

# Service Entrance Grounding and Bonding Diagrams

*Prepared by*

The Southwestern Section  
International Association of Electrical Inspectors  
2002 Grounding and Bonding Committee

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Ron Takiguchi, P.E.                          Tom Trainor

Gerald Williams

## Based on the 2002 National Electrical Code

These diagrams are intended to illustrate typical grounding and bonding requirements but are not intended to show the only acceptable grounding and bonding methods.



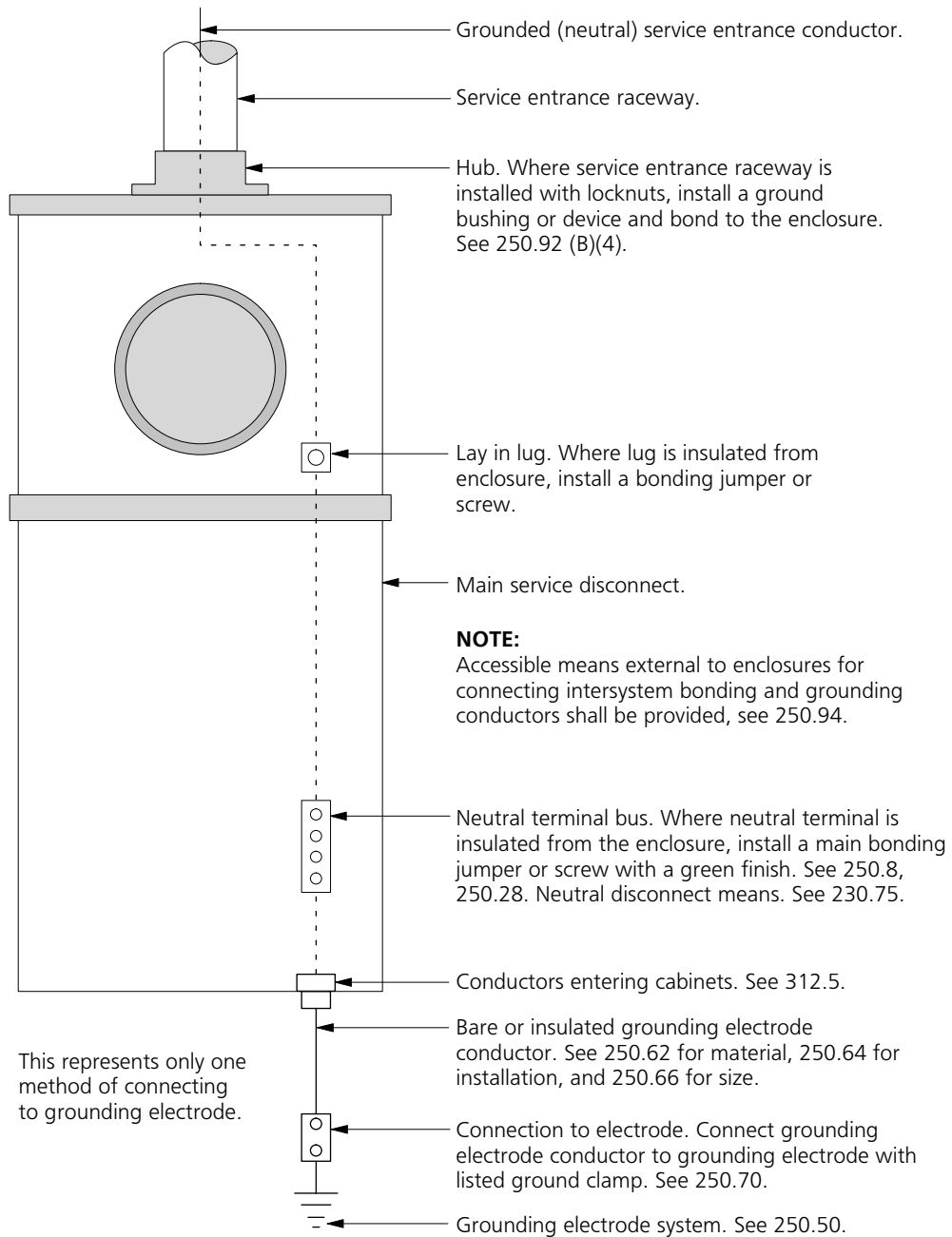
The Purpose of the I.A.E.I.

The objective of the I.A.E.I. shall be:

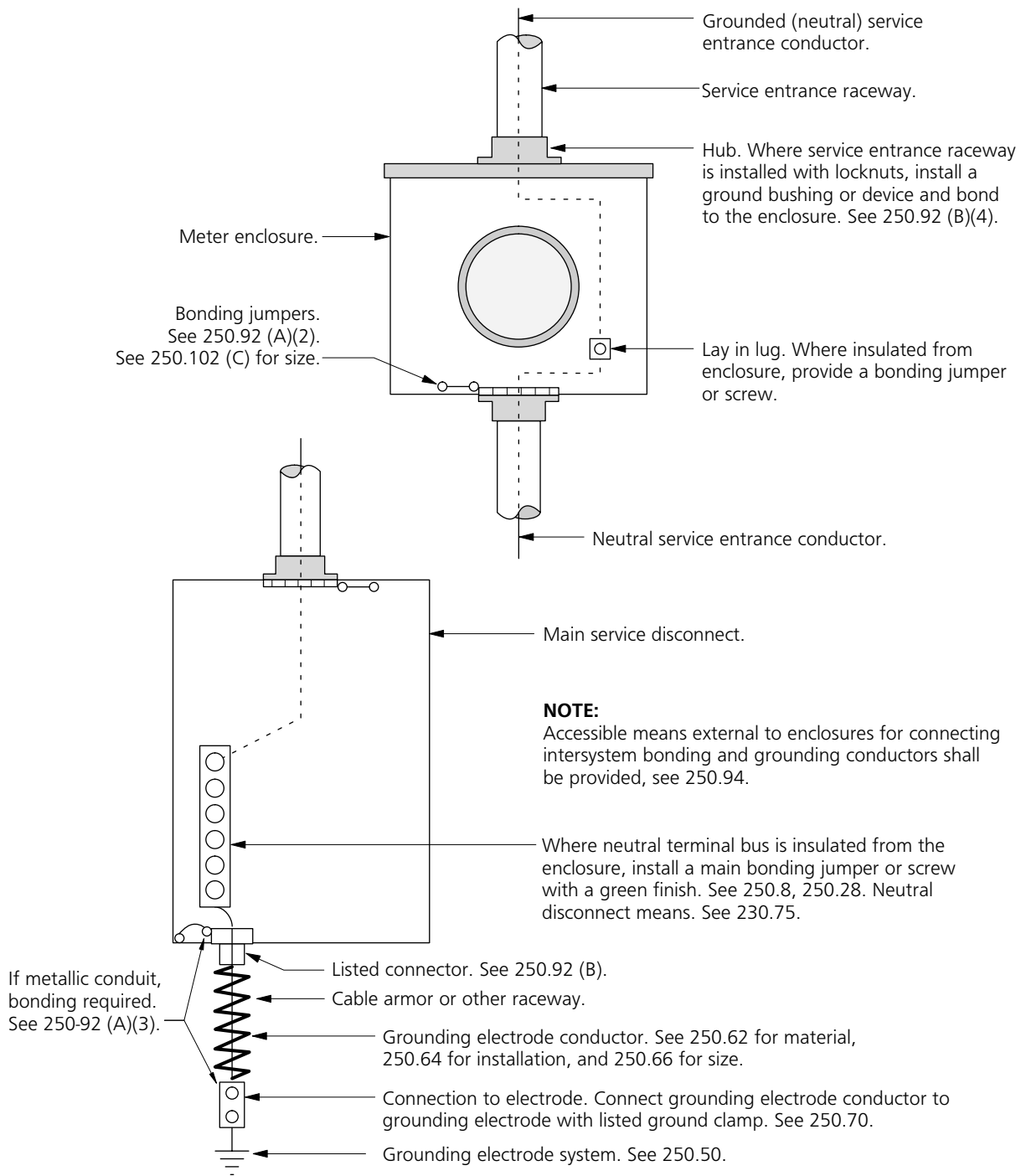
- To cooperate in the formulation of standards for the safe installation and use of electrical materials, devices, and appliances.
- To promote the uniform understanding and application of the National Electric Code and other electrical codes.
- To promote cooperation between inspectors, the electrical industry, and the public.
- To collect and disseminate information relative to the safe use of electricity.
- To represent the electrical inspectors in all matters which are dealt with nationally and internationally by the electrical industry.
- To cooperate with other national and international organizations in furthering the development of the electrical industry.



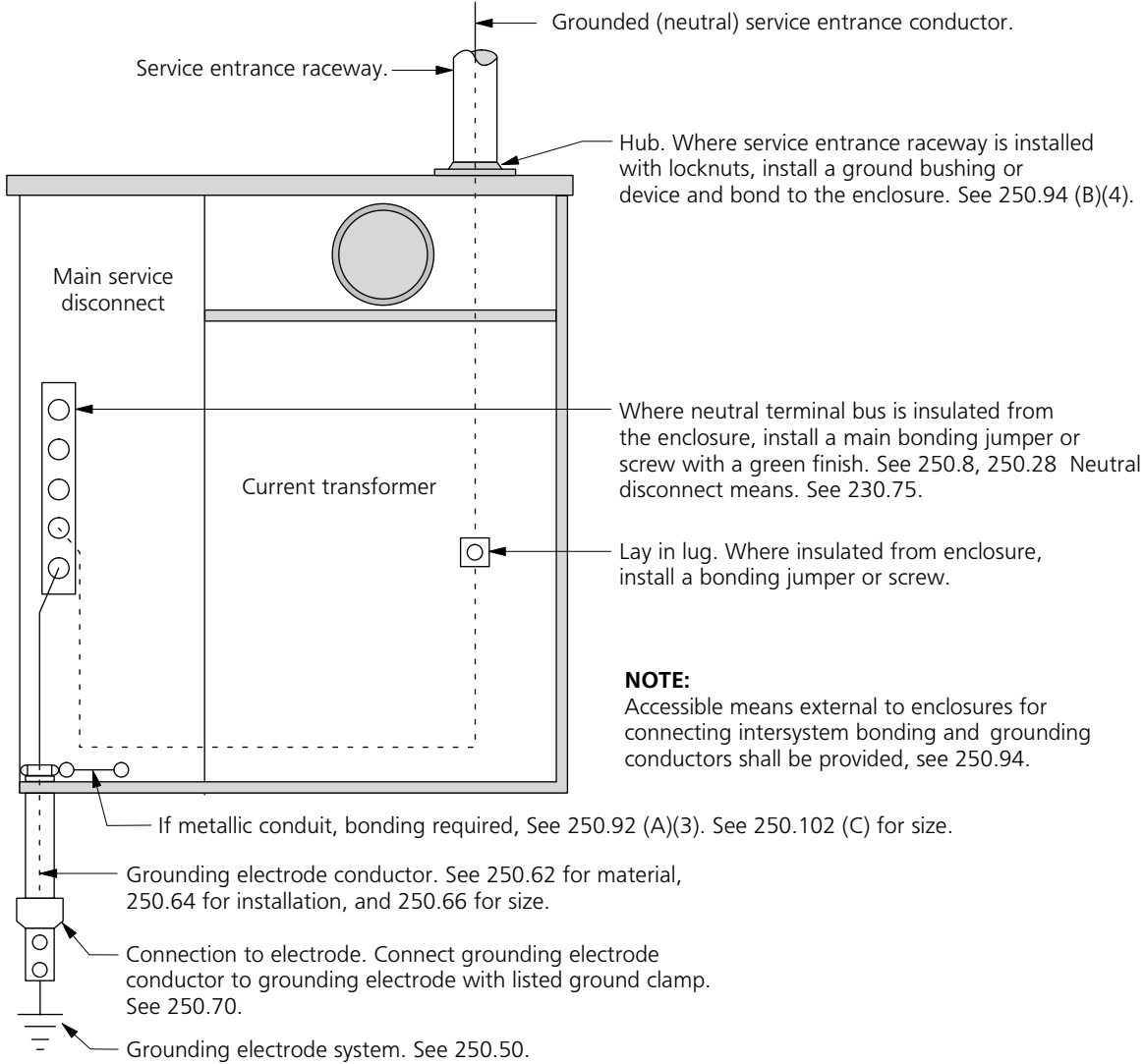
## COMBINATION METER AND SERVICE SECTION FOR OVERHEAD DWELLING SERVICE



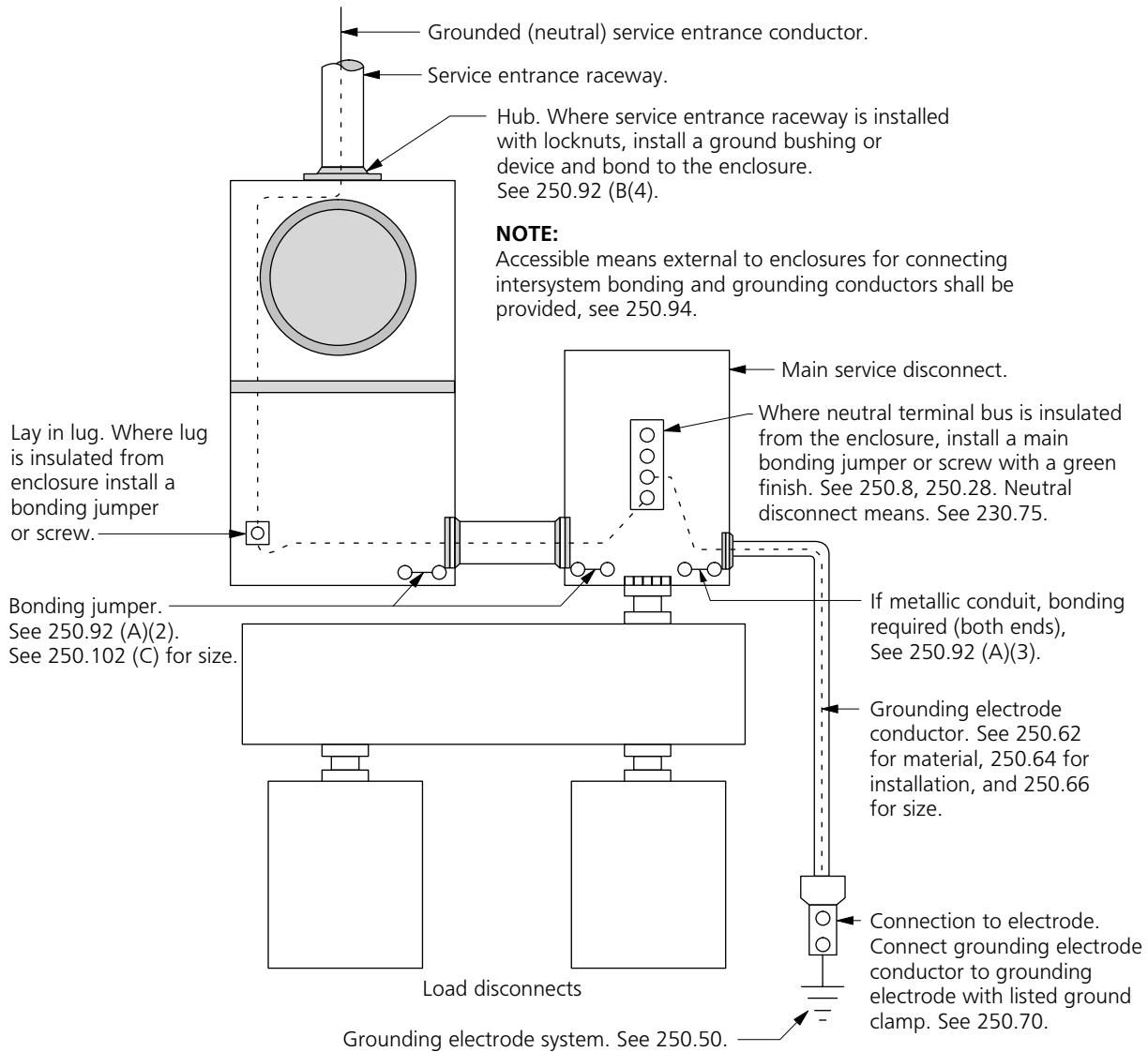
## METER REMOTE FROM SERVICE SECTION FOR OVERHEAD DWELLING SERVICE



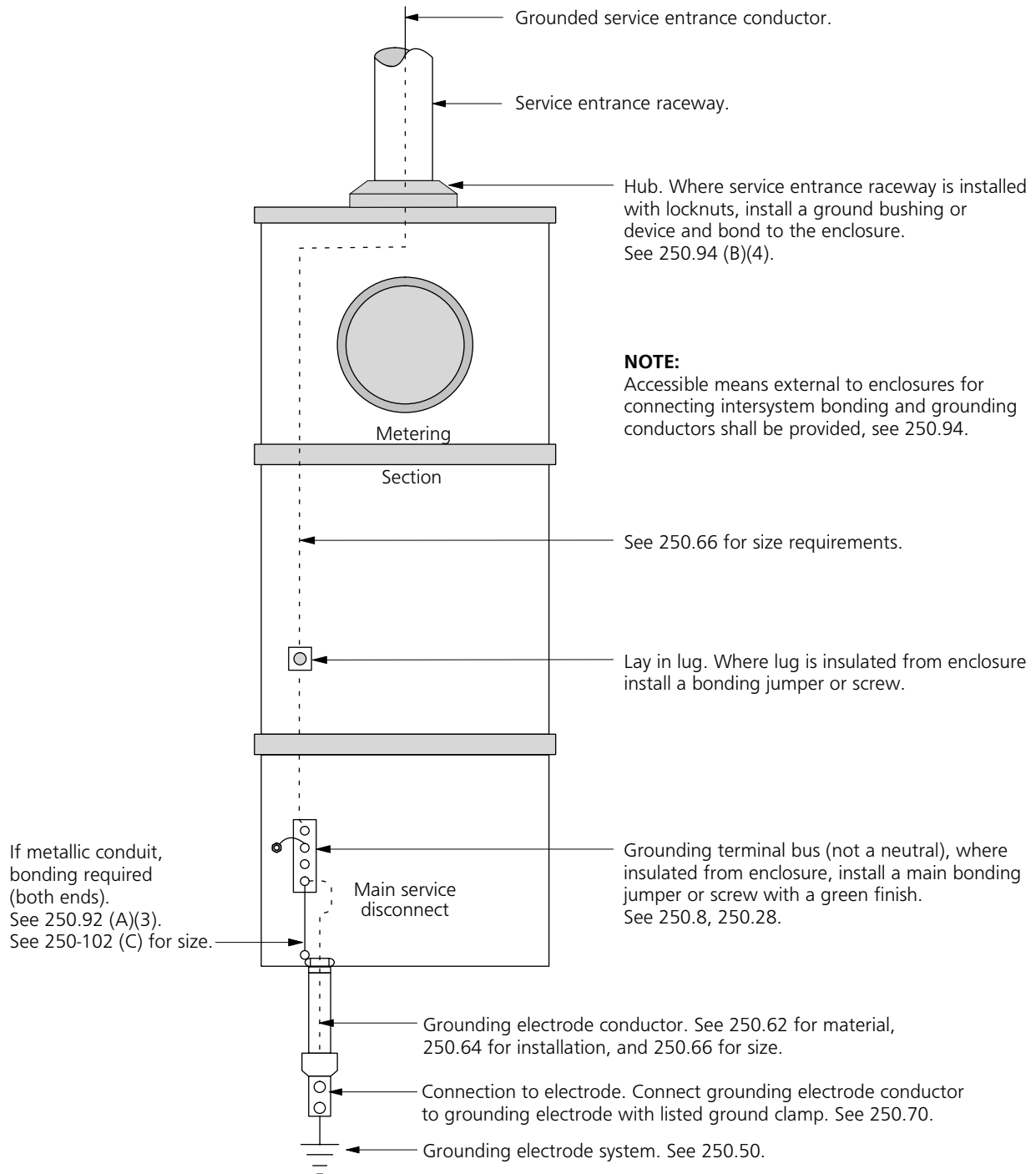
**METER AND SERVICE WITH  
CURRENT TRANSFORMER ENCLOSURE  
OVERHEAD SUPPLY**



**SINGLE-METER COMMERCIAL SERVICE  
WITH A NEUTRAL  
(WHERE A MAIN DISCONNECTING MEANS IS REQUIRED)**

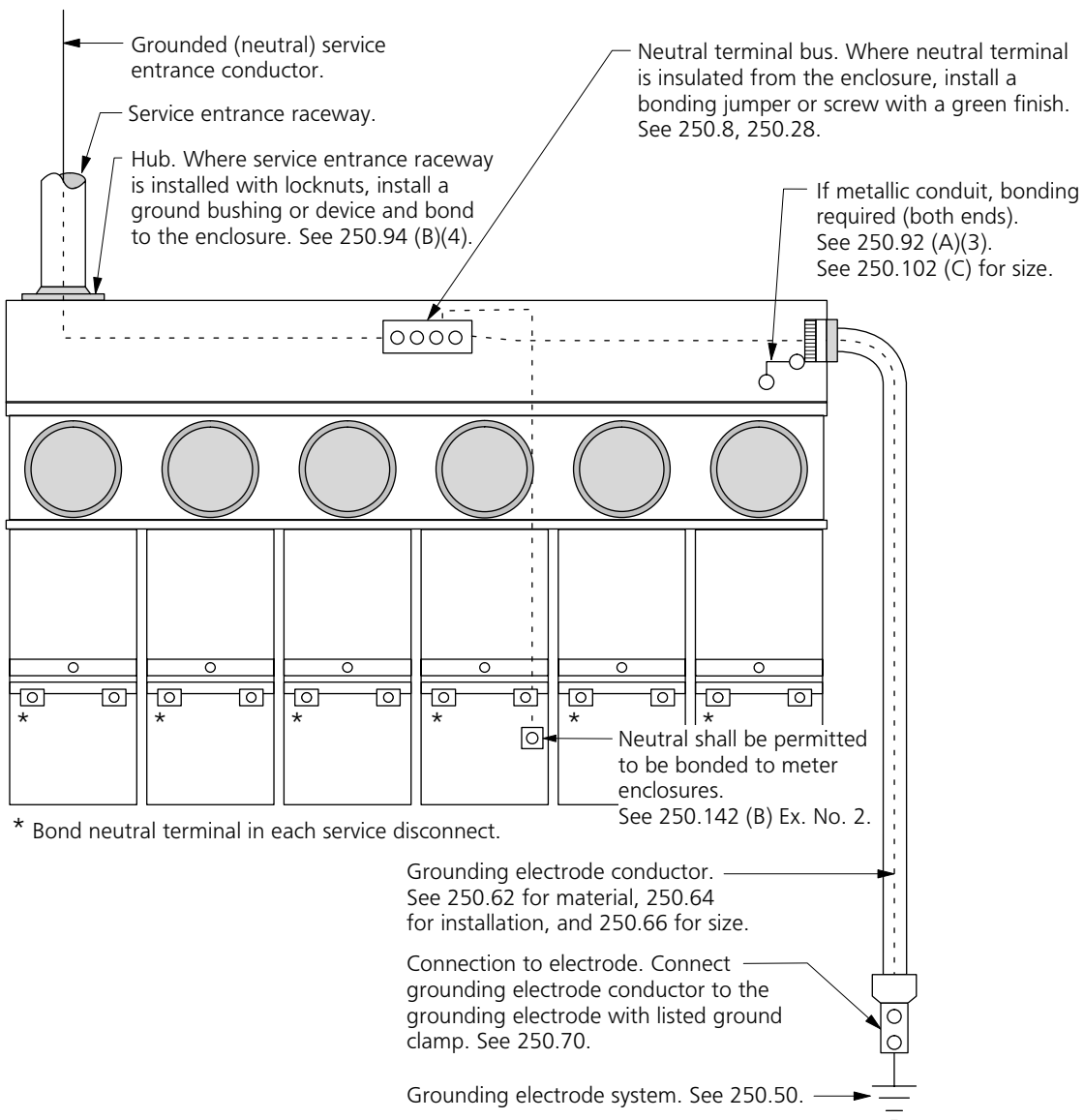


### THREE-PHASE, THREE-WIRE DELTA SERVICE WITH ADDED GROUNDING CONDUCTOR<sup>1</sup> (CORNER GROUND DELTA)



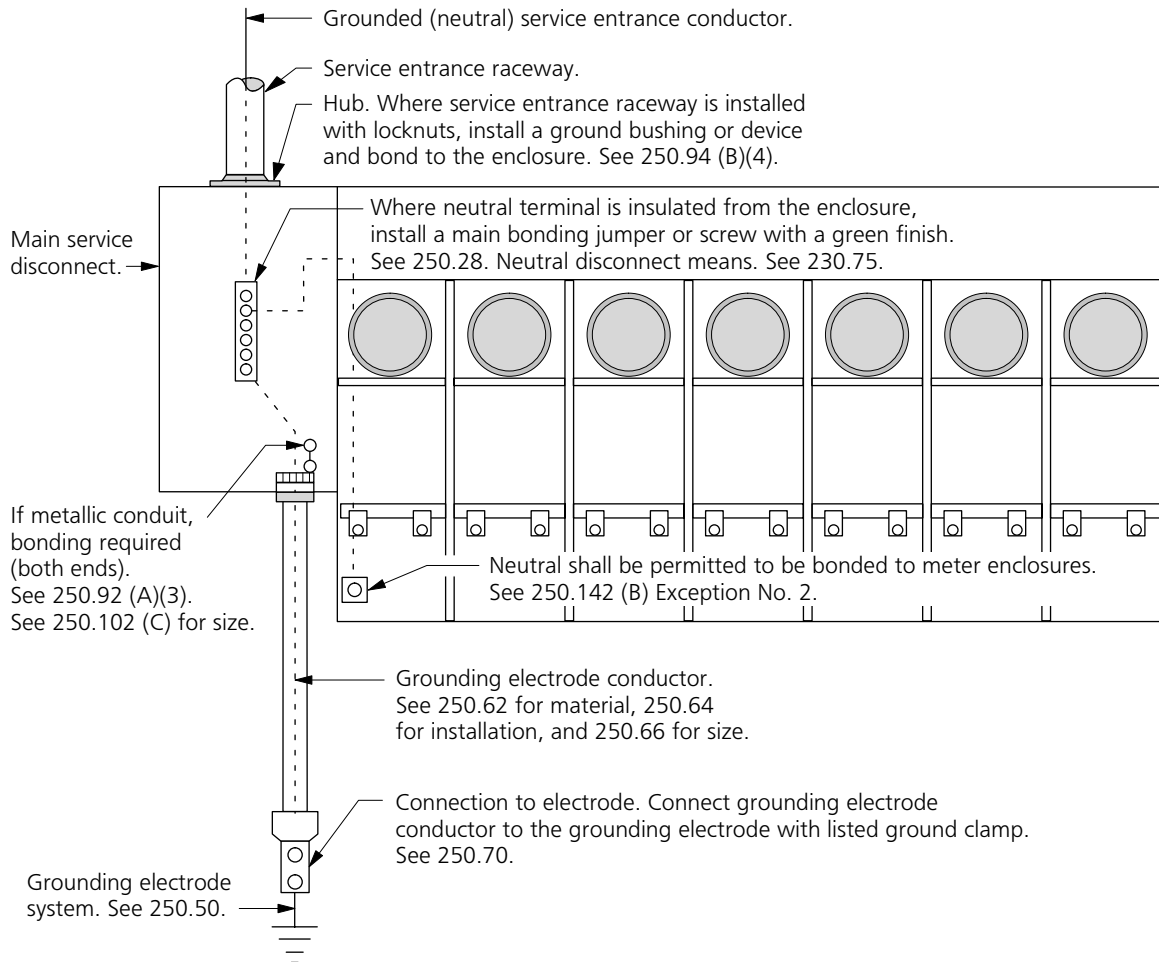
<sup>1/</sup> Serving utility MUST be consulted for service transformer connections and transformer grounding to determine appropriate equipment ratings/application.

**COMMERCIAL SERVICE  
OVERHEAD SUPPLY  
SIX SUBDIVISIONS OR LESS**



**NOTE:**  
Accessible means external to enclosures for connecting intersystem bonding and grounding conductors shall be provided, see 250.94.

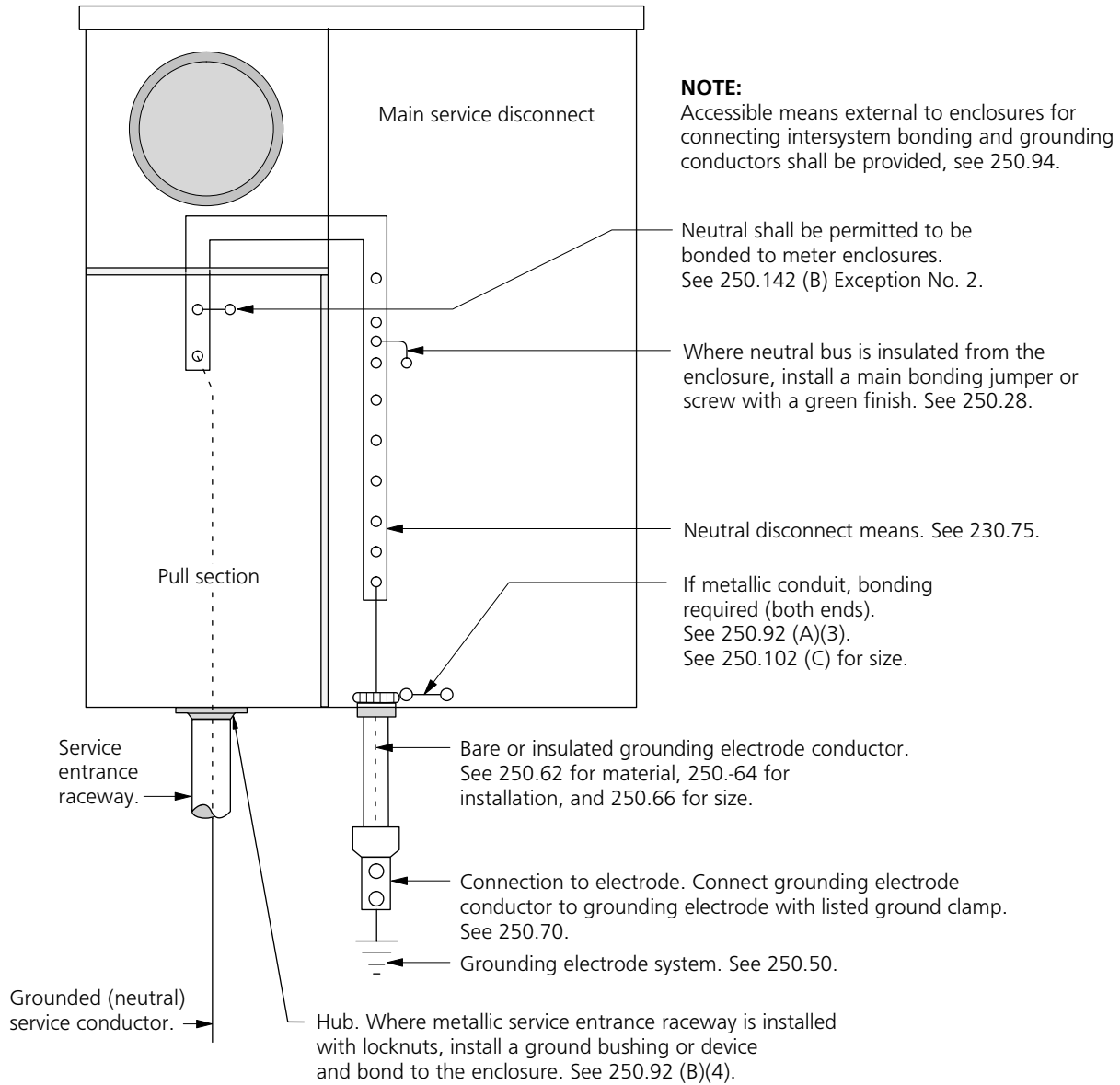
**COMMERCIAL SERVICE  
OVERHEAD SUPPLY  
MORE THAN SIX SUBDIVISIONS OF SERVICE**



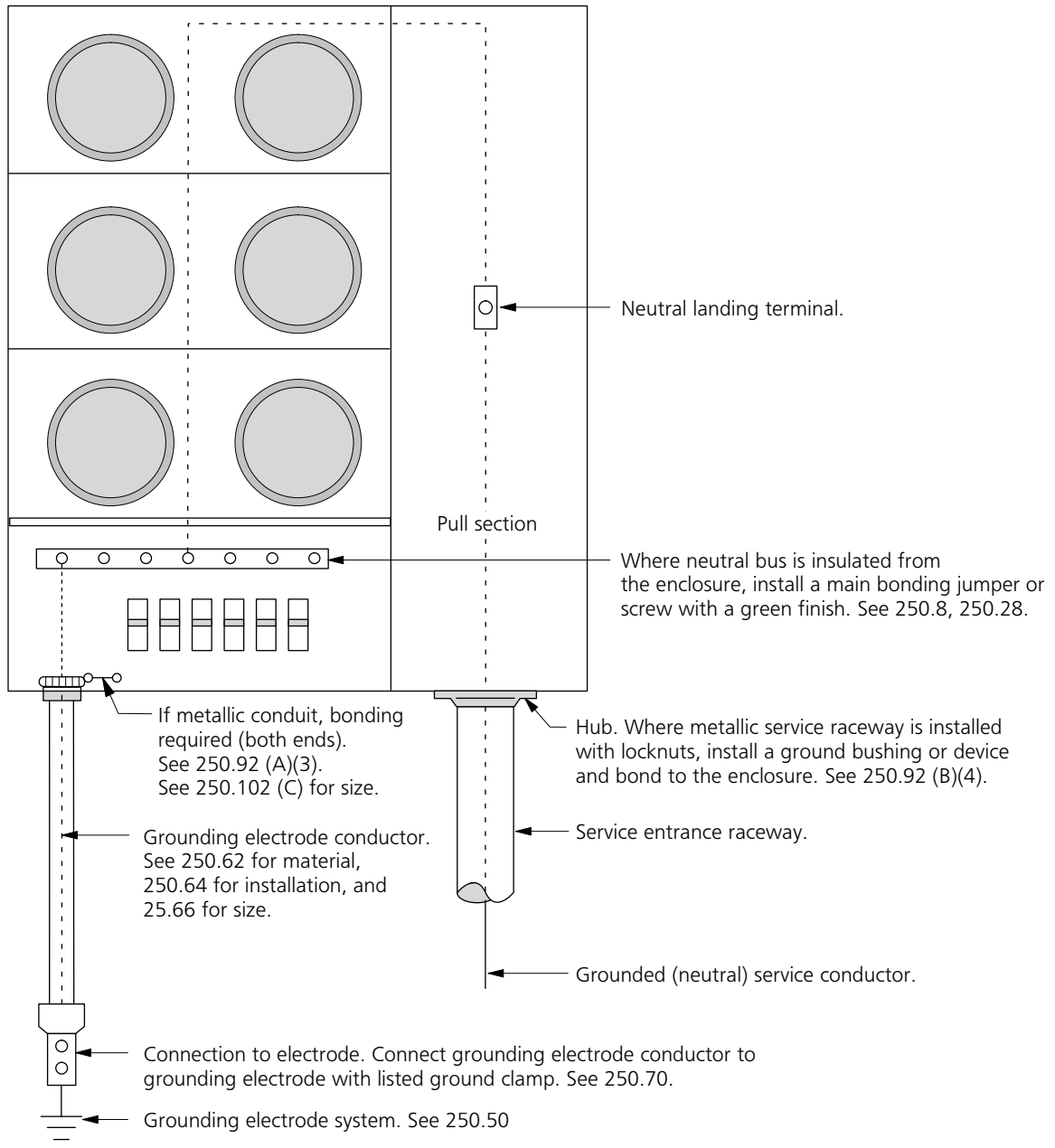
**NOTE:**

Accessible means external to enclosures for connecting intersystem bonding and grounding conductors shall be provided, see 250.94.

## COMBINATION METER AND SERVICE FOR UNDERGROUND DWELLING SERVICE



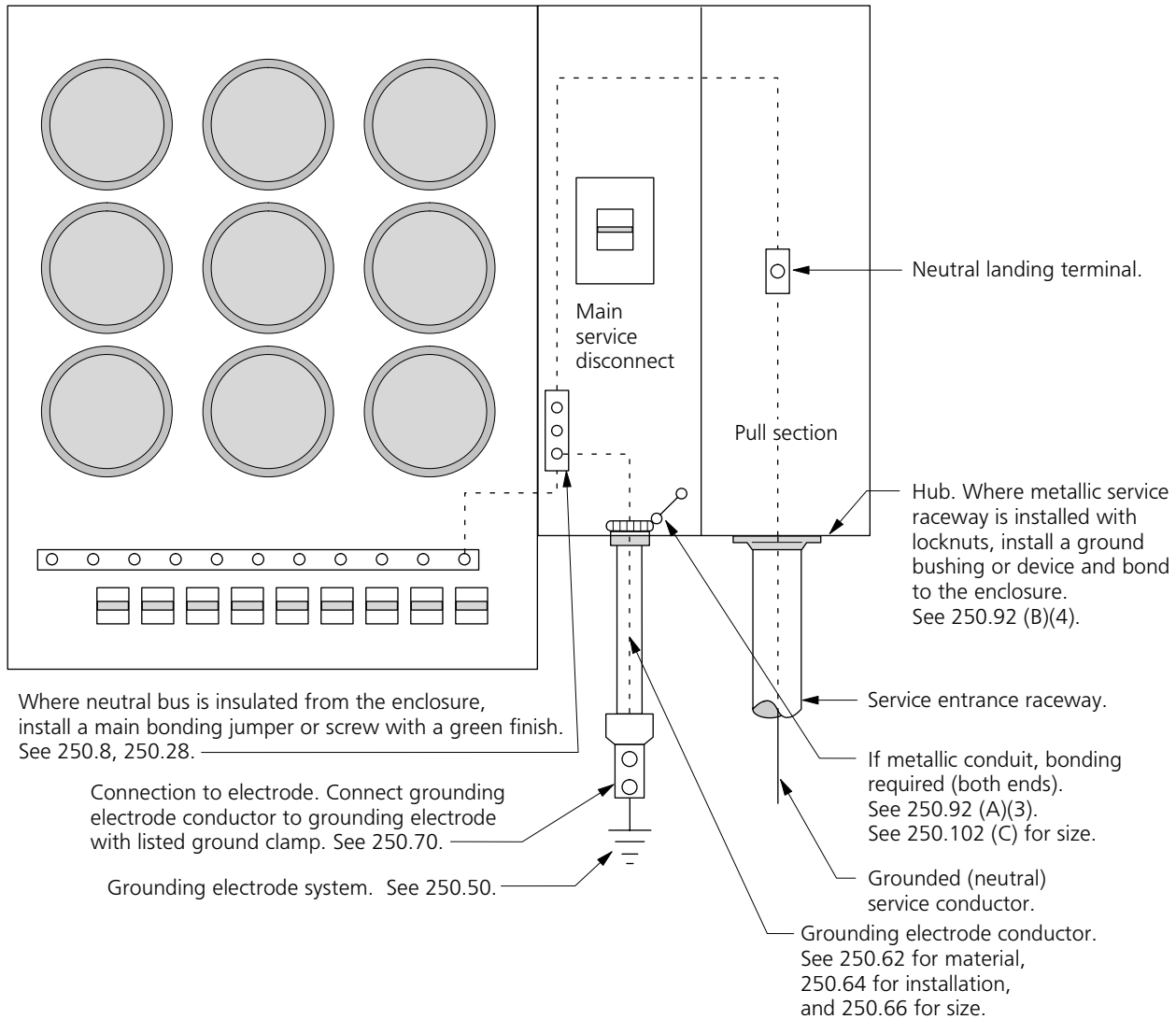
**COMBINATION METER AND SERVICE FOR  
UNDERGROUND MULTI-FAMILY DWELLING SERVICE  
SIX SUBDIVISIONS OF SERVICE OR LESS**



**NOTE:**

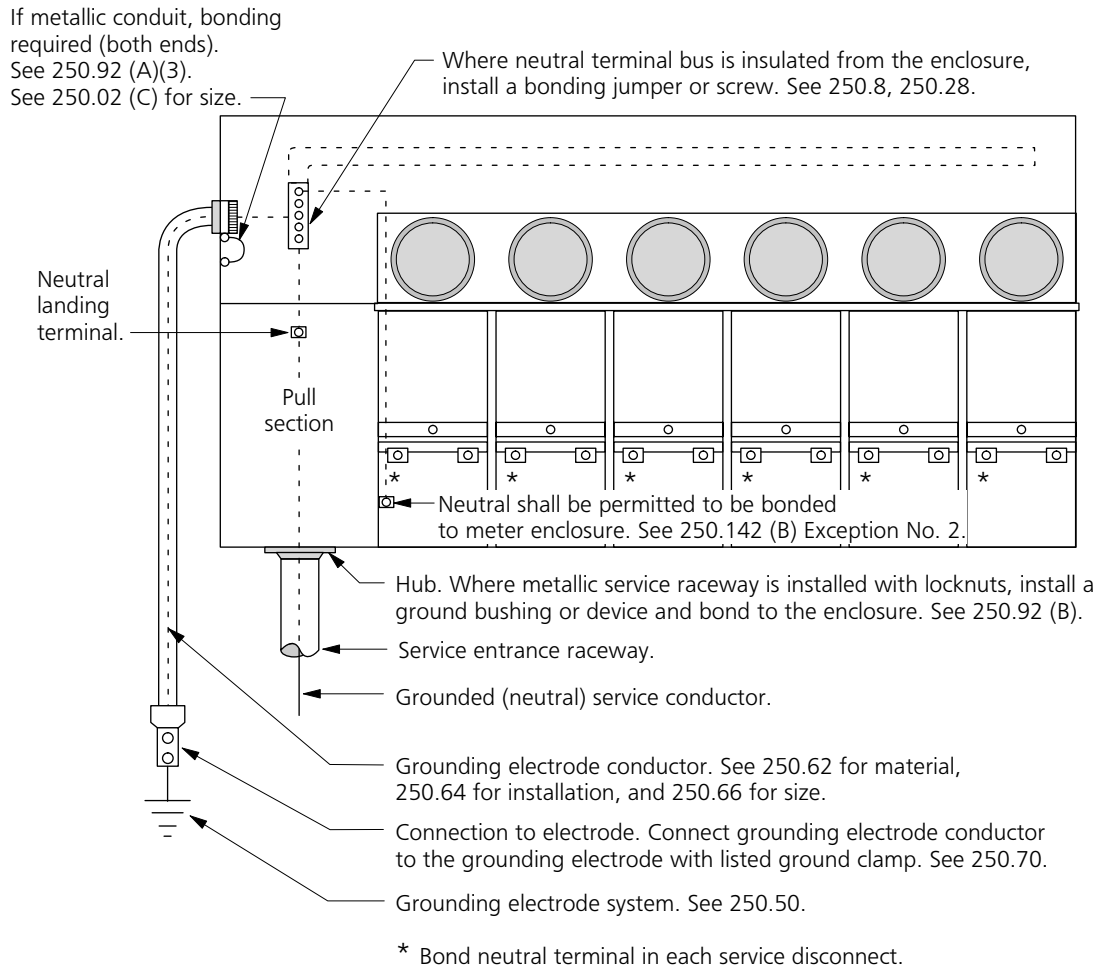
Accessible means external to enclosures for connecting intersystem bonding and grounding conductors shall be provided, see 250.94.

**COMBINATION METER AND SERVICE FOR  
UNDERGROUND MULTI-FAMILY DWELLING SERVICE  
MORE THAN SIX SUBDIVISIONS**



**NOTE:**  
Accessible means external to enclosures for connecting intersystem bonding and grounding conductors shall be provided, see 250.94.

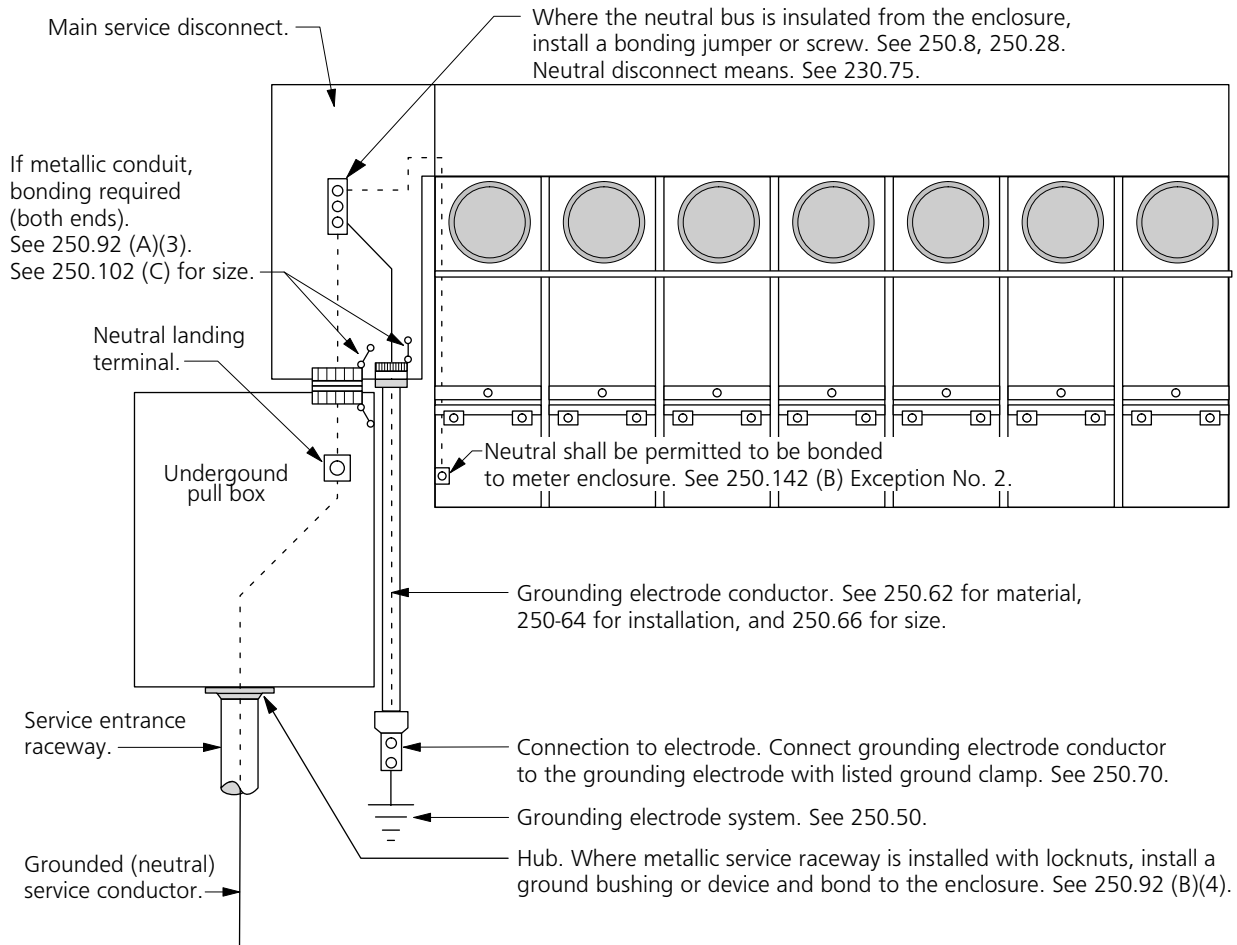
**COMBINATION METER AND SERVICE FOR  
UNDERGROUND COMMERCIAL SERVICE  
SIX SUBDIVISIONS OR LESS**



**NOTE:**

Accessible means external to enclosures for connecting intersystem bonding and grounding conductors shall be provided, see 250.94.

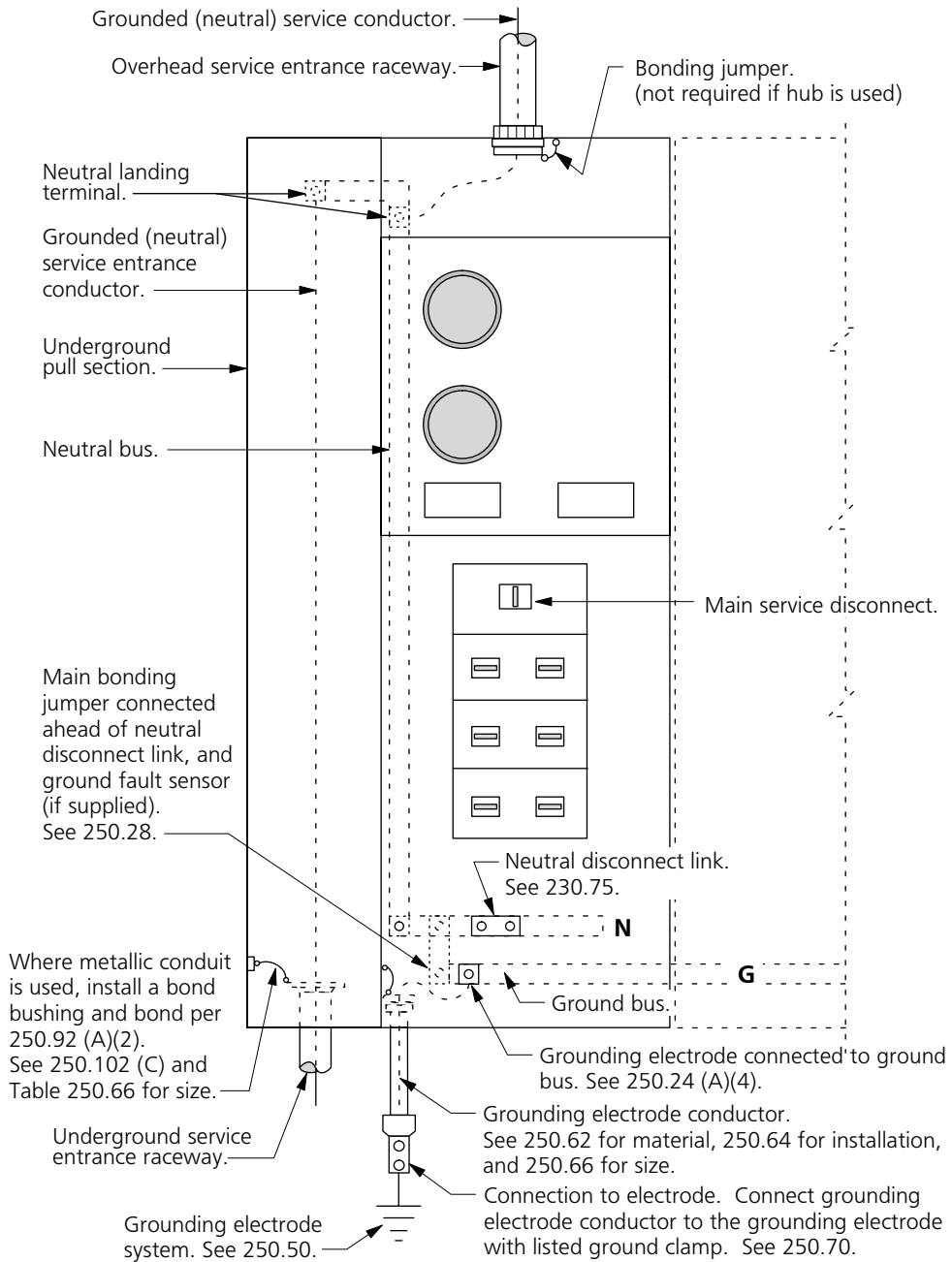
## COMBINATION METER AND SERVICE FOR UNDERGROUND COMMERCIAL SERVICE MORE THAN SIX SUBDIVISIONS OF SERVICE



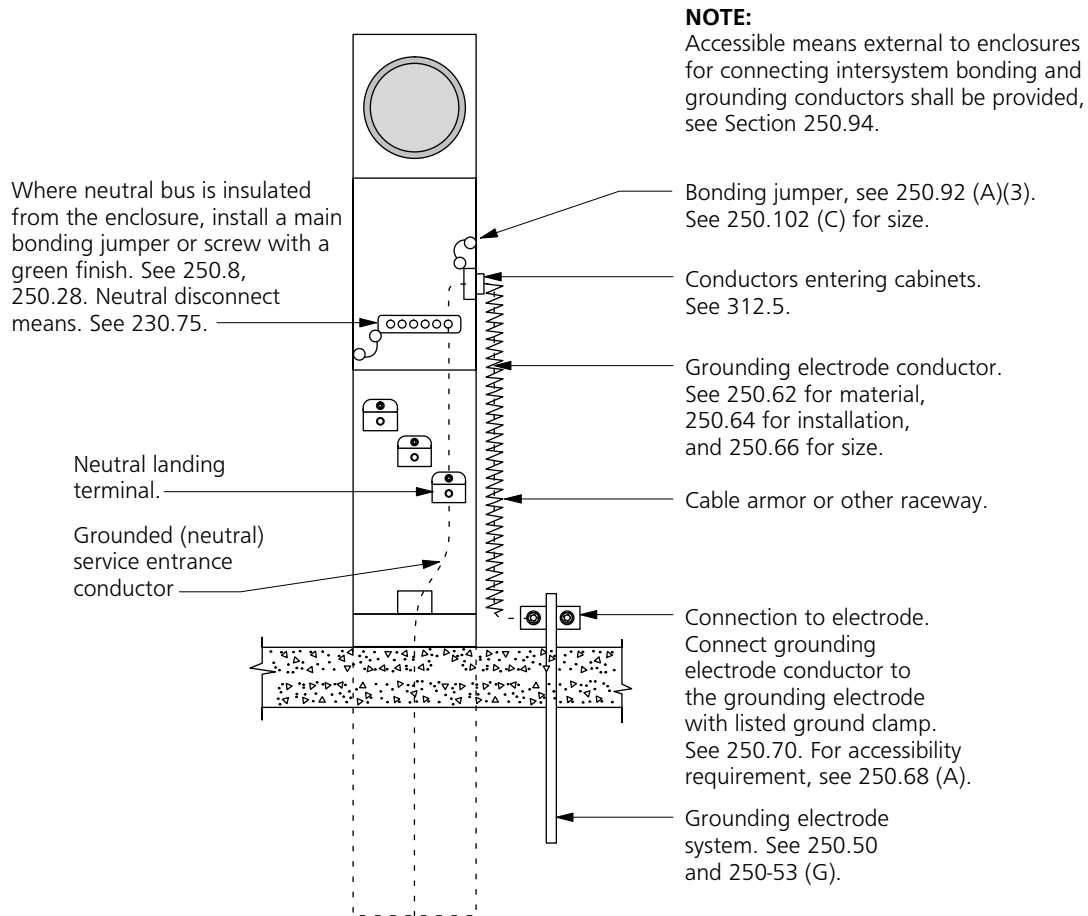
**NOTE:**

Accessible means external to enclosures for connecting intersystem bonding and grounding conductors shall be provided, see 250.94.

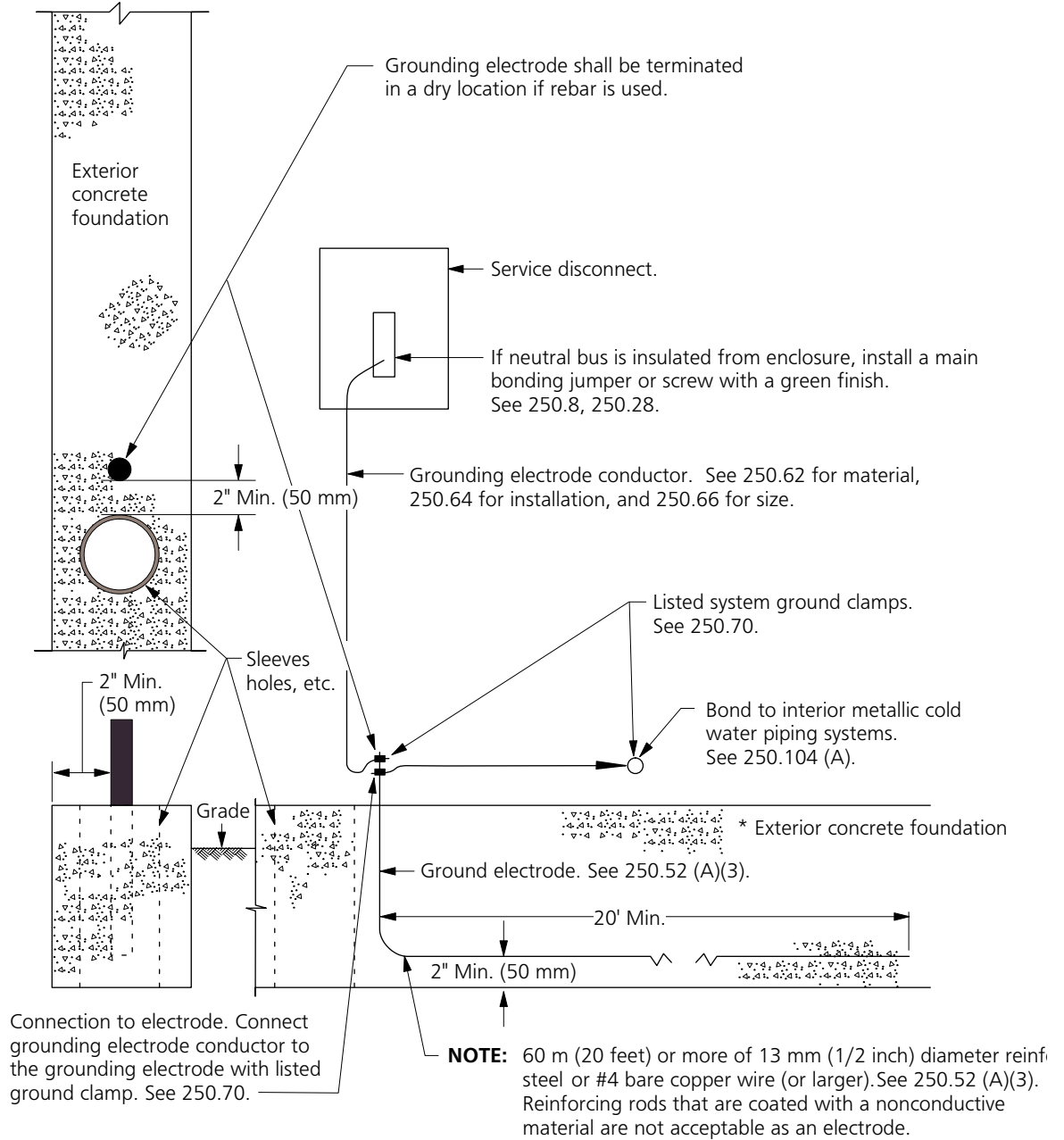
## SWITCHBOARD SERVICE SECTION



## UNDERGROUND SERVICE POST



## CONCRETE-ENCASED ELECTRODE (UFER GROUND)



2002 NEC

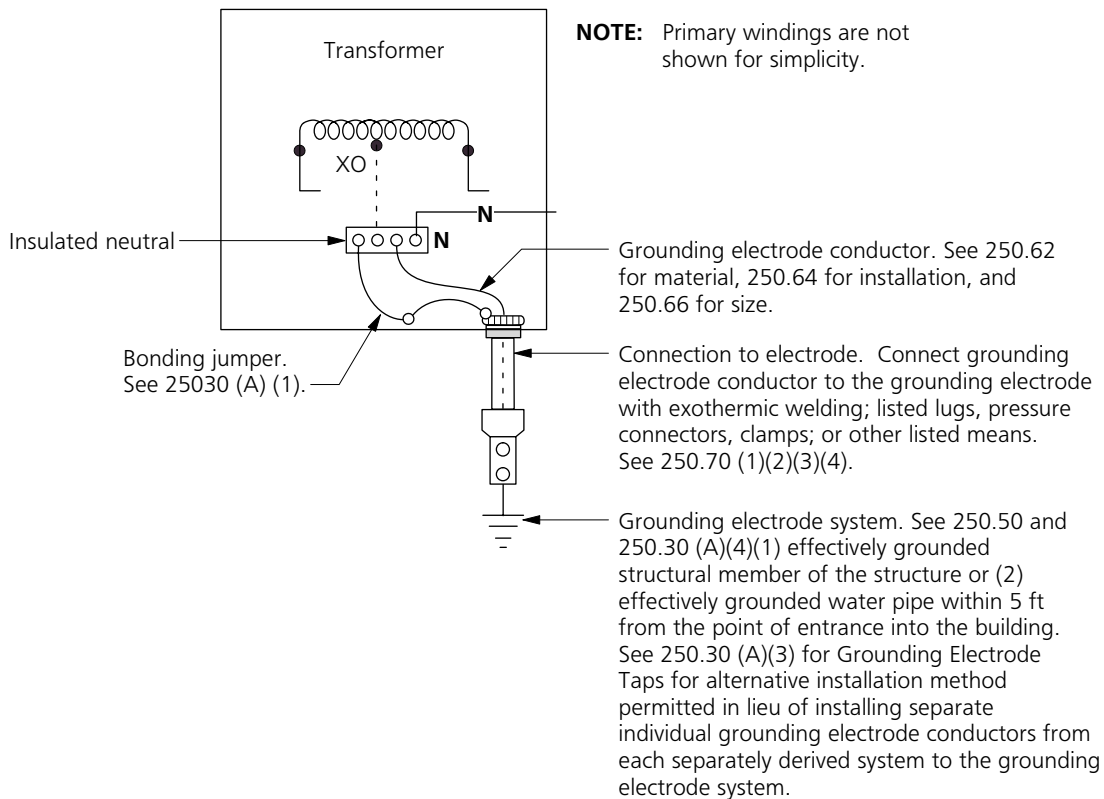
Service Entrance Grounding and Bonding Diagrams

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by IAEI Southwestern Section, Southern California Chapter

**SEPARATELY DERIVED SYSTEM  
GROUNDING AND BONDING  
(CUSTOMER'S TRANSFORMER)**

**Single Phase**

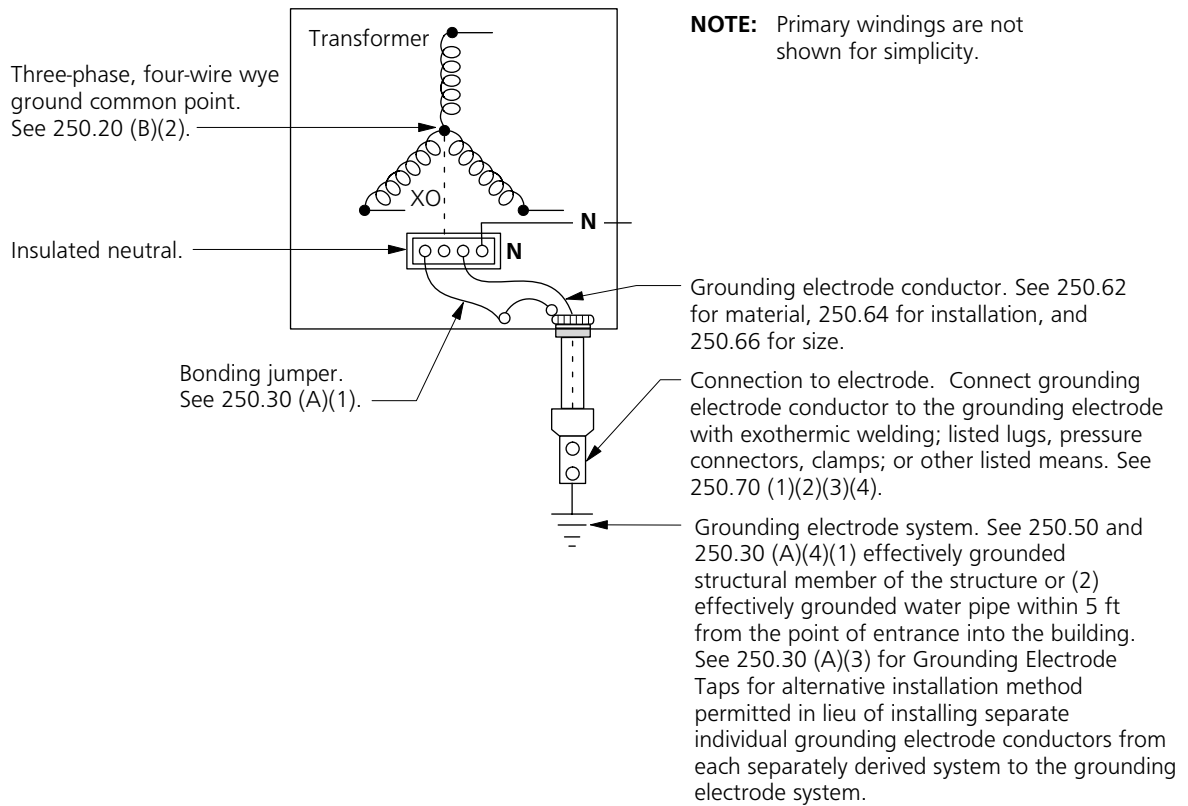


**NOTES:**

1. Primary winding are not shown for simplicity.
2. Grounding and bonding connection as shown above are permitted to be made at any point between the transformer secondary and the first disconnecting means. See 250.30 (A) (1) and (2). Exception No. 1 permits bonding at both source and first disconnecting means if no parallel path is established for grounded circuit conductor. Earth is not considered a parallel path.

**SEPARATELY DERIVED SYSTEM  
GROUNDING AND BONDING  
(CUSTOMER'S TRANSFORMER)**

**Three Phase Four Wire Wye**

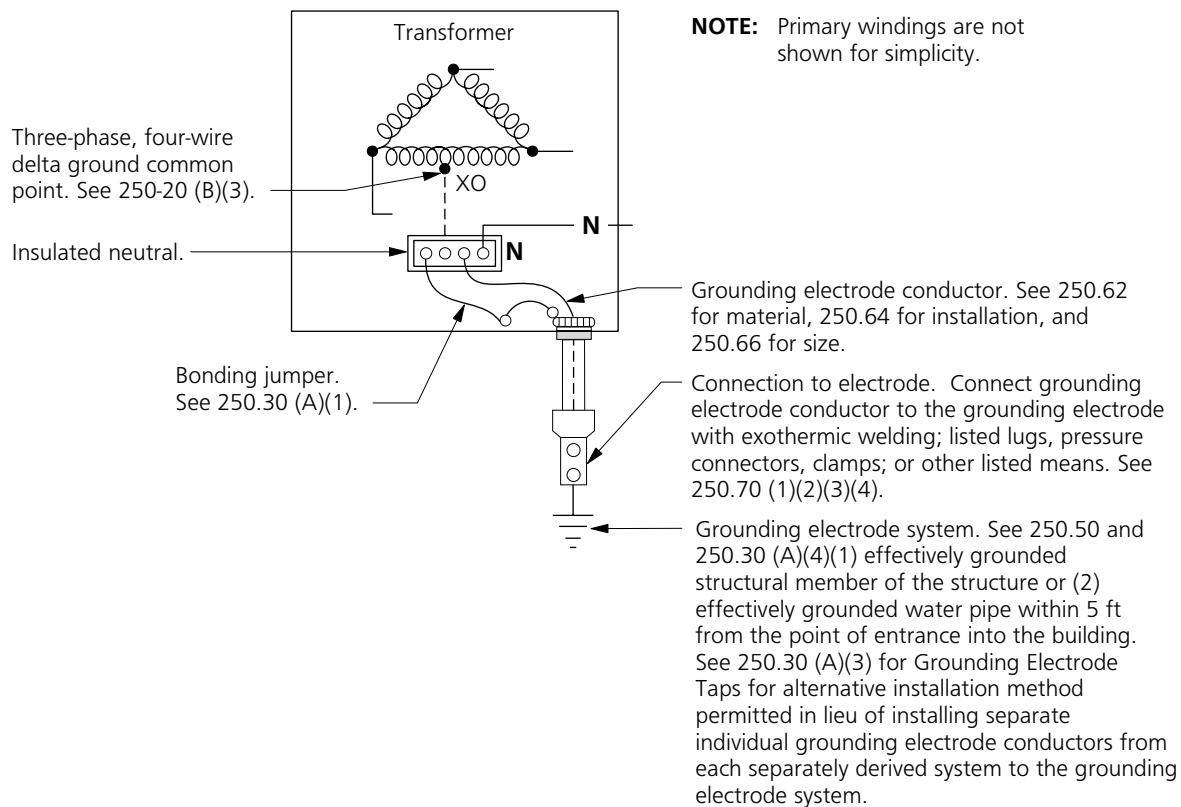


**NOTES:**

1. Primary windings are not shown for simplicity.
2. Grounding & bonding connections as shown above are permitted to be made at any point between the transformer secondary and the first disconnecting means. See 250-30 (a) (1) & (2). Exception No.1 permits bonding at both source and first disconnecting means if no parallel path is established for grounded circuit conductor. Earth is not considered a parallel path.

**SEPARATELY DERIVED SYSTEM  
GROUNDING AND BONDING  
(CUSTOMER'S TRANSFORMER)**

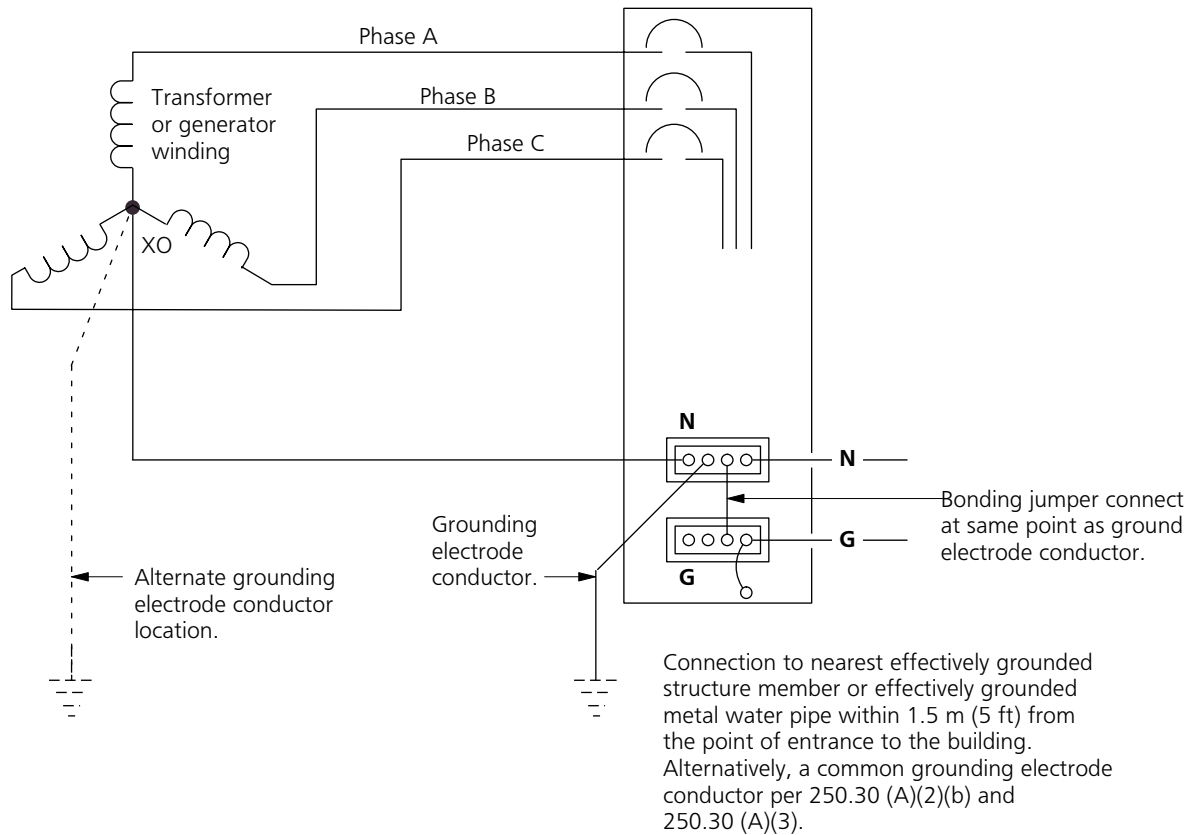
**Three Phase Four Wire Delta**



**NOTES:**

1. Primary windings are not shown for simplicity.
2. Grounding & bonding connections as shown above are permitted to be made at any point between the transformer secondary and the first disconnecting means. See 250.30 (A)(1) & (2). Exception No.1 permits bonding at both source and first disconnecting means if no parallel path is established for grounded circuit conductor. Earth is not considered a parallel path.

## SEPARATELY DERIVED SYSTEM GROUNDING LOCATIONS



## HIGH-IMPEDANCE GROUNDED NEUTRAL SYSTEM, SECTION 250.36

All of conditions (1), (2), (3), and (4) must be met:

- (1) Qualified persons.
- (2) Continuity of power is required.
- (3) Ground detectors are installed.
- (4) No line-to-neutral loads are served.

