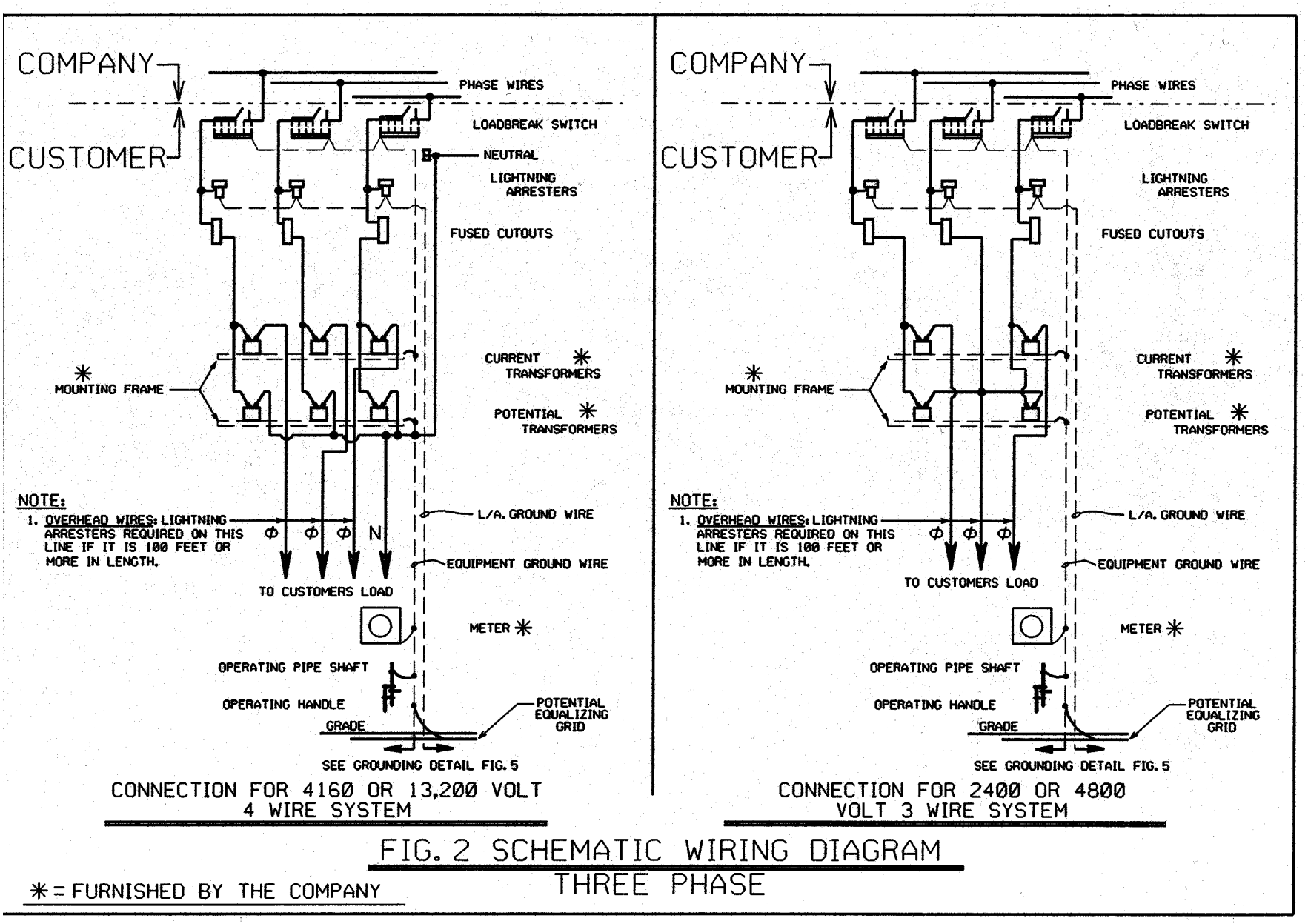
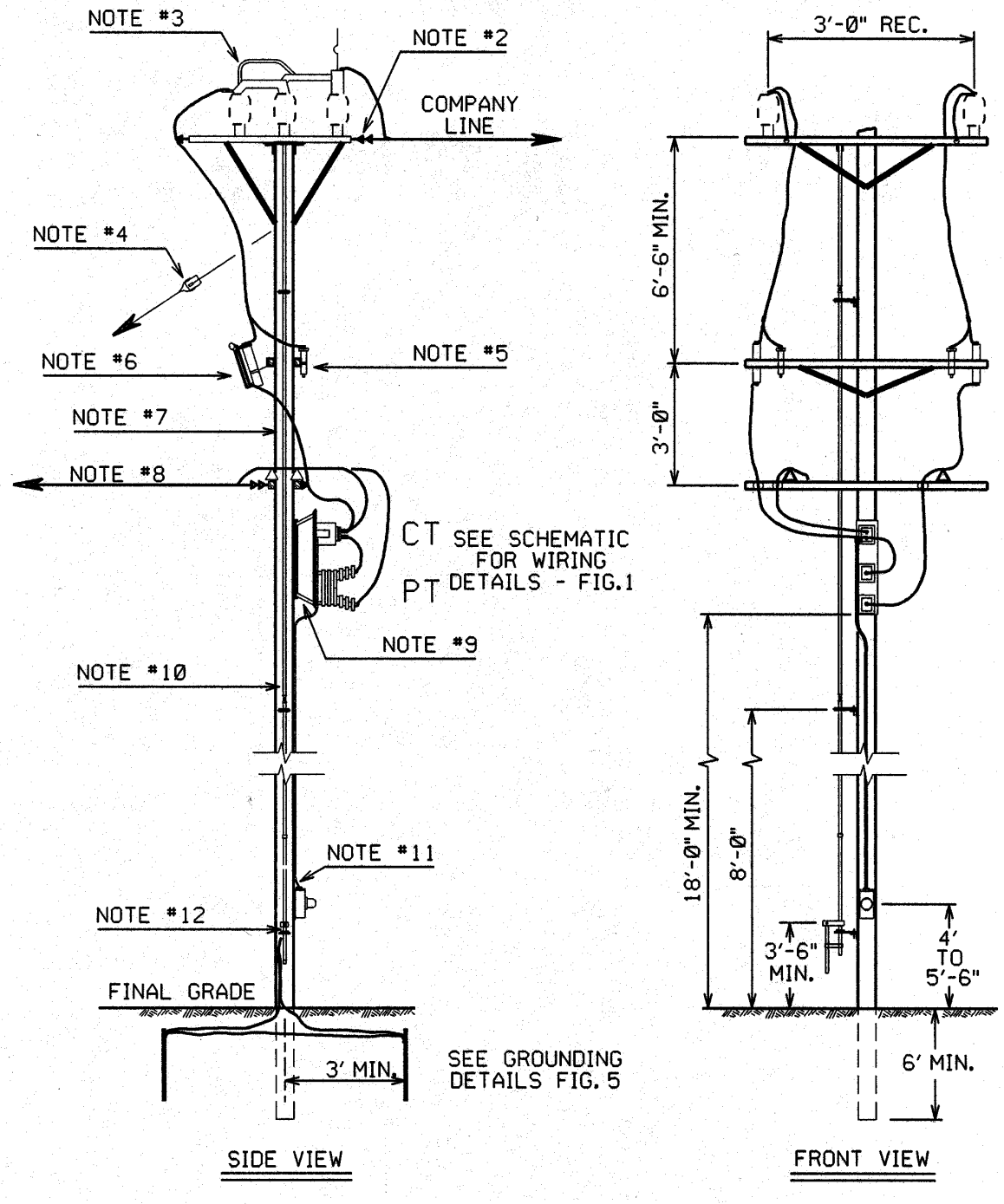


FIG. 2 SCHEMATIC WIRING DIAGRAM THREE PHASE

✳ = FURNISHED BY THE COMPANY

FIGURE 3 - NOTES

1. CUSTOMER TO FURNISH, INSTALL, OWN AND MAINTAIN EVERYTHING SHOWN EXCEPT AS NOTED.
2. DEAD END INSULATOR, CLAMPS AND CLEVISES FURNISHED AND INSTALLED BY COMPANY.
3. COMPANY APPROVED 2 P.S.T. GROUP OPERATED 14.4 kV, 400 AMP LOADBREAK SWITCH WITH WOOD POLE STEEL MTG. FRAME SUITABLE FOR SUPPORTING LINE TENSIONS OF 2000 LBS. PER CONDUCTOR AT 3 FT. PHASE SPACING COMPLETE WITH 1-1/2" SHAFT ASSEMBLY. 15 INCH OUTRIGGER REQUIRED. PROVIDE TERMINALS TO FIT COMPANY INCOMING LINE.
4. GUY TO ANCHOR BURIED 6 FT. IN GROUND, 25 FT. MIN. LEAD WITH INSULATOR.
5. LIGHTNING ARRESTERS. USE SEPARATE GROUNDING CONDUCTOR TO GROUND GRID.
6. FUSED CUTOUTS - FUSE SIZE TO BE SPECIFIED BY THE COMPANY.
7. #4 AWG BARE COPPER GROUNDING CONDUCTOR. BOND ALL METALLIC NON-CURRENT CARRYING PARTS TO THE EQUIPMENT GROUND WIRE.
8. TO CUSTOMER'S LOAD. CONDUCTOR CLEARANCE 22 FT. MINIMUM AT MID SPAN.
9. MOUNTING FRAME AND METERING TRANSFORMERS FURNISHED BY COMPANY, INSTALLED BY CUSTOMER. PRIMARY CONNECTIONS MADE BY CUSTOMER, SECONDARY CONNECTIONS BY COMPANY.
10. OPERATING SHAFT (REFER TO DETAIL IN FIG. #5.)
11. 1-1/2" RIGID METALLIC OR SCHEDULE 80 P.V.C. CONDUIT INSTALLED BY CUSTOMER.
12. INSTALL BRACKET SO THAT OPERATING HANDLE WILL BE APPROX. 3'-6" ABOVE GRADE.



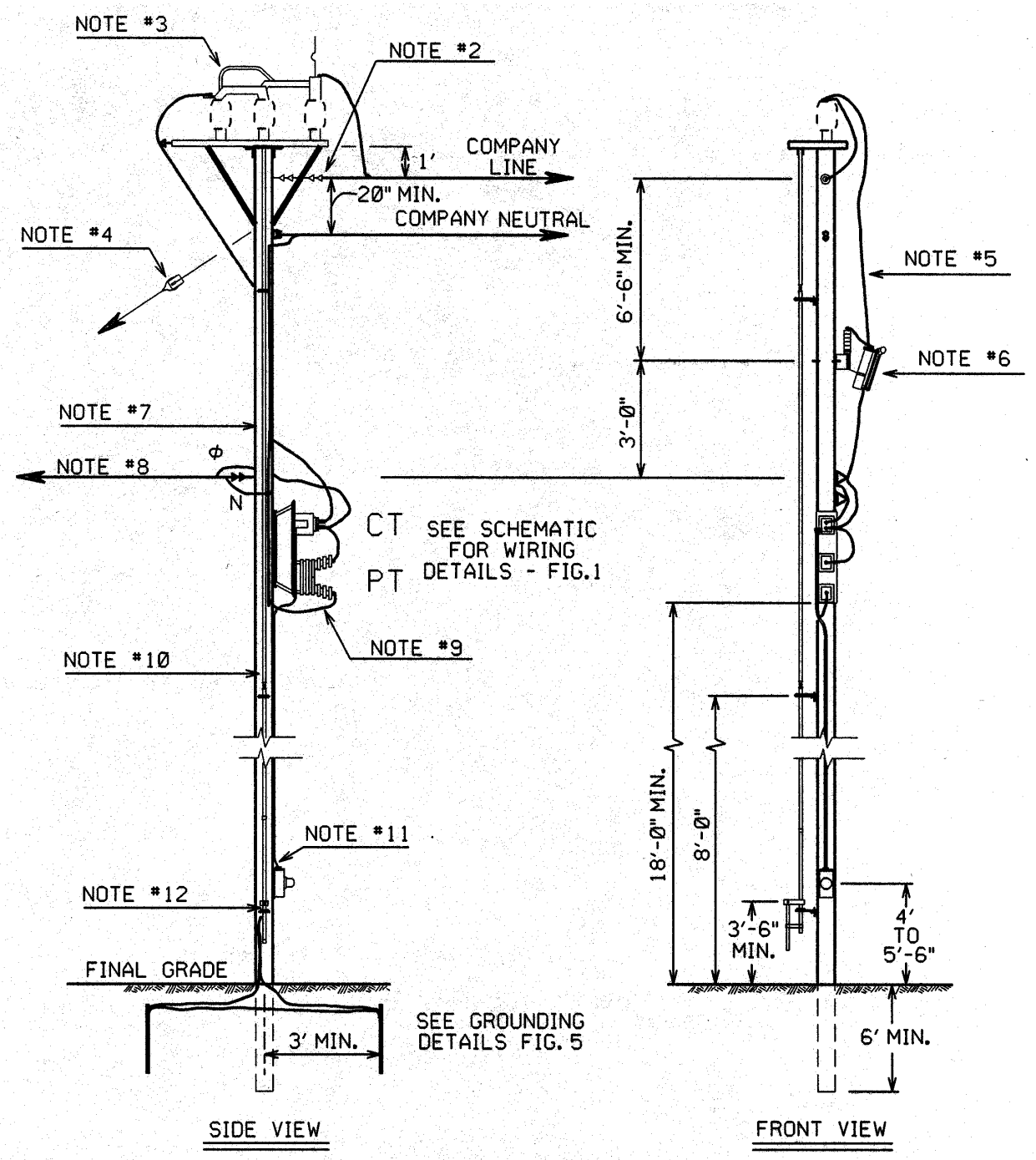
2,400 - 4,800 VOLT LINE-LINE

SINGLE PHASE

FIGURE NO. 3
CUSTOMER'S OUTDOOR RECEIVING STRUCTURE ARRANGEMENT
SINGLE-PHASE-100KVA LIMITATION

FIGURE 3A - NOTES

1. CUSTOMER TO FURNISH, INSTALL, OWN AND MAINTAIN EVERYTHING SHOWN EXCEPT AS NOTED. POLE TO BE SUITABLE FOR SUPPORTING LINE TENSION OF 2000 LBS. AT COMPANY'S LINE ATTACHMENT HEIGHT.
2. DEAD END INSULATOR, CLAMPS AND CLEVISES FURNISHED AND INSTALLED BY COMPANY.
3. COMPANY APPROVED 1 P.S.T. MANUALLY OPERATED 14.4 kV, 400 AMP LOADBREAK SWITCH WITH STEEL BASE. SWITCH SHALL HAVE 1-1/2" SHAFT ASSEMBLY AND 15 INCH OUTRIGGER. PROVIDE TERMINALS TO FIT COMPANY INCOMING LINE.
4. GUY TO ANCHOR BURIED 6 FT. IN GROUND, 25 FT. MIN. LEAD WITH INSULATOR.
5. LIGHTNING ARRESTER. USE SEPARATE GROUNDING CONDUCTOR TO GROUND GRID.
6. FUSED CUTOUT - FUSE SIZE TO BE SPECIFIED BY THE COMPANY.
7. #4 AWG BARE COPPER GROUNDING CONDUCTOR. BOND ALL METALLIC NON-CURRENT CARRYING PARTS TO THE EQUIPMENT GROUND WIRE.
8. TO CUSTOMER'S LOAD. CONDUCTOR CLEARANCE 22 FT. MINIMUM AT MID SPAN.
9. MOUNTING FRAME AND METERING TRANSFORMERS FURNISHED BY COMPANY, INSTALLED BY CUSTOMER. PRIMARY CONNECTIONS MADE BY CUSTOMER, SECONDARY CONNECTIONS BY COMPANY.
10. OPERATING SHAFT (REFER TO DETAIL IN FIG. #5.)
11. 1-1/2" RIGID METALLIC OR SCHEDULE 80 P.V.C. CONDUIT INSTALLED BY CUSTOMER.
12. INSTALL BRACKET SO THAT OPERATING HANDLE WILL BE APPROX. 3'-6" ABOVE GRADE.



2,400 - 7,620 VOLT LINE-NEUTRAL
SINGLE PHASE

FIGURE NO. 3A
CUSTOMER'S OUTDOOR RECEIVING STRUCTURE ARRANGEMENT
SINGLE-PHASE-100KVA LIMITATION

FIGURE 4 - NOTES

1. CUSTOMER TO FURNISH, INSTALL, OWN AND MAINTAIN EVERYTHING SHOWN EXCEPT AS NOTED.
2. DEAD END INSULATOR, CLAMPS AND CLEVISES FURNISHED AND INSTALLED BY COMPANY.
3. COMPANY APPROVED 3 P.S.T. GROUP OPERATED 14.4 kV, 400 AMP LOADBREAK SWITCH WITH WOOD POLE STEEL MTG. FRAME SUITABLE FOR SUPPORTING LINE TENSIONS OF 2000 LBS. PER CONDUCTOR AT 3 FT. PHASE SPACING COMPLETE WITH 1-1/2" SHAFT ASSEMBLY. 15 INCH OUTRIGGER REQUIRED. PROVIDE TERMINALS TO FIT COMPANY INCOMING LINE.
4. GUY TO ANCHOR BURIED 6 FT. IN GROUND, 25 FT. MIN. LEAD WITH INSULATOR.
5. LIGHTNING ARRESTERS. USE SEPARATE GROUNDING CONDUCTOR TO GROUND GRID.
6. FUSED CUTOUTS - FUSE SIZE TO BE SPECIFIED BY THE COMPANY.
7. #4 AWG BARE COPPER GROUNDING CONDUCTOR. BOND ALL METALLIC NON-CURRENT CARRYING PARTS AND THE NEUTRAL (WHERE FURNISHED) TO THE EQUIPMENT GROUND WIRE.
8. TO CUSTOMER'S LOAD. CONDUCTOR CLEARANCE 22 FT. MINIMUM AT MID SPAN.
9. MOUNTING FRAME AND METERING TRANSFORMERS FURNISHED BY COMPANY, INSTALLED BY CUSTOMER. PRIMARY CONNECTIONS MADE BY CUSTOMER, SECONDARY CONNECTIONS BY COMPANY.
10. OPERATING SHAFT (REFER TO DETAIL IN FIG. #5.)
11. 1-1/2" RIGID METALLIC OR SCHEDULE 80 P.V.C. CONDUIT INSTALLED BY CUSTOMER.
12. INSTALL BRACKET SO THAT OPERATING HANDLE WILL BE APPROX. 3'-6" ABOVE GRADE.

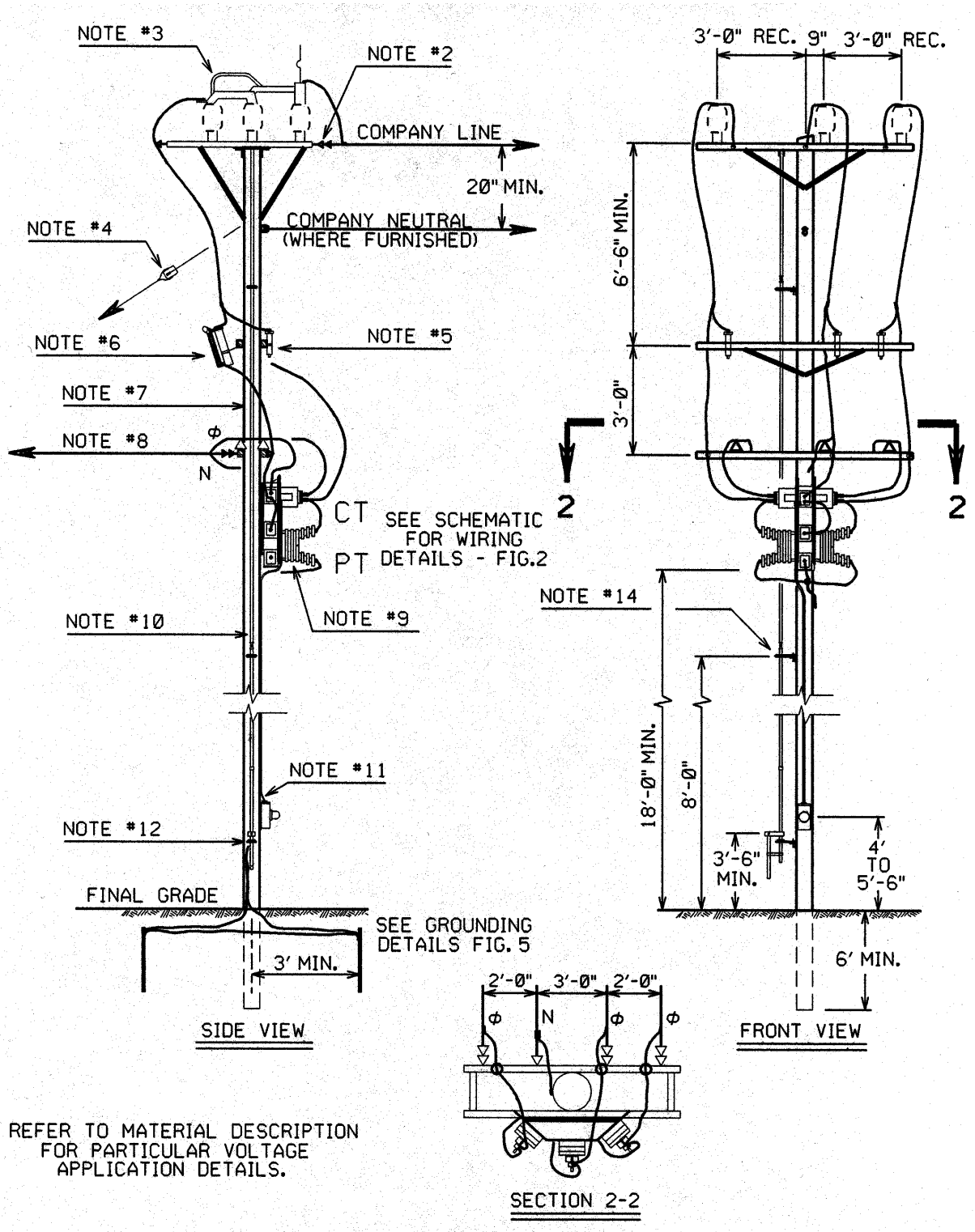


FIGURE NO. 4
CUSTOMER'S OUTDOOR RECEIVING STRUCTURE ARRANGEMENT
THREE-PHASE

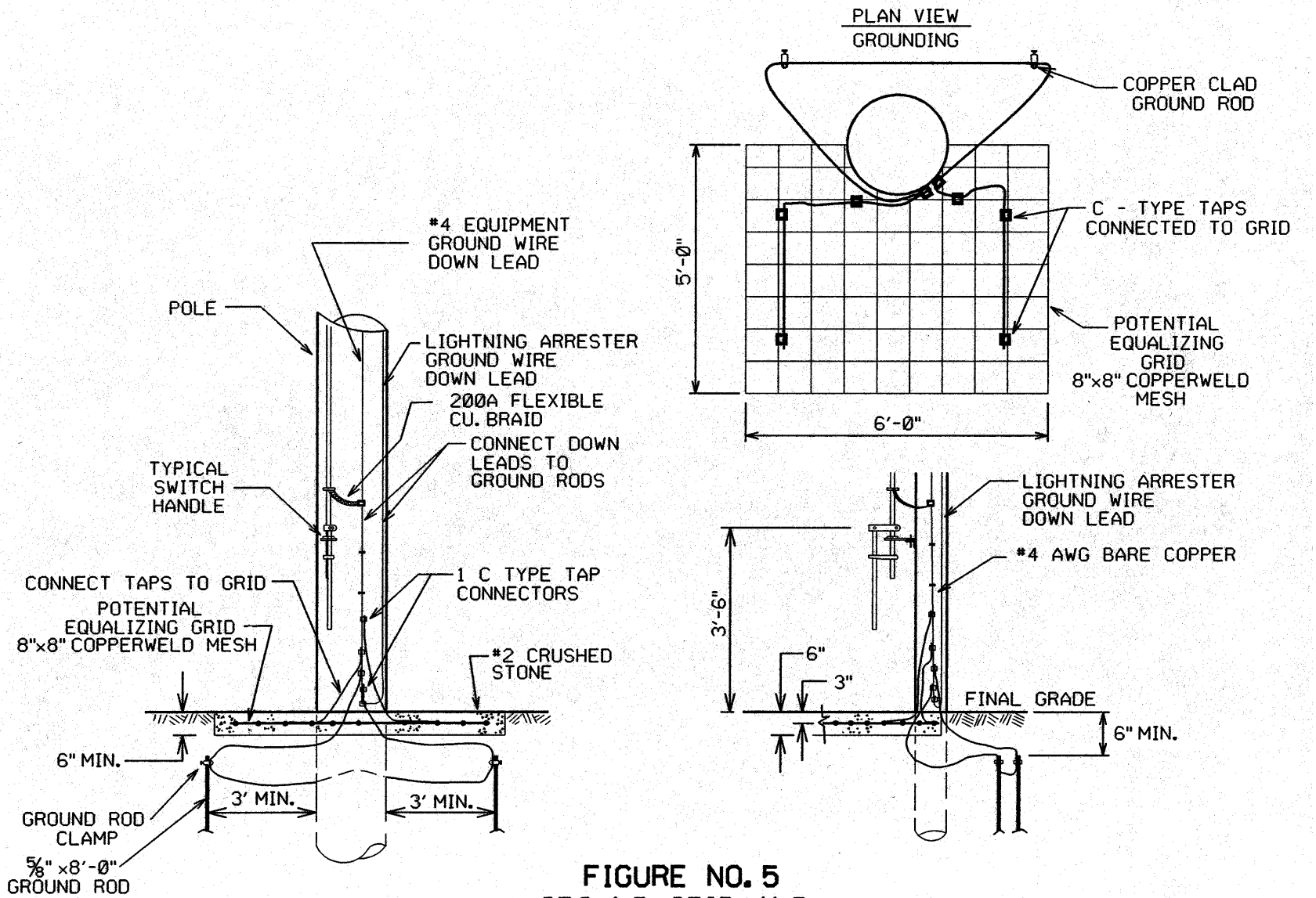


FIGURE NO. 5
GROUND GRID AND
SWITCH HANDLE GROUNDING

Preferred Nominal System Voltage	2400V 4160V 4800V 7200V 4.8/8.32kV 7.62/13.2kV	12kV 13.2kV
BIL	**95kV**	**110kV**
Max. kV Rating	**8.25**	**15.5**
Centerline-to-Centerline Spacing of Buses	18"	2'-0"
Clearance Between Live Parts — **Recommended**	12"	18"
Clearance Between Live Parts — **Minimum**	7"	12"
Clearance from Live Parts to Ground — **Recommended**	8"	10"
Clearance from Live Parts to Ground — **Minimum**	6"	7"
Min. Clearance to Unguarded Live Parts for Personnel On Foot — **Vertical**	9'-0"	9'-6"
Min. Clearance to Unguarded Live Parts for Personnel On Foot — **Horizontal**	3'-4"	3'-6"
Min. Spacing of Horn Gap Switches **With** Arc Extinguishing Device — **Phase-to-Phase**	18"	2'-0"
Min. Spacing of Horn Gap Switches **With** Arc Extinguishing Device — **Phase-to-Ground**	8"	10"
Min. Spacing of Horn Gap Switches **Without** Arc Extinguishing Device — **Phase-to-Phase**	3'-0"	3'-0"
Min. Spacing of Horn Gap Switches **Without** Arc Extinguishing Device — **Phase-to-Ground**	2'-0"	2'-0"
Minimum Vertical Clearance to Unguarded Live Parts for Vehicular Traffic	22'-0"	
Min. Safety Clearance to Nearby Structures	10'-0"	10'-2"

OUTDOOR ELECTRICAL CLEARANCES - FIGURE 6