UL 414

STANDARD FOR SAFETY

Meter Sockets

UL Standard for Safety for Meter Sockets, UL 414

Ninth Edition, Dated January 5, 2016

SUMMARY OF TOPICS

This revision of ANSI/UL 414 dated March 1, 2024 includes the following changes in requirements:

– Location of conductive parts of meter socket adapters; SA2.1, SA2.3, SB2.2 and SB2.4

– Supplements SA and SB heating test updates; SA4.1.2, SB4.1, SB12.1.1 and SB12.1.7

– New Moment Test requirements; SA3.1, Section SA5A, SB11.1 and SB15.11

– New Supplement SC or Meter Socket Adapters with Branch Circuit Connections

Text that has been changed in any manner or impacted by ULSE's electronic publishing system is marked with a vertical line in the margin.

The new and revised requirements are substantially in accordance with Proposal(s) on this subject dated October 13, 2023 and January 19, 2024.

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UL 414

Standard for Meter Sockets

First Edition – October, 1957
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Ninth Edition

January 5, 2016

This ANSI/UL Standard for Safety consists of the Ninth Edition including revisions through March 1, 2024.

The most recent designation of ANSI/UL 414 as an American National Standard (ANSI) occurred on March 1, 2024. ANSI approval for a standard does not include the Cover Page, Transmittal Pages, and Title Page.

The Department of Defense (DoD) has adopted UL 414 on November 20, 1987. The publication of revised pages or a new edition of this Standard will not invalidate the DoD adoption.

Comments or proposals for revisions on any part of the Standard may be submitted to ULSE at any time. Proposals should be submitted via a Proposal Request in the Collaborative Standards Development System (CSDS) at https://csds.ul.com.

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INTRODUCTION

1 Scope

1.1 These requirements cover meter sockets for use with:

a) Watthour and similar meters;

b) Test switches;

c) Metering transformer cabinets; and

d) Metering transformer cabinet interiors

for installation in accordance with the National Electrical Code, NFPA 70.

1.2 Meter sockets are marked with a continuous duty ampere rating and may in addition have a maximum use (intermittent) ampere rating of 125 percent or less of the continuous duty ampere rating.

1.3 A meter socket, as covered by these requirements, is an assembly of wiring terminals and jaw type contacts for one or more plug-in watthour meters in an enclosure having provisions for securing the meter to the socket.

1.4 Some meter sockets may be housed in a metal pedestal enclosure intended for mounting on a concrete slab or in a metal post enclosure intended to be sunk in the ground with or without concrete poured around the post at ground level and either self-supported or intended for separate support. Such posts or pedestals are not intended to serve as the sole support of masts for overhead wiring.

1.5 Some meter sockets may be intended for mounting on a mounting post or pedestal for distribution equipment.

1.6 Except as indicated in 1.10, as covered by these requirements, a meter socket does not include:

a) A meter,

b) An overcurrent device,

c) An instrument transformer,

d) An arcing or switching part, or

e) A similar component.

A meter socket does not have provision for installation of instrument transformers within the meter socket enclosure.

1.7 These requirements cover meter sockets rated:

a) 300 volts alternating current or less, or 600 volts alternating current and

b) 400 amperes maximum per meter position.

1.8 These requirements cover metering transformer cabinets and metering transformer cabinet interiors rated maximum 6000 amperes at maximum 600 volts.

1.9 As covered by these requirements, a metering transformer cabinet or metering transformer cabinet interior does not include the current transformers.

1.10 This Standard contains requirements in Supplement SA that cover meter socket adapters and Supplement SB, that covers meter socket adapters with provisions for connection of distributed generation equipment, that may contain overcurrent protection.

2 General

2.1 Components

2.1.1 Except as indicated in 2.1.2, a component of a product covered by this standard shall comply with the requirements for that component. See Appendix A for a list of standards covering components generally used in the products covered by this standard.

2.1.2 A component is not required to comply with a specific requirement that:

a) Involves a feature or characteristic not required in the application of the component in the product covered by this standard, or

b) Is superseded by a requirement in this standard.

2.1.3 A component shall be used in accordance with its rating established for the intended conditions of use.

2.1.4 Specific components are incomplete in construction features or restricted in performance capabilities. Such components are intended for use only under limited conditions, such as certain temperatures not exceeding specified limits, and shall be used only under those specific conditions.

2.2 Units of measurement

2.2.1 Values stated without parentheses are the requirement. Values in parentheses are explanatory or approximate information.

2.2.2 Unless indicated otherwise, voltages and current values mentioned in this standard are root-mean-square (rms).

2.3 Undated references

2.3.1 Any undated reference to a code or standard appearing in the requirements of this standard shall be interpreted as referring to the latest edition of that code or standard.

ALL METER SOCKETS AND METERING TRANSFORMER CABINETS

CONSTRUCTION

3 General

3.1 Unless otherwise noted specifically in this standard, all parts shall be assembled in place when the equipment is shipped from the factory. Internal connections between factory installed components shall be completed.

3.2 If a meter socket, metering transformer cabinet, or metering transformer is intended for use with or without an accessory assembly, the accessory assembly need not be shipped from the factory with the product if:

a) The accessory assembly is shipped from the factory assembled as far as practicable, together with mounting screws, barriers, or the like, and installation instructions;

b) The assembly itself is complete and needs no parts to make it ready for installation; and

c) The accessory assembly is identified in accordance with 27.6.1 – 27.6.3.

3.3 For posts and pedestal type meter sockets, the requirements of Sections 29 – 40 apply in addition to the requirements for all meter sockets.

3.4 A meter socket provided with a circuit closer or disconnect shall be marked, as applicable, in accordance with 27.7.1 – 27.7.3.

4 Enclosure

4.1 An enclosure shall comply with the requirements of the Standard for Enclosures for Electrical Equipment, Non-Environmental Considerations, UL 50 and the Standard for Enclosures for Electrical Equipment, Environmental Considerations, UL 50E, unless modified by additional requirements as specifically described in this standard and shall be marked in accordance with 27.4.1.

4.2 In a cast metal enclosure intended for one meter, there may be an indication of location in the rear wall for an additional conduit connection. This indication may be in the form of a breakout with a reduced thickness to not less than 0.020 inch (0.51 mm), but shall not be a knockout nor shall it be for more than one size of conduit.

Exception: A concentric type breakout for a 1-1/4 inch trade size conduit and for one smaller trade size conduit may be provided in a cast metal enclosure.

4.3 Breakouts and knockouts shall be located so as not to result in interference with terminals or mounting screw holes or to cause reduction in minimum spacings when conduit fittings are in place.

4.4 In a single-meter sheet metal enclosure, a single non-concentric knockout may be located above the line of the lowest live part, provided the knockout, after formation is pushed back essentially flush with the wall.

4.5 In a single-meter enclosure a single concentric knockout may be located above the line of the lowest live part provided that such a knockout after formation is pushed back essentially flush with the wall. The concentric knockout shall also be subjected to the Concentric Knockout Rain Test, Section 18.

4.6 An external operating mechanism, such as for a disconnect, mounted on or through the enclosure shall withstand the environmental tests specified in the Standard for Enclosures for Electrical Equipment, Environmental Considerations, UL 50E, for the enclosure type marked in accordance with 27.4.1.

4.7 An enclosure not exceeding 185 square inches (1194 cm^2) frontal area may be formed of 0.060 inch (1.52 mm) thick aluminum, if the aluminum hardness is grade H14, and if a meter socket is provided, the distance from the edge of the meter opening does not exceed 5 inches (127 mm) to an unflanged edge nor 10 inches (254 mm) to a flanged edge.

4.8 The cover over a socket for an individual meter shall be secured to the assembly by at least two fastenings. A latch or overlapping flange shall be considered as a fastening.

4.9 If required for a specific need, such as to provide for latching, the overlap between the cover and box may be less than 1/2 inch (12.7 mm) but not less than 1/4 inch (6.4 mm). The length of the reduced overlap shall not exceed 1-1/2 inches (38.1 mm).

4.10 The enclosure socket shall be tight, and shall have no opening other than:

a) The opening necessary to accommodate a watthour meter.

b) Openings for hubs, latches, drainage, mounting, ventilation and such, only as specifically described in this standard.

c) If applicable, an open bottom to accommodate the entry of underground conductors as in a post or pedestal construction.

d) A special opening intended for connection to other equipment if marked as specified in 27.4.3, and if the construction complies with 4.18.

4.11 The enclosure of the equipment shall enclose all live parts.

Exception: This requirement does not apply to ventilating openings, an open bottom for underground conductors, and the like, or if an intended meter is not in place.

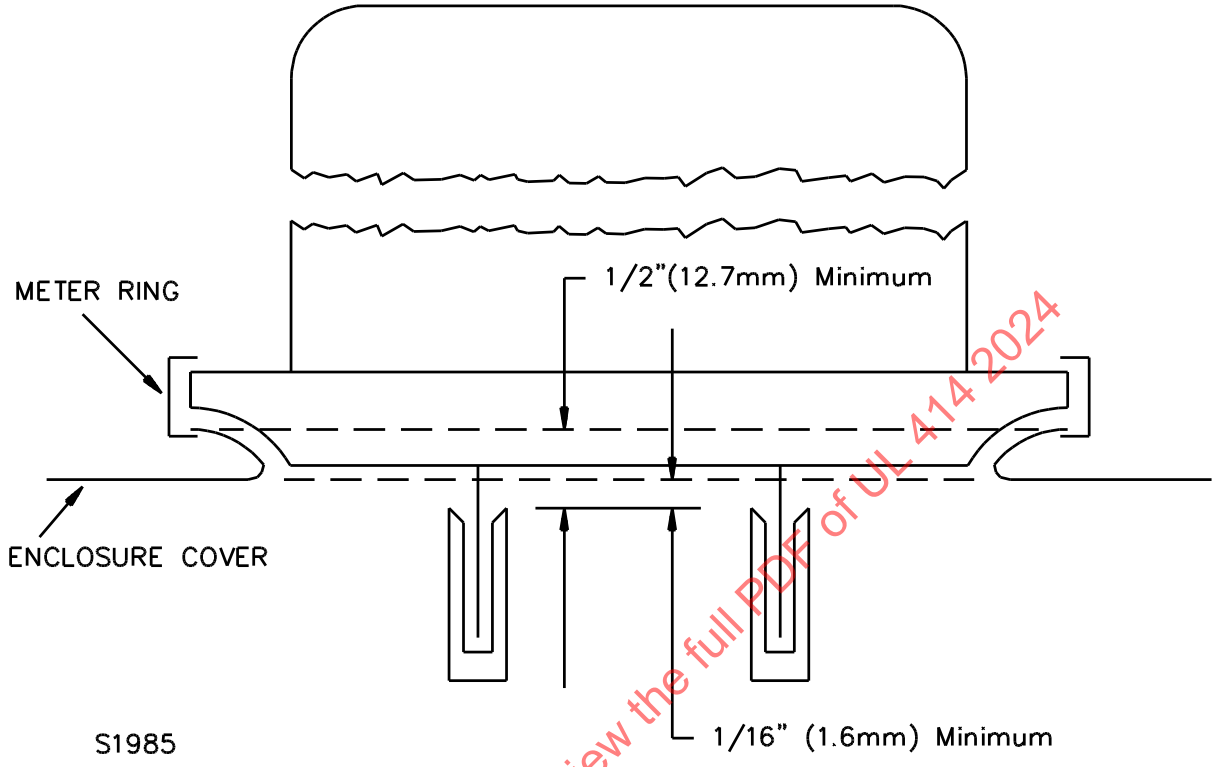
4.12 All live parts within a 3-inch (76.2-mm) radius of the center of the meter socket base shall be recessed not less than 1/2 inch (12.7 mm) behind the front plane of:

a) The meter mounting rim of a ring type meter socket as shown in Figure 4.1 or

b) The meter support of a ringless type meter socket.

Figure 4.1

Ring type meter socket



4.13 The construction of a ring type meter socket shall be such that removal of the cover necessitates a procedure tending to guide the cover clear of any uninsulated live part.

Exception: The guide or insulation of a live part is not required if the jaws or other live part of the meter socket are recessed at least 1/16 inch (1.6 mm) behind the front plane of the meter socket cover as shown in Figure 4.1.

4.14 In a meter socket intended to mount up to three meters and having up to three unit covers of flanged or flanged and offset overlap construction or other features intended to strengthen the assembly, the maximum length of an enclosure of 0.053 inch (1.35 mm) thick steel or 0.060 inch (1.52 mm) thick aluminum may exceed 24 inches (610 mm) but may not be greater than 30 inches (762 mm) provided that the width does not exceed 10 inches (254 mm) and the depth does not exceed 5 inches (127 mm).

4.15 If the performance of a meter socket depends on an operation applying clamping pressure to the jaws, it shall not be possible to complete the installation until the clamping pressure has been applied to the jaws. Completion of the installation is defined as follows:

a) For ringless type meter sockets, installation of the cover and

b) For ring type meter sockets, installation of the cover, meter, and sealing ring.

4.16 The diameter of the watthour meter opening in a ringless type meter socket shall not be less than 6.55 inches (166 mm).

4.17 An enclosure may be provided with removable ends or plates to facilitate ganging with other cooperating enclosures.

4.18 Equipment of the gangable type shall be provided with means to:

a) Ensure bonding continuity between adjacent enclosures.

b) Secure enclosures together by at least one fastening bolt for each joined edge not over 4 inches (102 mm) in length. For joints longer than 4 inches, fastenings shall be located not more than 1-1/2 inches (38.1 mm) from each end and not more than 6-1/2 inches (165 mm) apart.

c) Close the gap at the joint between enclosures with metal of the same gauge as required for the enclosure. There shall be an overlap of 1/2 inch (12.7 mm) on each side of the gap.

d) Close the end of an enclosure with an available fitting. Openings for fastenings shall be provided with upturned edges to retain the fitting when the screws are loosened.

e) Identify gangable enclosures by marking.

f) Ensure proper connection of live parts of ganged enclosures.

4.19 Each enclosure shall be provided with at least two mounting means not more than 5 feet (1.52 m) apart and not more than 12 inches (305 mm) from either end unless intended for mounting as a post or pedestal.

4.20 If internal mounting means are in the form of openings in the enclosure and are located above the level of any live part or terminal for a grounding connection, not more than two such openings shall be provided unless:

a) All other openings are closed at the factory and

b) The closing means when undisturbed excludes the beating rain in the test described in 17.1.

4.21 A ventilating opening in an enclosure shall comply with the requirements specified in Ventilation Openings, Section 31.

4.22 An enclosure of the semi-flush type shall be marked as an enclosure Type 3R and shall additionally be marked as specified in 27.4.2.

4.23 A meter socket not intended to be wired from either the top feed (overhead feed) or bottom feed (underground feed) shall be marked in accordance with 27.5.1.

5 Bases – Insulating Material

5.1 A base for the mounting of uninsulated live parts shall not be easily ignited, moisture resistant insulating material. The base shall be constructed so that it is able to withstand the most severe conditions likely to be met in service.

5.2 An insulating material shall have a Performance Level Category (PLC) that does not exceed the value specified in Table 5.1. The specified values are derived from the Standard for Polymeric Materials – Use in Electrical Equipment Evaluations, UL 746C. The Relative Thermal Index (RTI) of the material shall be at least 105°C (221°F).

Exception No. 1: A material may be accepted based on end-product testing as specified in UL 746C.

Exception No. 2: The RTI may be 90°C (194°F) for material that is spaced at least 1/2 inch (12.7 mm) from insulated or uninsulated live parts.

Table 5.1
Maximum performance level category (PLC) for insulating material

Test specified	Flammability rating of material[a,b]			
	V-0	V-1	V-2	HB
Comparative Tracking Index Under Moist Conditions (CTI)[c,d]	3[e]	3[e]	3[e]	3[e]
High Current Arc Resistance to Ignition (HAI)[b,c]	3	2	2	1
Hot Wire Ignition (HWI)[c,d]	4	4	4	4

NOTE – The additional parameters specified in Table 5.2 shall be considered.

[a] As specified in the Standard for Tests for Flammability of Plastic Materials for Parts in Devices and Appliances, UL 94.

[b] If the material is used for indirect support and is spaced from uninsulated live parts by at least 1/2 inch (12.7 mm), the flammability rating may be HB if the PLC level for this test (HAI) is 4.

[c] See the Standard for Polymeric Materials – Short Term Property Evaluations, UL 746A.

[d] If the material is used for indirect support and is spaced from uninsulated live parts by at least 1/2 inch (12.7 mm), this test (CTI or HWI) is not required.

[e] A material having a comparative tracking index PLC of 4 may be used if the voltage involved is 250 volts or less.

Table 5.2
Additional parameters

Property	Test	Method	Units	Minimum levels related to flammability classification
Distortion under load and mold stress relief	Heat deflection temperature, or	UL 746A	Minimum °C	10°C greater than use temperature, but not less than 90°C, or
	Vicat softening point, or	UL 746A	Minimum °C	25°C greater than use temperature, but not less than 105°C, or
	Ball pressure temperature	UL 746A	Minimum °C	(40°C minus the ambient temperature) greater than the use temperature, but not less than 95°C

5.3 A base of insulating material shall be secured to its supporting surface so that it will comply with the conditions of the tests described in 19.1 and 23.1.

5.4 A live part, rivet, screw head or nut on the underside of a base designed for surface mounting shall be countersunk no less than 1/8 inch (3.2 mm) in the clear and covered to a depth of not less than 1/8 inch (3.2 mm) with a waterproof, insulating sealing compound that will not soften at a temperature of 15°C (27°F) higher than the temperature observed at the point where it is used but not lower than 65°C (149°F).

Exception: A sealing compound is not required for constructions complying with 5.5.

5.5 Live parts mentioned in 5.4, which are not covered with a sealing compound, shall comply with through air and over surface spacing requirements noted in Table 8.1. Insulating materials used to provide the necessary spacings shall comply with:

a) Requirements for Bases – Insulating Materials, Section 5 or

b) Requirements for Insulating Barriers, Section 9.1 or

In addition to complying with these spacing requirements, threaded fasteners which are not covered with a sealing compound shall be reliably prevented from loosening by being staked or upset, by a lock washer, a spring washer, or by other means.

5.6 A determination of the softening point of a sealing compound shall be made by use of the ring and ball apparatus described in the requirements for Polymeric Materials – Short Term Property Evaluations, UL 746A.

5.7 The base of a meter socket having line or load terminals supported directly by the base shall be secured to its mounting surface so as to prevent rotation by means other than friction between surfaces.

5.8 The mounting or alignment of a wire connector or a jaw, the integrity of the base material of the equipment, the electrical or mechanical connection between a wire connector and a jaw of the equipment, or the spacings shall not be adversely affected by the application of the maximum tightening means.

5.9 With respect to the Test of Insertion and Withdrawal Force on Meter Base, Section 23, the mounting of the base of a meter socket shall withstand insertion and withdrawal forces without permanent deformation or damage to the insulating base. The rigidity of the assembly shall be such that after seating a typical watthour meter to the maximum depth permitted by the jaws or flange, the clearance between the meter and flange shall not exceed 1/16 inch (1.6 mm) and a sealing ring or cover can be installed.

5.10 A meter socket base shall not be solely dependent on the cover for support unless it is intended to be used with current transformers such that conductors no larger than 8 AWG (8.4 mm^2) will be used.

Exception: The requirement does not apply to backwired devices mounted in switchboards or similar equipment.

6 Current-Carrying Parts

6.1 General

6.1.1 All current-carrying parts, including those associated with a potential jaw assembly shall be of:

a) Silver;

b) A silver alloy;

c) Copper;

d) A copper alloy;

e) Aluminum; or

f) Aluminum alloy.

Exception No. 1: A current-carrying part used only to bypass a meter may be plated steel if determined to be acceptable for the purpose in accordance with the Heating Test, Section 14.

Exception No. 2: A plated No. 10 (4.8 mm diameter) or larger wire-binding screw or nut and stud terminal may be fabricated of iron or steel.

6.1.2 The plating of steel wire-binding screws, nuts, and stud terminals, meter bypasses, and components of pressure wire connectors, shall be made of cadmium, nickel, zinc, tin, or silver.

6.1.3 A plated iron or steel member, if not depended upon to carry current, may be used with a pressure wire connector.

6.1.4 The surface of an aluminum bus bar shall be coated at a clamped joint with:

a) Tin;

b) Silver;

c) Nickel; or

d) Cadmium.

Exception: Other coatings may be used for aluminum bus bars if investigated for the application in accordance with the requirements in 14.2, 14.25, and 14.27.

6.1.5 Among the factors taken into consideration when the acceptability of coating as mentioned in the Exception to 6.1.4 is being determined are its adherence to aluminum and its resistance to corrosive environment. These factors are considered with respect to conductivity and thermal aging.

6.1.6 A multiple meter socket assembly shall be provided with all internal line conductors or busing or both.

Exception: The line conductors connecting not more than six sockets may be omitted where the main terminals are of the lay-in type.

6.1.7 Instructions or markings or both shall be provided to facilitate the proper interconnection of current carrying parts of gangable meter socket units. A link, jumper, or other hardware necessary to effect the connection shall be identified by part designation or other means. Instructions shall refer to the size of interconnecting conductors necessary to ensure compliance with 26.2 and 27.9.1 and Table 26.1.

6.1.8 An insulated wire provided as a part of a meter socket is judged under the requirements for such material, considering its use in the particular application.

6.1.9 A current-carrying part shall be secured so that spacings shall not be reduced below the minimum required spacings specified in Spacings, Section 8.

6.1.10 Friction between surfaces may not be used as the sole means to restrict turning of an uninsulated live part.

6.1.11 If parts are held together by screws, a threaded part shall have not fewer than two full, clean cut threads engaged. If the screw does not extend all the way through a threaded part, the taper or lead thread and the first full thread are to be disregarded in a determination of a number of threads engaged.

6.1.12 A current-carrying part of a meter socket shall be constructed so that the part will not be permanently deformed by intended service.

6.1.13 If current-carrying conductors pass or may pass through an opening in a partition of magnetic material, all conductors of that circuit shall either be included in the same opening, or openings shall be joined by slotting or other means to break the magnetic path.

Exception: If one or more conductors of a circuit are separated by a complete path of magnetic material from the remainder of the circuit conductors, the construction shall be tested as required in 14.14 to determine that no adverse conditions result.

6.2 Washers

6.2.1 Each riveted connection involving current-carrying parts shall have a spring washer at one end and either a spring washer or a flat washer or equivalent at the other end.

Exception No. 1: The washers are not required in a riveted construction that has been tested in accordance with 14.25.

Exception No. 2: The washers are not required in a connection rated 225 amperes or less employing copper bus bars only.

6.2.2 A spring washer shall be used at one end of a bolt securing current-carrying parts together.

Exception No. 1: A spring washer is not necessary in a construction that has been tested in accordance with 14.25.

Exception No. 2: A spring washer may be replaced with a split ring lock washer and flat washer if each aluminum bus in the joint has a tensile yield strength of at least 20,000 pounds per square inch (138 MPa).

Exception No. 3: A flat washer, a split-ring lock washer, or a bolthead that complies with 6.2.4 may be used in place of a spring washer if the joint does not include any aluminum or if aluminum bolts are used with aluminum bus bars.

Exception No. 4: A type of fastening equivalent to that used for investigating the suitability of a wire connector used as a component in accordance with the requirements for wire connectors may be used.

Exception No. 5: A spring washer is not required at a bolted contact of an aluminum alloy conductor used in the grounding circuit for an application such as the service-grounding electrode, a neutral-bonding conductor, or an equipment-grounding conductor.

6.2.3 A spring washer as mentioned in 6.2.1 and 6.2.2 shall:

a) Be a dished washer of stainless or hardened and tempered steel;

b) Have an outer diameter not less than 150 percent of the bolt or rivet shank diameter and a thickness not less than 1/8 of the bolt diameter or rivet shank diameter; and

c) Be dished not less than 3-1/2 percent of the bolt diameter.

6.2.4 A flat washer as mentioned in 6.2.1 and 6.2.2 shall have a thickness at least 1/6 the diameter of the rivet shank or bolt and an outer diameter at least 150 percent of that of the rivet shank or bolt, but not less than the outer diameter of the spring washer.

6.3 Test blocks

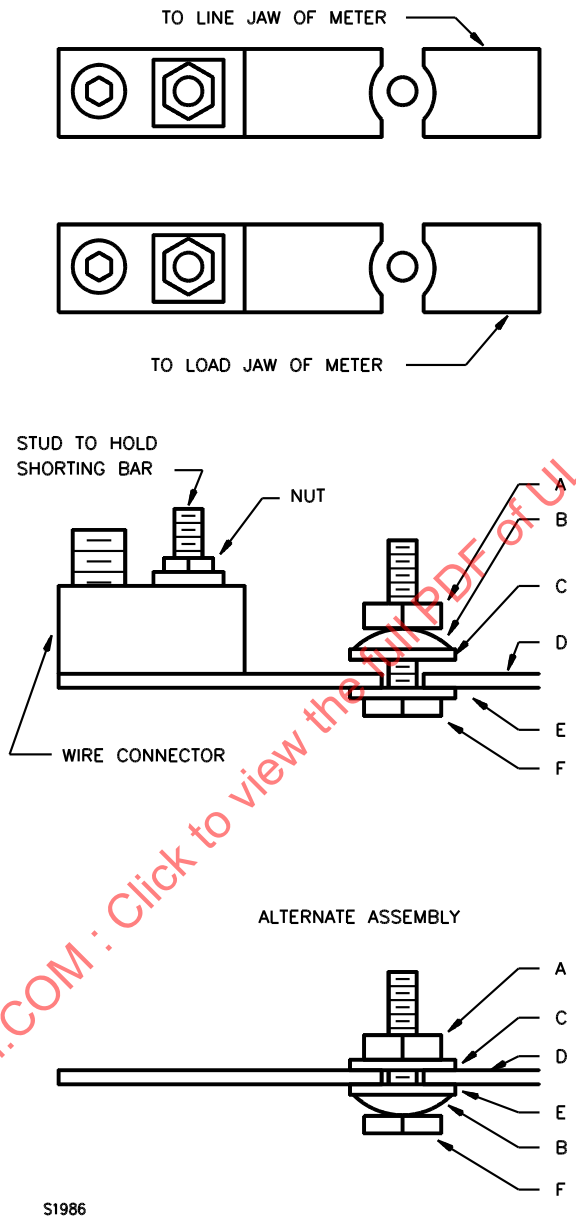
6.3.1 A test block disconnect assembly shall be provided with a spring washer of the type described in 6.2.3. A typical test block construction is shown in Figure 6.1.

6.3.2 A stud for a test block disconnect nut assembly shall be restricted from rotating and shall be tested in accordance with the Test of Torque and Force on Test Block, Section 25.

6.3.3 A meter socket provided with a test block assembly shall be marked in accordance with 27.11.1.

Figure 6.1

Typical test block construction



NOTES

A – Nut

B – Dished Washer

C – Shorting Washer

D – Bus Bars

E – Insulating Washer or Part of Base

F – Stud Head

7 Wiring Terminals

7.1 A meter socket shall be provided with wiring terminals for the connection of insulated conductors having an ampacity for each rating of the device or circuit in accordance with Table 7.1, based on the assumption that 75°C (167°F) rated wire will be used. A meter socket shall be marked, if applicable, in accordance with 27.10.1 – 27.10.17.

Exception No. 1: Wire terminals need not be provided as specified in 7.6.

Exception No. 2: Conductors as noted in 14.6 may be used.

Table 7.1
Ampacity of insulated conductors

Size,		Conduit trade size inches for[a]		Temperature rating of conductor			
				75°C (167°F)		90°C (194°F)[b]	
AWG or kcmil	(mm^2)	3 Wires	4 Wires	Copper	Aluminum	Copper	Aluminum
14	2.1	1/2	1/2	15		20	–
12	3.3	1/2	1/2	20	15	20	15
10	5.3	1/2	3/4	30	25	30	25
8	8.4	3/4	3/4	50	40	55	45
6	13.3	3/4	1	65	50	75	60
4	21.2	1	1-1/4	85[c]	65[c]	95	75
3	26.7	1	1-1/4	100[c]	75[c]	110	85
2	33.6	1-1/4	1-1/4	115[c]	90[c]	130	100
1	42.4	1-1/4	1-1/2	130[c]	100[c]	150	115
1/0	53.5	1-1/2	2	150[c]	120[c]	170	135
2/0	67.4	1-1/2	2	175[c]	135[c]	195	150
3/0	85.0	2	2	200[c]	155[c]	225	175
4/0	107.0	2	2-1/2	230[c]	180[c]	260	205
kcmil							
250	127	2	2-1/2	255[c]	205[c]	290	230
300	152	2-1/2	3	285[c]	230[c]	320	255
350	177	2-1/2	3	310[c]	250[c]	350	280
400	203	2-1/2	3	335[c]	270[c]	380	305
500	253	3	3-1/2	380[c]	310[c]	430	350
600	304	3	3-1/2	420[c]	340[c]	475	385
700	355	3-1/2	4	460	375	520	420
750	380	3-1/2	4	475	385	535	435
800	405	3-1/2	4	490	395	555	450
900	456	3-1/2	4	520	425	585	480
1000	506	4	5	545	445	615	500
1250	633	5	5	590	485	665	545
1500	760	5	6	625	520	705	585

Table 7.1 Continued on Next Page

Table 7.1 Continued

Size, AWG or kcmil	Size, (mm^2)	Conduit trade size inches for[a]		Temperature rating of conductor			
				75°C (167°F)		90°C (194°F)[b]	
		3 Wires	4 Wires	Copper	Aluminum	Copper	Aluminum
1750	887	5	6	650	545	735	615
2000	1013	5	6	665	560	750	630

NOTES

1 For a multiple-conductor connector at a terminal, the value is to be multiplied by the number of 1/0 AWG and larger conductors that the terminal will accommodate.

2 These values of ampacity apply only if no more than three conductors will be field-installed in the conduit. If four or more conductors, other than a neutral that carries the unbalanced current, will be installed in a conduit (as may occur because of the number of conduit hubs provided or because of the number of wires necessary in certain polyphase systems or for other reason), the ampacity of each of those conductors is reduced as shown in Table 7.2.

[a] Conduit size based on use of conductors having insulation thickness comparable to that of Type THW conductors and with conduit hubs or knockouts provided in the enclosure.

[b] A meter socket may be rated for use with conductors on the line side having 90°C (194°F) ampacity under the following conditions:

1) Tested in accordance with Exception No. 1 to 14.6, with temperature rise limits as specified in 14.3.

2) Marked in accordance with 27.10.5.

[c] With respect to Exception No. 2 to 14.6, equipment intended for use in a three-wire, single-phase dwelling service circuit with 75°C (167°F) rated conductors and marked in accordance with 27.3.7 may be investigated for ratings in accordance with the conductor ampacities specified in Table 7.3.

Table 7.2
Ampacity of four or more conductors installed in a conduit

Numbers of conductors (diversity considered)	Percent of values in table
4 – 6	80
7 – 24	70
25 – 42	60
43 or more	50
Numbers of conductors (diversity not considered)	**Percent of values in table**
4 – 6	80
7 – 9	70
10 – 29	59
21 – 30	45
31 – 40	40
41 – 60	35

Table 7.3
Ampacity of conductors provided with meter sockets used in 3-wire, single-phase, dwelling service appliances

Ampacity, amperes	Conductor size, AWG or kcmil	
	Copper	Aluminum
100	4 AWG	2 AWG
110	3	1
125	2	1/0
150	1	2/0
175	1/0	3/0
200	2/0	4/0
225	3/0	250 kcmil
250	4/0	300
300	250 kcmil	350
350	350	500
400	400	600

7.2 A pressure wire connector intended to be used with a joint compound shall either have the compound in the barrel of the connector or, if in a separate package, instructions for use shall be provided on the package. Connectors to which the compound must be field applied shall be identified by a marking on the equipment.

7.3 A main terminal shall be rated for a minimum 8 AWG (8.4 mm^2) copper or 6 AWG (13.3 mm^2) aluminum conductor in a meter socket rated 40 amperes or less.

7.4 A pressure wire connector provided with or specified for use with a meter socket shall comply with the Standard for Wire Connectors, UL 486A-486B, when tested using the tightening torque specified in 7.5.

7.5 The tightening torque for a field-wiring terminal shall be as specified by the equipment manufacturer. The equipment shall be marked as specified in 27.10.3 to indicate the required torque value. The specified tightening torque shall not be more than 100 percent nor less than 90 percent of the value employed in the static heating test as specified in the Standard for Wire Connectors, UL 486A-486B, for that wire size corresponding to the ampere rating of the equipment.

Exception: The torque value may be less than 90 percent if the connector is investigated with the assigned torque value in accordance with UL 486A-486B.

7.6 With respect to Exception No. 1 to 7.1 and 27.10.15 and 27.10.16, pressure terminal connectors for field connection (line or load) need not be provided if the following conditions are met:

a) Component terminal assemblies shall be available from the equipment manufacturer or one or more types of pressure terminal connectors shall be specified for field installation on the equipment.

b) Fastening devices such as studs, nuts, bolts, spring or flat washers, or the like, as required for an effective installation, shall either be provided as part of the component terminal assembly or be mounted on or separately packaged with the equipment.

c) The installation of the terminal assembly shall not involve the loosening or disassembly of parts other than a cover or other part giving access to the terminal location. The means for securing the terminal connector shall be accessible for tightening before and after installation of conductors.

d) With respect to 27.10.2, if the pressure terminal connector provided in a component terminal assembly requires the use of a special tool for securing the conductor, any necessary instructions shall be included in the component assembly package or with the equipment.

e) Installation of the pressure terminal connectors in the intended manner shall result in a product that complies with the requirements in this standard.

f) If pressure terminal connectors are not provided on the equipment as shipped, the equipment shall be marked stating which pressure terminal connector or component terminal assemblies are for use with the equipment. The terminal assembly packages shall carry an identifying marking, wire size, and manufacturer's name or trademark.

g) A wire connector of the type(s) mentioned in the marking may be installed on the equipment at the factory with instructions, if necessary, for proper connection of the conductor(s).

7.7 Equipment intended for the connection of a conductor larger than 10 AWG (5.3 mm^2) shall be provided with a pressure wire connector or have provision for pressure wire connectors in accordance with 27.10.16.

7.8 A No. 10 (4.8 mm diameter) or larger wire-binding screw may be employed at a wiring terminal intended for the connection of a 10 AWG (5.3 mm^2) or smaller solid conductor if an upturned lug or the equivalent is provided to retain the conductor under the head of the screw when the screw is loosened to permit shifting of the conductor.

7.9 A wire-binding screw terminal is one in which the conductor is intended to be formed around the terminal screw and can be so formed without disengaging the screw from the terminal plate.

7.10 A terminal plate for a wire-binding screw shall:

a) Be of nonferrous metal;

b) Provide not fewer than two full threads; and

c) Provide physical strength to withstand a tightening torque of 20 pound-inches (2.3 N·m).

7.11 Attachment of a terminal for field wiring shall provide mechanical strength and incorporate a securing means to prevent reduction of required spacings during intended use of the terminal.

7.12 If a pressure wire connector for field connections will accommodate a conductor larger than 4 AWG (21.2 mm^2) and is secured by the mounting of the socket jaws and a single screw, friction alone shall not be depended upon to prevent rotation of the jaw or wire connector.

7.13 A lock washer is not considered a positive means to prevent rotation.

7.14 Removable wire connectors provided with the meter socket equipment, must meet the requirements of Section 24 when replaced with the torque specified in 27.10.18.

8 Spacings

8.1 Electrical spacings shall be as indicated in Table 8.1. Grounded metal includes the enclosure and any metal in permanent electrical connection with the enclosure.

Table 8.1
Minimum spacings

Voltage between parts involved	Minimum spacings from live parts to:							
	Parts of opposite polarity[a]				Grounded metal[b]			
	Over surface,[c]		Through air,		Over surface, [c]		Through air,	
	inches	(mm)	inch	(mm)	inch	(mm)	inch	(mm)
0 – 300[d]	3/4	19.1	3/8	9.5	1/2	12.7	3/8	9.5
301 – 600	1-1/4	31.8	3/4	19.1	1	25.4	1/2	12.7

[a] A through air or over surface spacing of 3/8 inch (9.5 mm) may be provided between parts of opposite polarity at other than wiring terminals if the construction complies with 20.1.2.

[b] A through air or over surface spacing of 3/8 inch may be provided at other than wiring terminals in a cast-metal enclosure or to grounded metal where indentation or deformation of the overall enclosure will not affect the spacing if the construction complies with 20.1.2.

[c] In measuring an over surface spacing, any slot, groove, or the like 0.013 inch (0.33 mm) wide or less in the contour of insulating material is to be disregarded.

[d] If a meter socket base is intended for use as a component in equipment having a maximum voltage rating of 300 volts, 300-volt spacings may be applied between the neutral and:

1) Phase potential parts and

2) Grounded dead-metal parts.

8.2 A terminal and any other part intended to be connected to the grounded circuit conductor is considered to be an uninsulated live part unless such a part is in permanent electrical connection with the enclosure. A separate screw, strap, or other means to bond an enclosure to the grounded circuit conductor may be considered to provide permanent electrical connection for the purpose of this requirement only if such connection is not likely to be broken other than for test purposes.

8.3 In measuring spacings between an uninsulated live part and conduit bushings, it is to be assumed that a bushing, having the dimensions indicated in Table 8.2, is in place inside the enclosure in conjunction with a single locknut on the outside of the enclosure.

Table 8.2
Bushing dimensions

Trade size of conduit,	Overall diameter,		Height,	
inches	inches	(mm)	inch	(mm)
1/2	1	25.4	3/8	9.5
3/4	1-15/64	31.4	27/64	10.7
1	1-19/32	40.5	33/64	13.1
1-1/4	1-15/16	49.2	9/16	14.3
1-1/2	2-13/64	56.0	19/32	15.1
2	2-45/64	68.7	5/8	15.9
2-1/2	3-7/32	81.8	3/4	19.1
3	3-7/8	98.4	13/16	20.6
3-1/2	4-7/16	112.7	15/16	23.8
4	4-31/32	126.2	1	25.4

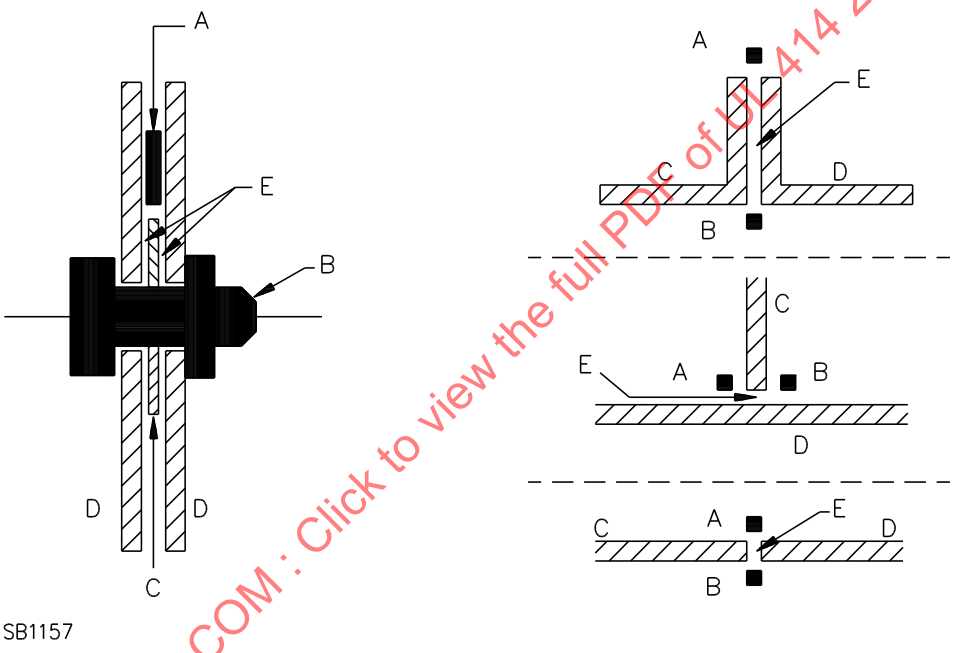
8.4 Spacings involving field wiring terminals are to be measured with the terminals wired in the intended manner.

8.5 An isolated dead metal part (such as a screw head or washer) interposed between uninsulated live parts of opposite polarity, or between an uninsulated live part and grounded dead metal, is considered to reduce the spacing by an amount equal to the dimensions of the interposed part along the path of measurement.

8.6 Spacings are to be measured through cracks unless a clamped joint has been tested in accordance with the Clamped Insulating Joint Test, Section 21, with acceptable results. A clamped joint is a joint between two pieces of insulating material that are under pressure as shown in Figure 8.1. Adhesives, cements, or the like, if used to effect a seal in lieu of a tightly mated joint, shall comply with the Standard for Polymeric Materials – Use in Electrical Equipment Evaluations, UL 746C.

Figure 8.1

Clamped insulating joint



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Parts A, B – Live parts of opposite polarity, or a live part and grounded metal part with spacing through the crack between C and D less than required in Table 8.1.

Parts C, D – Insulating barriers clamped tightly together so that the dielectric withstand strength between A and B is greater than the equivalent air spacing.

Part E – The clamped joint.

8.7 Spacings (though air and over surface) shall not be less than 1/8 inch (3.2 mm) between uninsulated live parts of the same polarity between the line and load of a meter socket. This spacing shall be maintained with the meter inserted and removed and, if equipped with bypasses, with the bypass in the fully open position.

9 Barriers

9.1 Insulating barriers

9.1.1 In 9.1.2 – 9.1.6, the liner or barrier that is referenced is insulating material that separates uninsulated live parts of opposite polarity, or separates uninsulated live parts and a grounded dead metal part (including the enclosure) where the through air spacing between the parts would otherwise be less than the required value. Over surface spacings are measured across air gaps of less than 1/32 inch (0.8 mm).

9.1.2 Fiber shall not be used as a liner or barrier.

9.1.3 A barrier that comprises the sole separation or is used in conjunction with an air space of less than 0.013 inch (0.33 mm) shall comply with (a) and (b). The barrier shall:

a) Be insulating material as covered in 5.2. However, with regard to the flammability rating in Table 5.1, the rating may be VTM-0 rather than V-0, VTM-1 rather than V-1, or VTM-2 rather than V-2.

Exception: A barrier may be acceptable based on the end-product tests specified in the Standard for Polymeric Materials – Use in Electrical Equipment Evaluations, UL 746C.

b) Have a minimum thickness of 0.028 inch (0.71 mm).

Exception: A barrier of insulating material may have a thickness less than 0.028 inch if it withstands a 60-hertz dielectric-withstand voltage of 5000 volts applied in accordance with 20.2.1.

9.1.4 A barrier used in conjunction with a minimum air space of 0.013 inch (0.33 mm) shall comply with (a) – (e). The barrier shall be:

a) Material that has insulating properties as covered in 9.1.3 or complies with the requirements for internal barriers as specified in Table 9.1. The relative thermal index shall be at least 90°C (194°F).

Exception: A barrier may be acceptable based on the end-product tests specified in the Standard for Polymeric Materials – Use in Electrical Equipment Evaluations, UL 746C.

b) Of such strength to withstand exposure to mechanical damage.

c) Secured in place.

d) Located so that it will not be adversely affected by operation of the equipment in service.

e) Of a minimum thickness of 0.028 inch (0.71 mm).

Exception No. 1: The material may have a thickness less than 0.028 inch if it withstands a 60-hertz dielectric-withstand voltage of 5000 volts applied in accordance with 20.2.1.

Exception No. 2: Material used in conjunction with an air space of 1/2 or more of the required through-air spacing may have a thickness not less than 0.013 inch, or less than 0.013 inch if it withstands a 60-hertz dielectric-withstand voltage of 2500 volts applied in accordance with 20.2.1.

Table 9.1
Maximum performance level category (PLC) for barrier used in place of spacing in conjunction with minimum air space of 0.013 inch (0.33 mm)

Test specified	Flammability rating of material[a]			
	V-0 or VTM-0	V-1 or VTM-1	V-2 or VTM-2	HB
Comparative Tracking Index Under Moist Conditions (CTI)[b]	4	4	4	4
High Current Arc Resistance to Ignition (HAI)[b]	3	2	2	1
Hot Wire Ignition (HWI)[b]	4	4	4	4

NOTE – The additional parameters specified in Table 9.2 shall be considered.

[a] Refer to the Standard Tests For Flammability of Plastic Materials for Parts in Devices and Appliances, UL 94.

[b] The Standard for Polymeric Materials – Short Term Property Evaluations, UL 746A.

Table 9.2
Additional parameters

Property	Test	Method	Units	Minimum levels related to flammability classification
Distortion under load and mold stress relief	Heat deflection temperature, or	UL 746A	Minimum °C	10°C greater than use temperature, but not less than 90°C, or
	Vicat softening point, or	UL 746A	Minimum °C	25°C greater than use temperature, but not less than 105°C, or
	Ball pressure temperature	UL 746A	Minimum °C	(40°C minus the ambient temperature) greater than the use temperature, but not less than 95°C

9.1.5 A wrap of thermoplastic tape, rated for use as sole insulation, may be employed if:

a) At a point where the spacing prior to the application of the tape is not less than half the required through-air spacing shown in Table 8.1 the wrap is not less than 0.013 inch (0.33 mm) thick and is applied in two or more layers.

b) At a point where the spacing prior to the application of the tape is less than half the required through-air spacing shown in Table 8.1, the wrap is not less than 0.028 inch (0.71 mm) thick.

c) The tape is not subject to compression.

d) The tape is not wrapped over a sharp edge.

e) The tape is not subjected to temperatures in excess of 80°C (176°F).

9.1.6 When the spacings are less than the required values, thermoplastic tubing may be used when:

a) It is not subjected to a temperature higher than that for which the tubing is acceptable;

b) It is not subjected to compression, repeated flexure, or creasing at a point where the tubing is required to satisfy spacing requirements;

c) All edges of the conductor covered with the tubing are well rounded and free from sharp edges;

d) For chemically dilated tubing, a solvent recommended by the tubing manufacturer is used; and

e) The wall thickness (after assembly) of the tubing is not less than 0.022 inch (0.56 mm) for tubing 1/2 inch (12.7 mm) or less in diameter, not less than 0.027 inch (0.69 mm) for 9/16 and 5/8 inch (14.3 and 15.9 mm) diameter tubing, and not less than 0.028 inch (0.71 mm) for larger tubing.

9.2 Restricting barriers

9.2.1 Restricting barriers are used to:

a) Define a wireway or wiring space;

b) Prevent the entry of rain;

c) Provide separation between circuits as defined in 9.3.1; or

d) Prevent direct access to live parts through ventilation openings in the enclosure.

9.2.2 A sheet steel barrier shall not be less than 0.053 inch (1.35 mm) thick if uncoated and not less than 0.056 inch (1.42 mm) thick if galvanized.

9.2.3 A metal barrier may be thinner than indicated in 9.2.2 provided that its strength and rigidity are not less than that of a flat sheet of steel having the same dimensions as the barrier and of the specified thickness.

9.2.4 A nonmetallic barrier shall:

a) Not be less than 1/16 inch (1.6 mm) thick and

b) Not contact any live part unless the barrier is of the type described in 9.1.3.

9.3 Isolating barriers

9.3.1 Space inside the enclosure marked for use with:

a) Telephone or other communication circuits;

b) Class 2 or Class 3 wiring; or

c) Community antenna television cable, as marked in accordance with 27.13.1.

shall be separated by barriers from space containing power circuit components or wiring. The barrier shall be provided in accordance with 9.2.2 or 9.2.4.

Exception: A barrier is not required if the wiring connects to the meter.

10 Wire-Bending Distance

10.1 The wire-bending distance provided in equipment for conductors to be installed in the field shall be as specified in:

a) Table 10.1 for the largest conductor, as specified by the marking in 27.10.4, entering or exiting the enclosure through the wall opposite the opening for wire in the connector or

b) Table 10.2 for the largest conductor, as specified by the marking, if the conductor does not enter or exit the enclosure through the wall opposite the opening for wire in the connector.

Exception No. 1: For a meter socket not installed in a metering transformer cabinet or interior, the wire-bending distance may be as specified in Table 10.2 for a conductor not larger than 350 kcmil (177 mm^2) that enters or exits the enclosure opposite the opening for wire in the connector provided:

a) The connector is of the lay-in type or removable wire connector with integral mounting tang, and directly faces the enclosure wall through which the conductor enters or exits or is angled toward the conductor exit in the wall and

b) The offset, if any, (measured between the center line of the opening for wire in the connector and the center line of the opening in the enclosure) as shown in Figure 10.1 is not greater than 50 percent of the wire-bending distance provided.

The center line of the opening for wire in a connector angled toward the exit in the wall shall intersect the center line of the exit opening at the enclosure wall or external to the enclosure as illustrated by wire terminal G in Figure 10.2.

Exception No. 2: For a meter socket not installed in a metering transformer cabinet or interior, the wire-bending distance may be as specified in Table 10.2 for a conductor not larger than 350 kcmil (177 mm^2) that enters or exits the enclosure opposite the opening for wire in the connector provided the terminal is of the lay-in type or removable wire connector with integral mounting tang, and complies with the limitations specified in Figure 10.2.

Table 10.1
Minimum wire-bending distance at connectors in inches

Wire size, AWG or kcmil	Wire size, (mm^2)	Wires per terminal (pole)[a] 1		2		3		4 or more	
14 – 10	2.1 – 5.3	Not specified		–		–		–	
8	8.4	1-1/2		–		–		–	
6[b]	13.3	2		–		–		–	
4[b]	21.2	3		–		–		–	
3[b]	26.7	3		–		–		–	
2[b]	33.6	3-1/2		–		–		–	
1[b]	42.4	4-1/2		–		–		–	
1/0[b]	53.5	5-1/2		5-1/2		7		–	
2/0[b]	67.4	6		6		7-1/2		–	
3/0[b]	85.0	6-1/2	(1/2)	6-1/2	(1/2)	8		–	
4/0[b]	107	7	(1)	7-1/2	(1-1/2)	8-1/2	(1/2)	–	
250[b]	127	8-1/2	(2)	8-1/2	(2)	9	(1)	10	
300[b]	152	10	(3)	10	(2)	11	(1)	12	
350[b]	177	12	(3)	12	(3)	13	(3)	14	(2)
400	203	13	(3)	13	(3)	14	(3)	15	(3)
500	253	14	(3)	14	(3)	15	(3)	16	(3)
600	304	15	(3)	16	(3)	18	(3)	19	(3)
700	355	16	(3)	18	(3)	20	(3)	22	(3)
750	380	17	(3)	19	(3)	22	(3)	24	(3)

Table 10.1 Continued on Next Page

Table 10.1 Continued

Wire size, AWG or kcmil	Wire size, (mm^2)	Wires per terminal (pole)[a] 1	2	3	4 or more
800	405	18	20	22	24
900	456	19	22	24	24
1000	506	20	–	–	–
1250	633	22	–	–	–
1500	760	24	–	–	–
1750	887	24	–	–	–
2000	1013	24	–	–	–

[a] The wire-bending distance may be reduced by the number of inches shown in parentheses under the following conditions:

1) Lay-in or removable wire connectors receiving one wire each are used (there may be more than one removable wire per terminal) and

2) The removable wire connectors can be removed from their intended location without disturbing structural or electrical parts other than a cover, and can be reinstalled with the conductor in place.

[b] See Exception Nos. 1 and 2 to 10.1 for conditions in which lay-in type or removable wire connectors may be used in accordance with Table 10.2 in meter sockets.

For SI units one inch = 25.4 mm.

Table 10.2
Minimum width of gutter and wire-bending distance in inches (mm) for wires not entering or exiting enclosure opposite connectors

Wire size, AWG or kcmil	Wire size, (mm^2)	Wires per terminal (pole) 1		2		3		4		5	
14 – 10	2.1 – 5.3	Not specified		–		–		–		–	
8 – 6	8.4 – 13.3	1-1/2	38.1	–		–		–		–	
4 – 3	21.1 – 26.7	2	50.8	–		–		–		–	
2	33.6	2-1/2	63.5	–		–		–		–	
1	42.4	3	76.2	–		–		–		–	
1/0 – 2/0	53.5 – 67.4	3-1/2	88.9	5	127	7	178	–		–	
3/0 – 4/0	85.0 – 107	4	102	6	152	8	203	–		–	
250	127	4-1/2	114	6	152	8	203	10	254	–	
300 – 350	152 – 177	5	127	8	203	10	254	12	305	–	
400 – 500	203 – 253	6	152	8	203	10	254	12	305	14	356
600 – 700	304 – 355	8	203	10	254	12	305	14	356	16	406
750 – 900	380 – 456	8	203	12	305	14	356	16	406	18	457
1000 – 1250	507 – 633	10	254	–		–		–		–	
1500 – 2000	760 – 1013	12	305	–		–		–		–	

NOTES

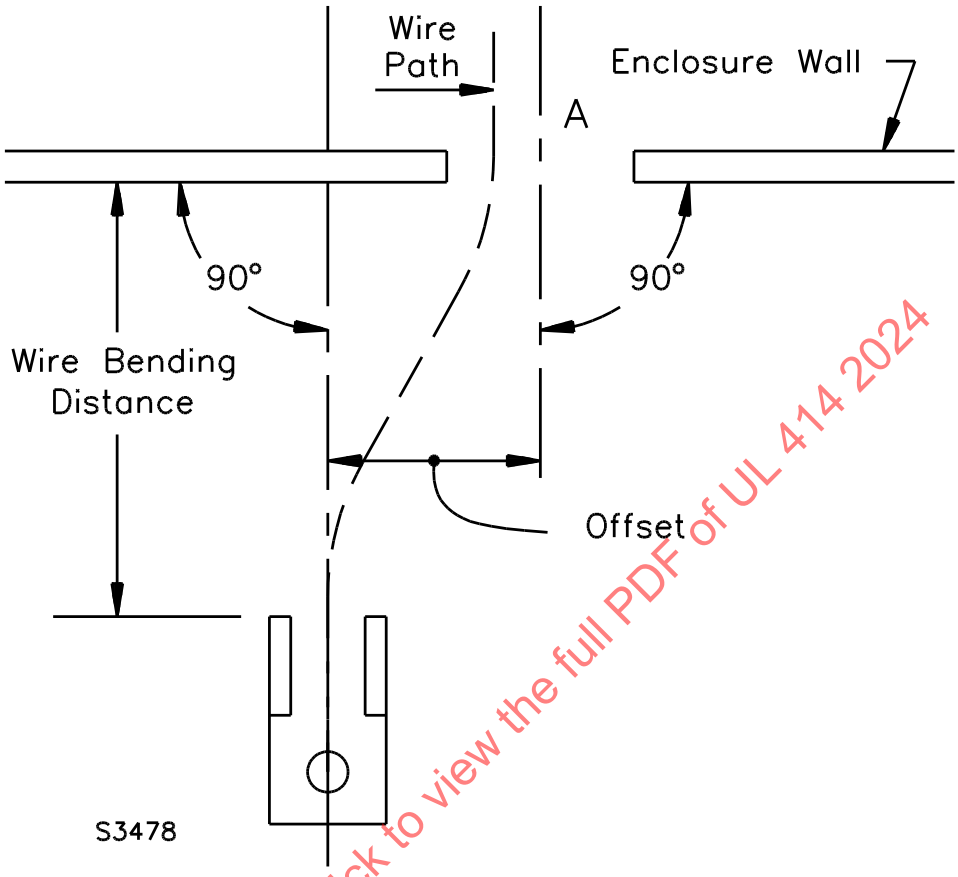
1 The table includes only those combinations that are likely to be used. Combinations not mentioned may be given further consideration.

2 The wire-bending distance is to be determined as specified in 10.2.

3 See Exception Nos. 1 and 2 to 10.1 for conditions in which lay-in type or removable wire connectors may be used in accordance with this table in meter sockets.

Figure 10.1

Maximum connector offset



NOTES

A – Center line of opening that is assumed to be:

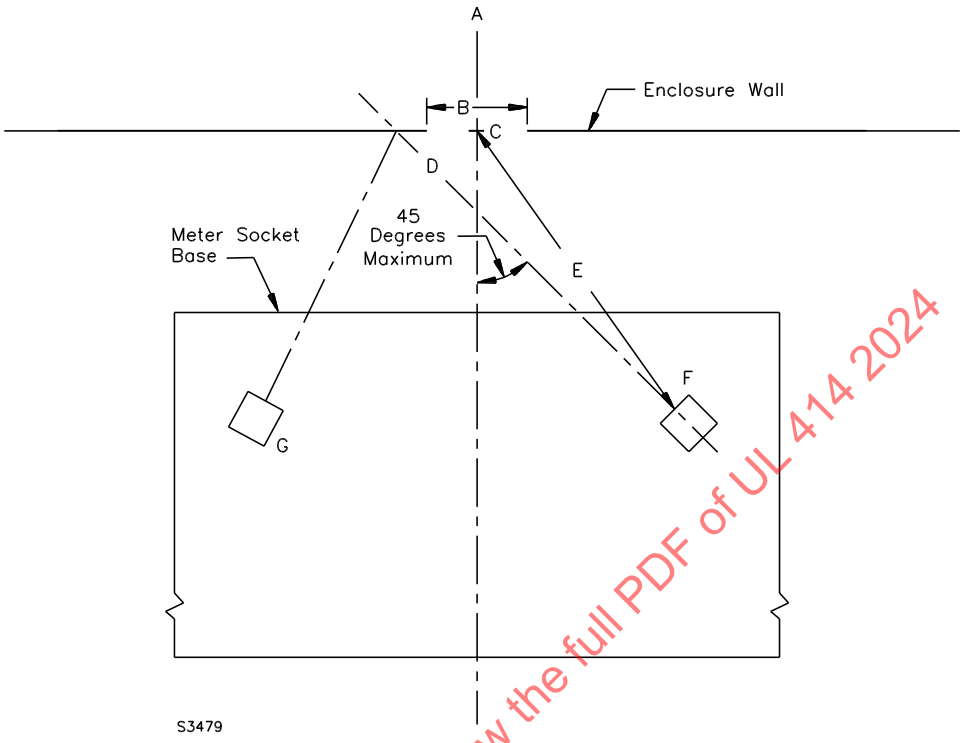
1) Located symmetrically about the center line of the meter socket base,

2) Indicated by a marking as specified in 27.4.4, or

3) Defined by a factory mounted conduit hub or a factory provided provision for a conduit hub.

Figure 10.2

Wire connector axis directed toward opening in enclosure



NOTES

A – Center line of opening that is:

1) Located symmetrically about the center line of the meter socket base;

2) Indicated by a marking as specified in 27.4.4; or

3) Defined by a factory mounted conduit hub or a factory provided provision for a conduit hub.

B – Opening in the enclosure with a radius as specified in Table 10.3 centered about center line A.

C – Center point of opening B in the enclosure wall.

D – Center line of the opening for wire in connector F that may intersect the opening B in the enclosure and that is within a 45 degree angle of directly facing the enclosure wall. The center line D of the opening for wire in connector F need not intersect the opening B if it intersects the center line A within the enclosure and is still within a 45 degree angle of directly facing the enclosure wall.

E – The wire-bending distance that is measured from the center point of the opening in the enclosure to the center point of the opening for wire in connector F. Wire-bending distance shall be determined as specified in Exception No. 2 to 10.1.

F – Wire terminal properly mounted that complies with D.

G – Wire terminal mounted such that the wire-bending distance shall comply with Table 10.1 and 10.2(a) since the center line of the opening for wire in the connector does not intersect opening B or line A within the enclosure as specified in D.

Table 10.3
Assumed radius of opening in enclosure

Maximum ampere rating of meter socket, amperes	Radius,[a] inches	(mm)
125 (100 Continuous)	7/8	22.2
250 (200 Continuous)	1-1/4	31.8

[a] See note B of Figure 10.2.

10.2 The wire-bending distance shall be measured as follows:

a) With regard to:

1) Table 10.1 or

2) Figure 10.1 and Table 10.2 based on application of Exception No. 1 to 10.1,

the wire-bending distance shall be measured perpendicular to the wall of the enclosure through which the wire enters or exits from the wall to the nearest part of the wire connector.

b) With regard to Table 10.2, the wire-bending distance shall be measured as shown in Figure 10.2 in the application of Exception No. 2 to 10.1.

c) With regard to Table 10.2, if the wire does not exit or enter the enclosure opposite the connector, the wire-bending distance shall be measured along the center line of the opening for wire in the terminal from the center of the wire opening in the connector to the enclosure wall, barrier, or obstruction. A barrier, shoulder, or the like is to be disregarded when the measurement is being made if it does not reduce the radius to which the wire must be bent.

10.3 If uninsulated live parts are located within a wiring space, the construction shall be such that the conductor can be routed to the proper terminal without contacting a live part of opposite polarity.

10.4 The size and location of a knockout, wire-bending space, wireway, barrier, terminal, or the like, with respect to the marked rating will be considered if equipment is marked for top (overhead) feed only. If direct entrance to the terminal is not practical, consideration can be given to other conductor routing.

11 Wiring Space

11.1 For the purpose of these requirements, a wiring space is the cross sectional area through which conductors are routed, but not terminated.

11.2 No wiring system shall enter or exit the enclosure in a wiring space.

11.3 There shall be sufficient wiring space within the enclosure of a meter socket for the installation of conductors likely to be used in connecting the line and load terminals. Unless intended to be installed for either top or bottom feed only as allowed in 4.23, and marked in accordance with 27.5.1, it is to be assumed that conductors can enter or exit at either end of the enclosure.

11.4 The clear wiring space, independent of all projections, obstructions, or interference from a moving part, shall:

a) Not be smaller in width and depth than the values specified in Table 11.1; and

b) Not be smaller in total area than 250 percent of the total cross-sectional area of the maximum number of conductors that may be used in the space. See Table 11.1.

11.5 In determining whether a wiring space complies with the requirements in 11.4 consideration is to be given to the actual size of conductors that will be used in the space; but it is to be assumed that conductors smaller than 12 AWG (3.3 mm^2) will not be used. In computing the area of a wiring space, consideration is to be given to all the available space that may be used for the more common multiple wire connections as specified in Table 10.1.

Table 11.1
Wire space

Maximum size of wire or cable,		Minimum width and depth of wiring space,		Minimum area required for multiple wires based on factor of 2.5											
				Two wires,		Three wires,		Four wires,		Five wires,		Six wires,		Seven wires,	
AWG or kcmil	(mm^2)	in	(mm)	in^2	(cm^2)	in^2	(cm^2)	in^2	(cm^2)	in^2	(cm^2)	in^2	(cm^2)	in^2	(cm^2)
12	3.3	3/8	9.5	0.14	0.9	0.21	1.4	0.28	1.8	0.35	2.3	0.42	2.7	0.49	3.2
10	5.3	3/8	9.5	0.23	1.5	0.34	2.2	0.46	3.0	0.57	3.7	0.68	4.4	0.80	5.2
8	8.4	1/2	12.7	0.43	2.8	0.64	4.1	0.85	5.5	1.07	6.9	1.28	8.3	1.50	9.7
6	13.3	5/8	15.9	0.62	4.0	0.93	6.0	1.24	8.0	1.55	10.0	1.86	12.0	2.17	14.0
4	21.2	3/4	19.1	0.80	5.2	1.20	7.7	1.60	10.3	2.00	12.9	2.40	15.5	2.80	18.1
3	26.7	3/4	19.1	0.91	5.9	1.36	8.8	1.82	11.7	2.27	14.6	2.72	17.6	3.18	20.5
2	33.6	7/8	22.2	1.03	6.6	1.55	10.0	2.06	13.3	2.58	16.6	3.10	20.0	3.61	23.3
1	42.4	1	25.4	1.36	8.8	2.04	13.2	2.72	17.6	3.40	21.9	4.08	26.3	4.76	30.7
1/0	53.5	1	25.4	1.55	10.0	2.33	15.0	3.10	20.0	3.88	25.0	4.66	30.1	5.43	35.0
2/0	67.4	1	25.4	1.79	11.6	2.68	17.3	3.58	23.1	4.47	28.8	5.36	34.6	6.26	40.4
3/0	85.0	1-1/8	28.6	2.08	13.4	3.11	20.1	4.16	26.8	5.19	33.5	6.22	40.1	7.27	46.9
4/0	107.2	1-1/4	31.8	2.42	15.6	3.63	23.4	4.84	31.2	6.05	39.0	7.26	46.8	8.47	54.6
250	127	1-3/8	34.9	2.96	19.1	4.44	28.6	5.92	38.2	7.40	47.7	8.88	57.3	10.36	66.8
300	152	1-1/2	38.1	3.42	22.1	5.13	33.1	6.84	44.1	8.55	55.2	10.26	66.2	11.96	77.2
350	177	1-1/2	38.1	3.81	24.6	5.72	36.9	7.62	49.2	9.53	61.5	11.44	73.8	13.34	86.1
400	203	1- 5/8	41.3	4.18	27.0	6.27	40.5	8.36	53.9	10.45	67.4	12.54	80.9	14.63	94.4
500	253	1-3/4	44.5	4.92	31.7	7.38	47.6	9.84	63.5	12.30	79.4	14.76	95.2	17.22	111.1
600	304	1-7/8	47.6	5.97	38.5	8.96	57.8	11.94	77.0	14.93	96.3	17.92	115.6	20.90	134.8
700	355	2	50.8	6.68	43.1	10.02	64.6	13.36	86.2	16.70	107.7	20.04	129.3	23.38	150.8
750	380	2	50.8	7.04	45.4	10.56	68.1	14.08	90.8	17.60	113.5	21.12	136.3	24.64	159.0
800	405	2-1/8	54.0	7.39	47.7	11.09	71.6	14.78	95.4	18.48	119.2	22.18	143.1	25.87	166.9
900	456	2-1/4	57.2	8.09	52.2	12.13	78.3	16.18	104.4	20.22	130.5	24.26	156.5	28.31	182.6
1000	507	2-1/4	57.2	8.77	56.6	13.15	84.8	17.54	113.2	21.92	141.4	26.30	169.7	30.69	198.0
1250	633	2-1/2	63.5	11.03	71.2	16.55	106.8	22.06	142.3	27.58	177.9	33.10	213.5	38.61	249.1
1500	760	2-3/4	69.8	12.74	82.2	19.11	123.3	25.48	164.4	31.85	205.5	38.22	246.6	44.59	287.7
1750	887	2-7/8	73.0	14.45	93.2	21.67	139.8	28.90	186.5	36.12	233.0	43.34	279.6	50.57	326.3
2000	1010	3-1/8	79.4	16.04	103.5	24.06	155.2	32.08	207.0	40.10	258.7	48.12	310.5	56.14	362.2

12 Provisions for Bonding and Grounding

12.1 If provided, a bonding jumper in the form of a separate screw, strap, or other means, for bonding the enclosure to the grounded (neutral) conductor of an alternating current system shall be of copper or aluminum and shall have a cross-sectional area as specified in Table 12.1. If applicable, the meter socket shall be marked in accordance with 27.8.1.

Exception: A steel or brass screw, as specified in the footnotes to Table 12.1, may be used as the bonding means.

Table 12.1
Size of bonding jumper and grounded service conductor

Ampere rating not exceeding	Size of main bonding jumper (minimum)[a,b,c]		Cross section of main bonding jumper in square inches (minimum)[a,b,c]		Grounded service conductor (minimum)	
	Copper	Aluminum	Copper	Aluminum	Copper	Aluminum
90	8 AWG	6 AWG	0.013[d]	0.021[d]	8 AWG	6 AWG
100	6	4	0.021[d]	0.033[d]	6	4
125	6	4	0.021[d]	0.033[d]	6	4
150	6	4	0.021[e]	0.033[e]	6	4
200	4	2	0.033[e]	0.052[e]	4	2
300	2	1/0	0.052[f,g]	0.083[f,g]	2	1/0
400	1/0[h]	3/0[h]	0.083[g,h]	0.132[g,h]	1/0	3/0[h]
500	1/0	3/0	0.083	0.132	1/0	3/0
600	2/0	4/0	0.105	0.166	2/0	4/0
800	2/0	4/0	0.105	0.166	2/0	4/0
1000	3/0	250 kcmil	0.132	0.196	3/0	250 kcmil
1200	250 kcmil	250	0.196	0.196	250 kcmil	250
1600	300	400	0.236	0.314	300	400
2000	400	500	0.314	0.393	400	500
2500	500	700	0.393	0.550	500	700
3000	600	750	0.471	0.589	600	750
4000	750	1000	0.589	0.785	750	1000
5000	900	1250	0.713	0.981	900	1250
6000	1250	1500	0.981	1.178	1250	1500

[a] The cross section may be reduced to 12.5 percent of the total cross section of the largest main service conductor(s) of the same material (copper or aluminum) for any phase on equipment rated 1200 amperes and above.

[b] For equipment rated 1200 amperes or more and that has wiring terminals intended to connect service conductor wires sized larger than 600 kcmil copper or 750 kcmil aluminum, the cross section of the main bonding jumper shall be at least 12.5 percent of the total cross section of the largest main service conductor(s) of the same material (copper or aluminum) for any phase.

[c] See Table 12.2 for SI equivalents.

[d] A No. 8 (4.2 mm diameter) or larger brass or No. 10 (4.8 mm diameter) or larger steel screw may be used.

[e] A No. 10 or larger brass or steel screw may be used.

[f] A No. 10 or larger brass screw may be used.

[g] A 1/4 inch (6.4 mm) diameter or larger brass or steel screw may be used.

[h] When the ampere rating is 400 and the wire terminal connectors for the main service conductors are rated for two 3/0 AWG copper or two No. 250 kcmil aluminum conductor, but will not accept a 600 kcmil conductor, these values may be reduced to 2 AWG (0.052 square-inch) copper or 0 AWG (0.083 square-inch) aluminum.

Table 12.2
SI equivalents

Wire size, AWG	Minimum cross section, (mm^2)	Wire size, AWG or kcmil	Minimum cross section, (mm^2)
8	8.4	4/0 AWG	107
6	13.3	250 kcmil	126
4	21.2	300	152
2	33.6	400	203
1/0	53.5	500	253
2/0	67.4	600	304
3/0	85.0	750	380

12.2 If the bonding means is not used, the minimum spacings specified in Table 8.1 shall be maintained.

12.3 A meter socket with up to six meter positions and without a provision for load conductors to be connected to the grounded service conductor shall be provided with a wiring terminal bonded to the enclosure for connection of a grounded service conductor sized in accordance with Table 12.1.

Exception: The connector need not be provided in a single position meter socket.

12.4 Unless the intended use and method of installation of the bonding means are obvious, installation instructions shall be provided.

12.5 The neutral terminal or terminals of meter sockets having provisions for mounting not more than six meters may be mounted directly on or otherwise in permanent electrical connection with the enclosure, provided a secure and effective bond is made. The neutral terminal or terminals of meter sockets for seven or more meters shall be insulated but may have provision for bonding to the enclosure.

12.6 The cover of an enclosure shall be bonded to the enclosure as specified in 4.8 and 22.1.

PERFORMANCE

13 General

13.1 A representative sample of each rating, construction, and type of meter socket shall be subjected to tests for:

a) Heating;

b) Dielectric voltage-withstand;

c) Insertion-withdrawal;

d) Strength of insulating base and support;

e) Rotation prevention;

f) Bonding continuity; and

g) Other tests deemed appropriate.

14 Heating Test

14.1 Current-carrying load circuit parts shall be capable of carrying specified test currents without any part attaining a temperature rise greater than specified in 14.3 at any constant ambient temperature in the range of 25 ±5°C (77±9°F) when tested as described in 14.2 – 14.24.

14.2 The following sequence of tests shall be performed:

a) Five insertions and withdrawals are to be made of a meter provided with disconnect sleeves having 0.005 inch (0.13 mm) thick walls over the line stabs.

Exception: Such conditioning is to be omitted for sockets intended for use with a specific disconnect position and those marked in accordance with 27.7.3 as not intended for use with disconnect sleeves.

b) A temperature test is to be conducted at 100 percent of the continuous ampere rating.

c) Immediately following the temperature test, the meter is to be removed and reinserted 13 times while it is thermally hot.

d) The meter socket is to be allowed to cool 2 hours or to room temperature and is then to be removed and reinserted 12 times.

e) Following the final insertion operation, a cycling test is to be conducted consisting of 16 cycles with current on for 2 hours and off for 1 hour at 120 percent of the continuous ampere rating.

f) The temperature test is then to be repeated at 100 percent of the continuous rating.

14.3 The temperature rise observed in a meter socket shall not exceed the following:

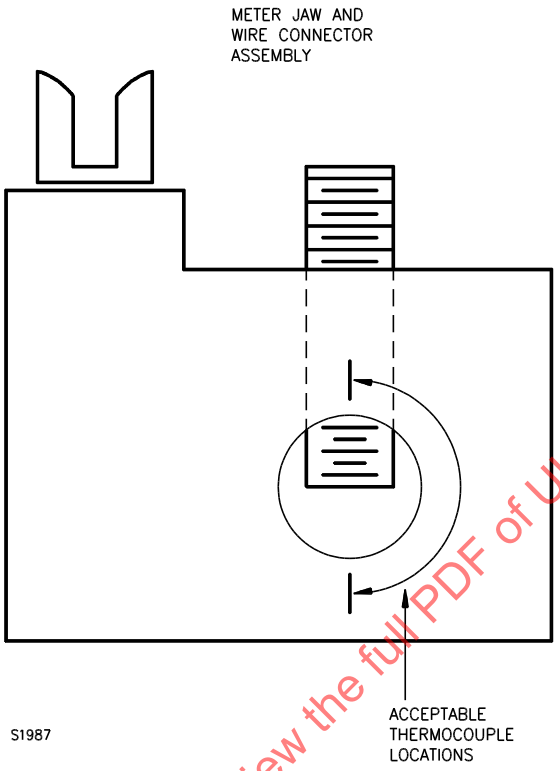
a) 65°C (117°F) at a jaw or at a bus bar when tested in accordance with 14.2 (b) and (f).

b) 55°C (99°F) within 1/8 inch (3.2 mm) of the opening for wire in a field wiring terminal, as shown in Figure 14.1, when tested in accordance with 14.2 (b) and (f).

c) 7°C (13°F) maximum increase at a jaw or a field wiring terminal when tested in accordance with 14.2(f) as compared to the rise recorded when tested in accordance with 14.2(b).

Figure 14.1

Location of thermocouple



14.4 To determine if a meter socket or meter socket assembly complies with 14.1, it is to be mounted in the intended operating position with at least 6 inches (152 mm) of clear space between it and the nearest object, with an appropriate simulated meter as specified in Table 14.1 plugged into the socket and with a sealing ring, if required, in place and with all other openings closed. The socket is to be wired with not less than 4 feet (1.2 m) of conductor per terminal connector of the smallest size as given in Table 7.1 based on the meter socket ampere rating. Two-foot (0.6-m) lengths of rigid steel conduit as specified in footnote a of Table 7.1 are to be installed in the top or bottom of the enclosure. Test conductors are to be arranged so as to reduce heating of the enclosure by induced currents. Tests are to be made in a room free from air currents, and openings around conductors are to be closed at the outer end of the conduit to prevent drafts. The test is to be conducted with the same current in the phase and neutral conductors, if applicable, at the rated current of the socket, and at any convenient voltage.

Table 14.1
Class of simulated meter to be used for heating test

Meter socket rating, amperes continuous		Simulated meter jumper bar class to be used
More than	Not more than	
0	100	100
100	200	200
200	320	320

14.5 During the temperature test, all conductors, including a neutral if required by the rating, are to be installed in the conduit. Phase currents are to be balanced so that the neutral carries no current.

Exception: In equipment rated for connection to the neutral and 2-phase conductors of a 3-phase, 4-wire system, the neutral is to carry full line current.

14.6 Copper conductors are to be used for temperature tests. The size is to be chosen from Table 7.1 for 75°C conductors, based on the continuous ampere rating of the meter socket. Note 2 of Table 7.1 is not to be used for determining conductor sizes for the temperature test.

Exception No. 1: With reference to footnote b of Table 7.1, conductors sized for 90°C (194°F) ampacity are to be used on the line side of the meter socket when the meter socket is marked for use with 90°C conductors in accordance with 27.10.5.

Exception No. 2: To qualify for an ampere rating and marking in accordance with footnote c of Table 7.1, a meter socket is to be tested with conductors of such size that the investigation establishes a continuous ampere rating no less than 80 percent of the note c ratings.

Exception No. 3: Aluminum wire is to be used if the meter socket is marked for use with Aluminum wire only.

14.7 The torque applied to assemble conductors to the terminal connectors in the socket is to be as indicated in 7.5. Joint compound is to be used in wire connectors only if its use is intended as indicated in 7.2.

14.8 The simulated meter used in the heating tests is to be of a conventional construction with a 5-inch (127-mm) high glass cover of blade arrangement coinciding with the socket under test and with the stabs or blades interconnected by tin plated copper jumpers complying with Figure 14.2 – Figure 14.4 for the appropriate rating. Potential circuit jumpers are to be 1/16 inch (1.6 mm) thick and 3/8 inch (9.5 mm) wide. The backplate or base of the simulated meter is to be of nonmetallic material.

Figure 14.2

Dimensions for jumper bars of Class 100 and 200 simulated meter

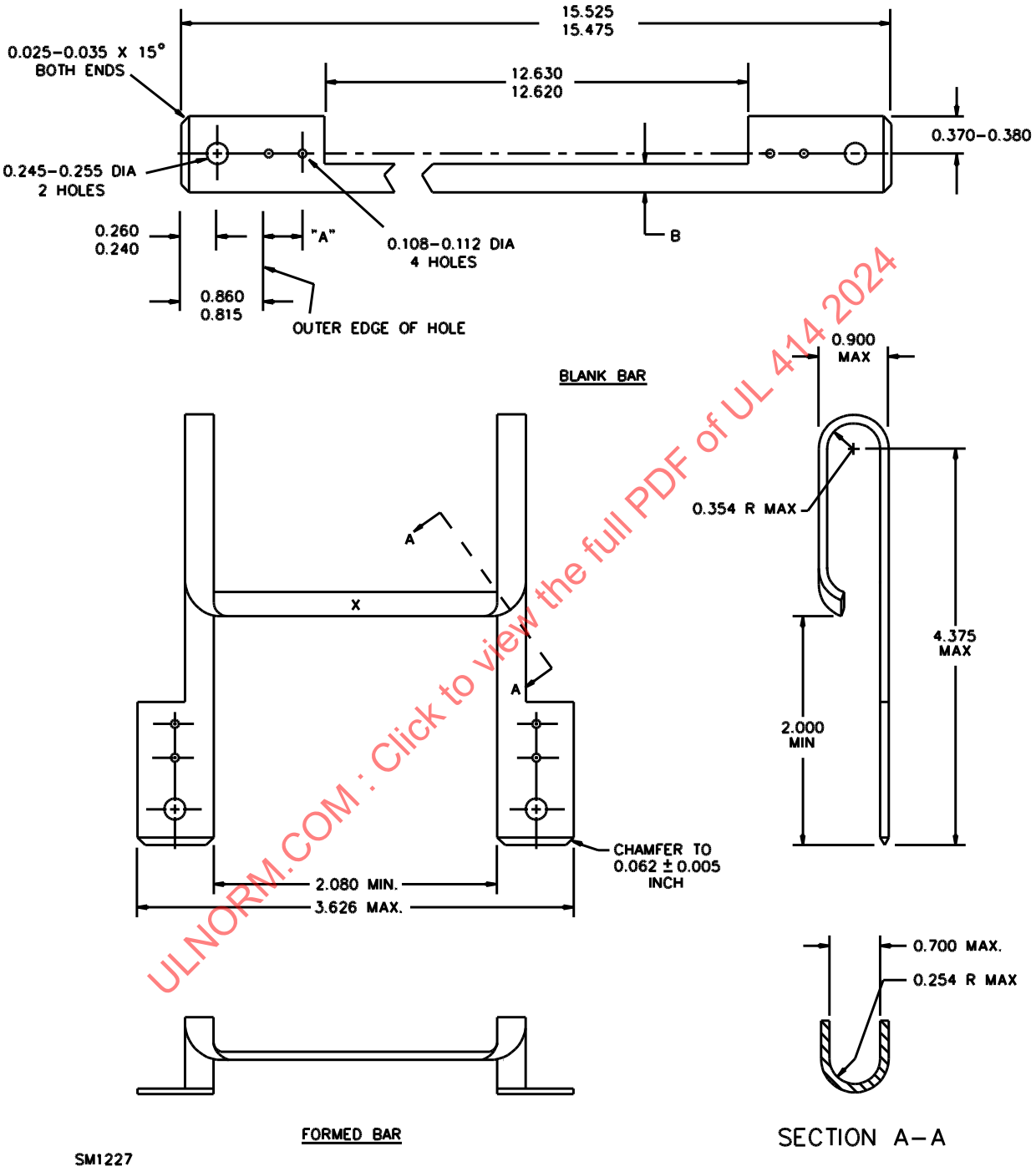


Figure 14.2 (Cont.)

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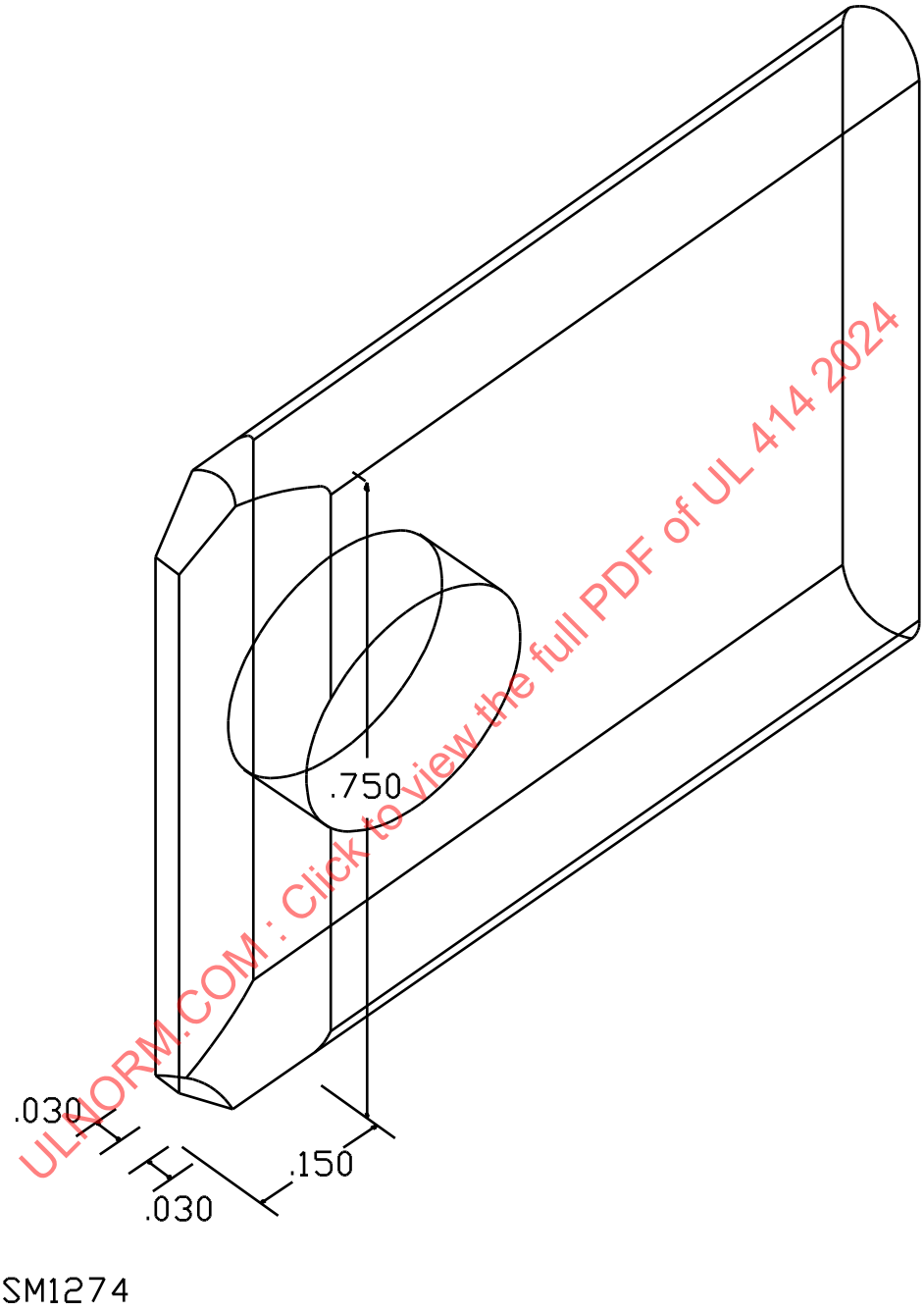

NOTES

Material is 0.094 ±0.002 inch (2.5 ±0.05 mm) by 0.750±0.005 inch (2.4 ±0.05 by 19.0 ±0.012 mm) round edge copper with electro-tin plate 0.0002 – 0.0005 inch (0.005 – 0.012 mm) thick.

All dimensions in inches. Multiply dimensions in inches by 25.4 to obtain millimeters. Round off to nearest 0.02 mm.

Dimension A for cotter pin holes determined to suit meter base plate used.

Dimension B for Class 100 simulated meter is 0.235 ±0.002 inch (6.0 ±0.05 mm) and for Class 200 simulated meter is 0.500 ±0.002 inch (12.7 ±0.05 mm).

Figure 14.3

Dimensions for jumper bars of Class 320 simulated meter

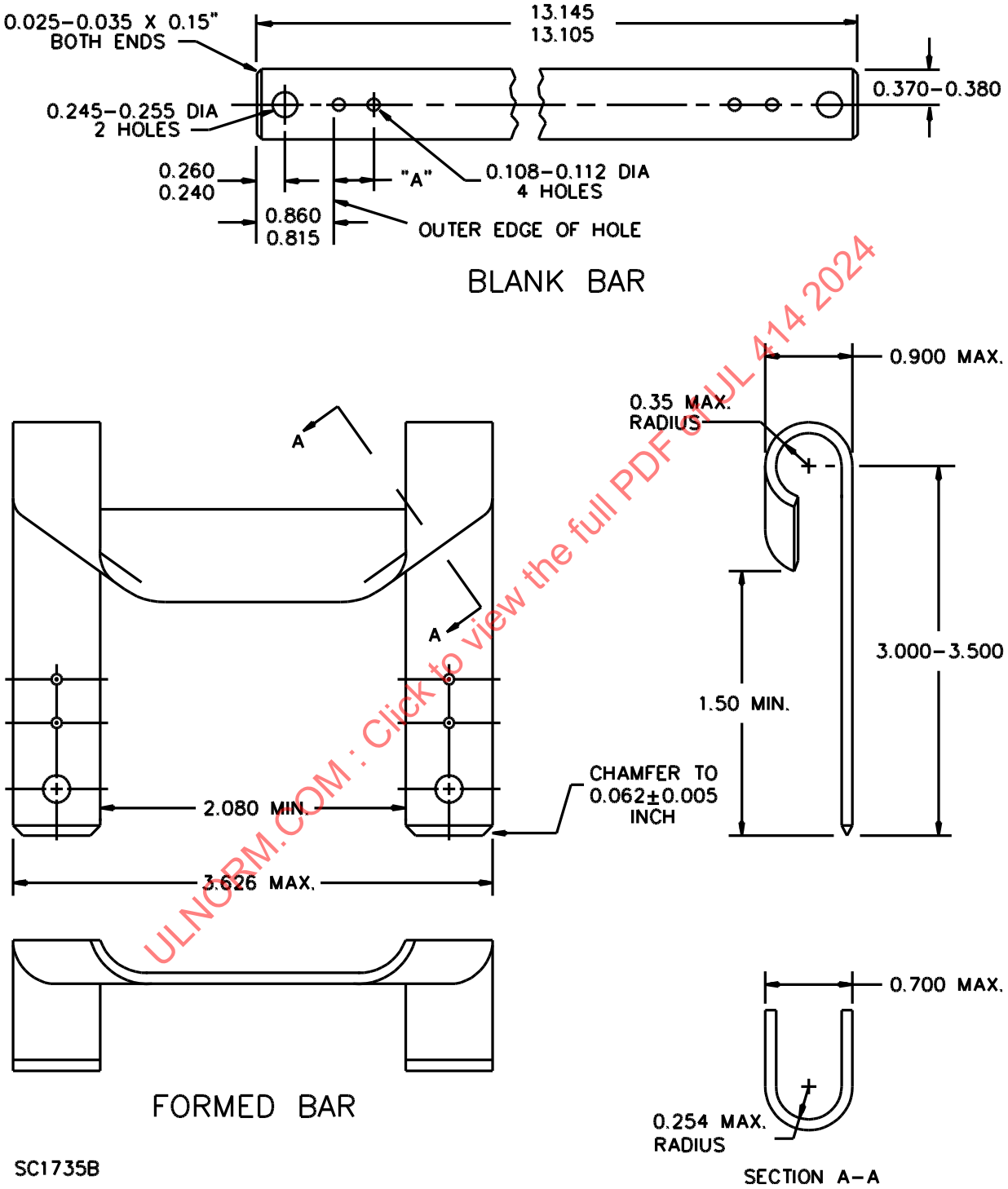

Figure 14.3 (Cont.)

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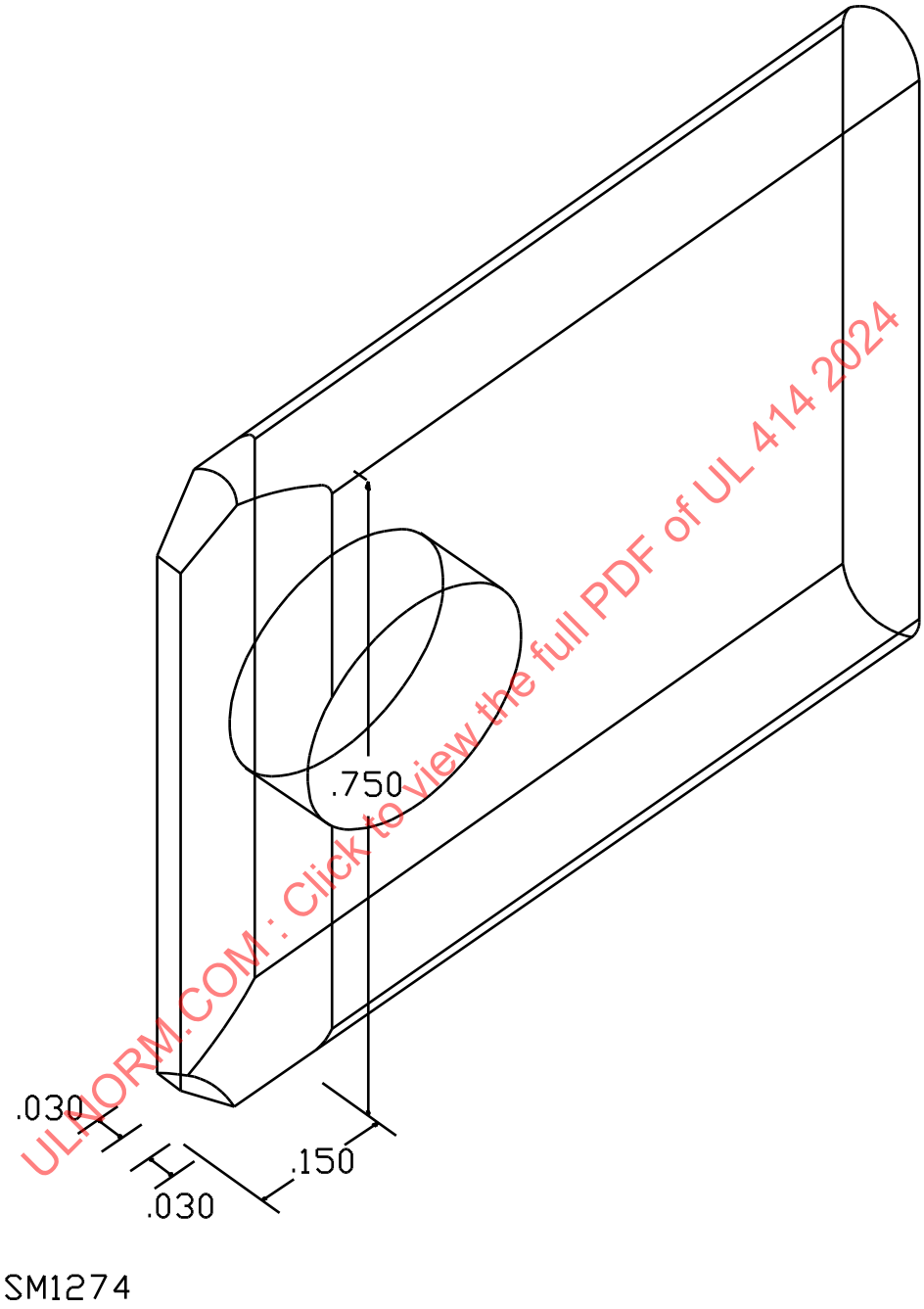


NOTES

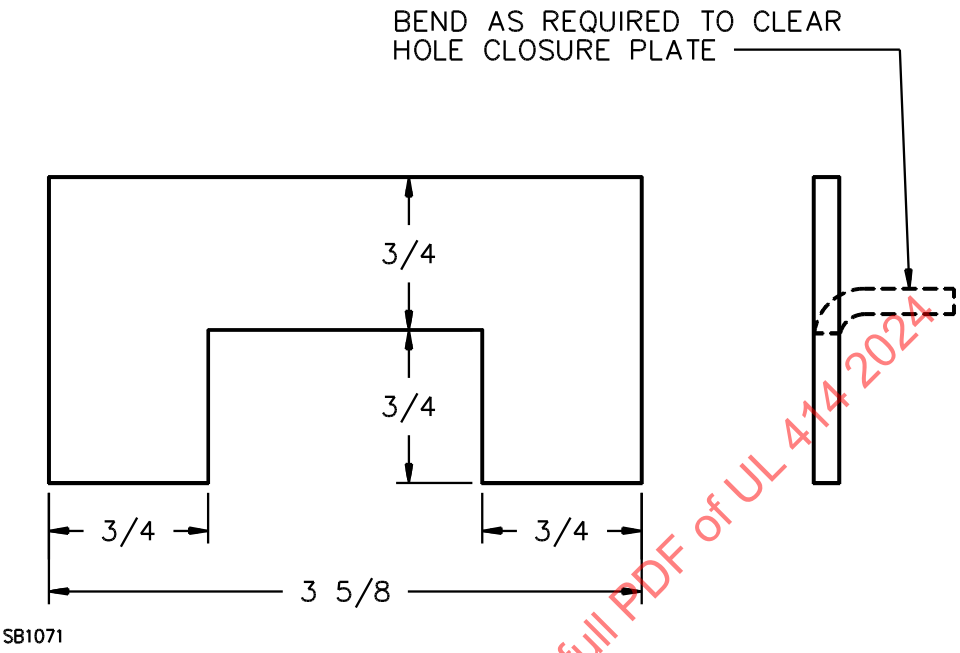
All dimensions in inches. Multiply dimensions in inches by 25.4 to obtain millimeters. Round off to nearest 0.02 mm.

Material is 0.094 ±0.002 (2.5 ±0.05 mm) by 0.750 ±0.005 inch (2.4 ±0.05 by 19.0 ±0.012 mm) round edge copper with electro-tin plate 0.0002 – 0.0005 inch (0.005 – 0.012 mm) thick.

Dimension A for copper pin holes determined to suit meter base plate used.

Figure 14.4

Jumper for testing multiple, 200-ampere, maximum socket installations



NOTES

Material is 0.094 ±0.002 inch (2.4 ±0.05 mm) thick copper sheet. Electro-tin plate 0.0002 – 0.0005 inch (0.005 – 0.012 mm) thick.

All edges to be free of burrs.

All dimensions in inches.

Tolerances ±1/32 inch (±0.8 mm).

Inches	(mm)
3/4	19.1
3-5/8	92.1

14.9 The simulated meter using the jumper bars of the appropriate class is to be used for heating tests of a single-position meter socket in accordance with Table 14.1.

14.10 A solid neutral connection in a meter socket intended for a single-phase circuit only is not to carry current in a heating test unless another pole in the meter socket is omitted from the test. This may result in the necessity for two tests.

14.11 With respect to 27.3.1, a single phase meter socket marked for use on polyphase systems is to be tested with the neutral conductor carrying the same current as the ungrounded line conductors.

14.12 The temperature test is to be performed with the meter socket connected to a single-phase circuit.

Exception: A 3-phase rated meter socket may be tested on a 3-phase circuit.

14.13 Temperature tests at the maximum ampere rating are not required, but the meter socket must comply with applicable requirements regarding terminals, wiring space, and other applicable factors.

14.14 If conductors of a circuit are separated by magnetic material as described in the Exception to 6.1.13, the construction shall be subjected to a heating test with such a value of current (within the rating) as to represent the most severe condition of inductive heating. The temperature of current carrying metal parts shall comply with the conditions of 14.1. Noncurrent carrying metal is not to show a temperature rise in excess of 45°C (81°F) nor, if likely to be contacted by conductors, a temperature in excess of the conductor insulation temperature rating.

14.15 The heating tests specified in 14.16 – 14.24 shall be made independently of each other and independently of the tests described in 14.1 – 14.14.

14.16 A meter socket equipped with a device intended to bypass the meter shall not show a temperature rise of more than 55°C (99°F) when a temperature test is conducted at 50 percent of the continuous ampere rating with the bypass circuit closed.

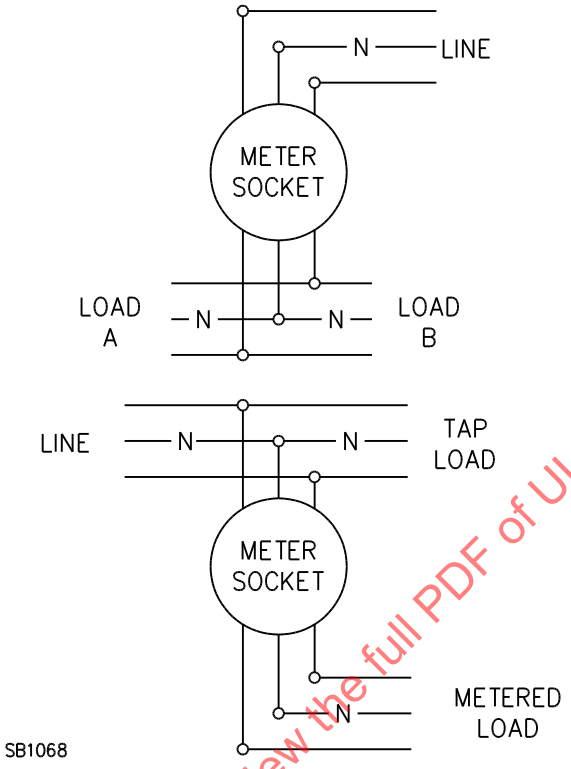
14.17 A meter socket equipped with a potential jaw or intended to be used with optional potential jaws shall be subjected to a temperature test in which a 5-ampere test current is passed through the potential jaw assembly at the same time as a current equal to the continuous ampere rating is passed through the current jaws. The meter socket is to be wired in accordance with 14.4 – 14.7. Results are acceptable if the maximum temperature rises do not exceed those specified in 14.3. This test may be combined with the temperature test mentioned in 14.2(b).

Exception: The test need not be conducted if the potential jaw has a cross-sectional area equal to or greater than 10 percent of a similarly constructed 100-ampere current jaw.

14.18 A meter socket for a single meter provided with terminals for additional load circuits as shown in Figure 14.5 shall be tested as described in 14.1 with 100 percent rated current in each load circuit.

Figure 14.5

Meter sockets with terminals for additional load circuits



14.19 A meter socket assembly intended for more than one meter is to be tested in a manner similar to that described in 14.1 with the line current equal to the overall continuous current rating of the assembly. The meter in the position nearest the line terminal is to carry a current, in accordance with 14.2, determined by the current rating of that position, and the simulated meter of Figure 14.2 or Figure 14.3 is to be used. The remainder of the line current is to be distributed among the remaining meter positions proportionate with the continuous current rating of each position. The jumper bars of Figure 14.4 are to be used with cardboard covers closing the meter opening for such other meter positions.

Exception: An additional meter position rated over 200 amperes continuous is to be tested with jumper bars considered appropriate for the rating of the position.

14.20 In a multiple meter socket in which each supply conductor is to be secured by two or more connectors, heating tests are to be made with the conductor secured in all connectors simultaneously.

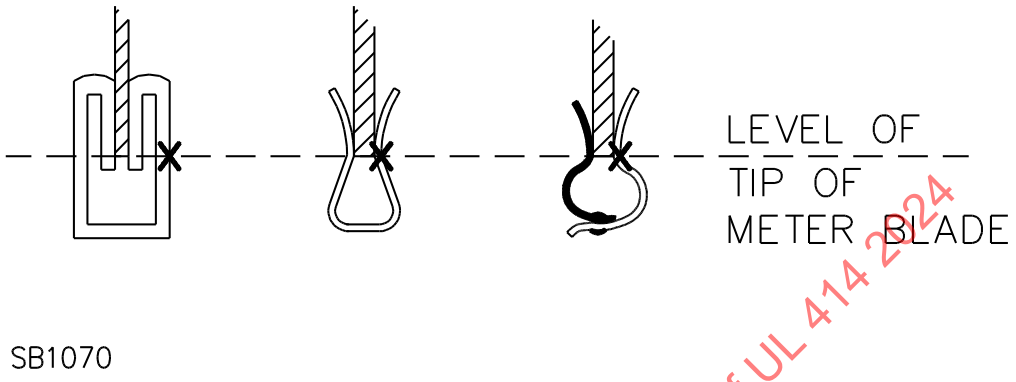
14.21 More than one heating test may be necessary in a multimeter socket assembly with non-uniform bussing.

14.22 Thermocouples are to consist of wires not larger than 24 AWG (0.21 mm^2) and not smaller than 30 AWG (0.05 mm^2). It is standard practice to employ thermocouples consisting of 30 AWG iron and constantan wires and a potentiometer type indicating instrument. Such equipment is to be used whenever referee temperature measurements by thermocouples are necessary. The thermocouple wire is to conform to the requirements for Special Tolerances thermocouples as listed in the Tolerances on Initial Values of EMF versus Temperature tables in the Standard Specification and Temperature-Electromotive Force (emf) Tables for Standardized Thermocouples, ANSI/ASTM E230/E230M.

14.23 A thermocouple is to be placed on the external conductive surface of the meter jaw as shown in Figure 14.6 and on the body of the terminal connector.

Figure 14.6

Thermocouple location



NOTE – "X" denotes thermocouples.

14.24 A heating test may be conducted at any convenient voltage. A temperature is considered to be constant if three successive readings taken at 15-minute intervals indicate no further increase in temperature.

14.25 A meter socket that employs a clamped joint construction as mentioned in Exception No. 1 to 6.2.1 or Exception No. 1 to 6.2.2, shall be subjected to the test described in 14.27. The temperature rise at the joint during the 500th cycle shall not be more than 15°C (27°F) higher than the temperature rise at the 25th cycle.

14.26 In a meter socket that employs bus bars with a coating as covered by the Exception to 6.1.4, the clamped joint or spring-loaded plug-in joint construction shall be subjected to the tests described in 14.27. Before conducting the cycling test, the joint shall be conditioned by assembling and disassembling the joints 25 times. The temperature rise at the joint during the 500th cycle shall not be more than 15°C (27°F) higher than the temperature rise at the 25th cycle.

14.27 The test sample is to consist of an assembly of bus bars connected together to form a series circuit. The bus bars are to be clamped together with the joint construction used in actual production. The number and size of the bus bar are to represent the maximum ampere rating and the maximum current density in which the joint construction is employed. This may necessitate more than one test. The length of each bus bar is to be 2 feet (0.6 m). The bus bar is to be connected to a power supply by any convenient means that will not affect the joint temperature. The power supply is to be adjusted to deliver a value of current that will result in a temperature of 75°C (135°F) above room temperature at the joint. The assembly is then to be subjected to a 500 cycle test. At the end of the 24th cycle, the current is to be readjusted to bring the temperature of the joint to 75°C above room temperature. This value of current is to be maintained for the remainder of the cycling test. At the end of the 25th and 500th cycles, the temperatures are to be recorded. The temperatures are to be measured on both sides of the joint as close as possible to the bolt or rivet. The cycling rate is to be 3 hours on and 1 hour off. The on period, during which temperatures are recorded, may be extended to more than 3 hours if necessary for the joint to attain thermal equilibrium.

Exception: The length of the bus bar may be less than 2 feet with the concurrence of those concerned.

15 Short-Circuit Current Test

15.1 Sufficient short-circuit current tests, as described in 15.2 – 15.7, with a minimum peak current of 30,000 amperes shall be conducted to represent each meter socket construction, including those with test blocks, and multiple meter socket constructions with bus bars.

Exception: Constructions having a short-circuit current rating of 10,000 amperes rms symmetrical need not be tested.

15.2 In choosing representative samples, the following factors shall be considered:

a) Bracing structure, if different, for each rating.

b) Material and cross-sectional configuration of each structure.

c) Weakest bus bar structure that could result in bus bar distortion.

d) Strongest bus bar structure that could transmit the maximum forces to the bus support or bracing.

e) A tested 4-jaw construction may represent 5- or 6-jaw meter sockets of similar construction and ratings. A tested 7-jaw construction may represent 6- or 8-jaw meter sockets of similar construction and ratings.

f) A line voltage bus or a neutral bus of a single or multiple meter socket shall be subjected to a separate short-circuit current test if it has a smaller cross-section, uses different supports, is face-to-face with a phase bus while the phase buses are edge-to-edge, or has supports spaced farther apart than the line voltage buses that were tested.

g) A meter socket having a different base or bus support need not be subjected to a short-circuit current test if, in comparison with the test constructions, the alternative base or bus support:

1) Has the same shape,

2) Is of material having equivalent mechanical strength, and

3) Is rated for an equal or lesser short-circuit current.

15.3 Either a simulated meter as used during the Heating Test, Section 14, or a commercially available watthour meter is to be in place during the short-circuit current test.

15.4 The line connections are to be made with convenient lengths of aluminum wire having an ampacity, in accordance with Table 7.1, not less than the rating of the meter socket. The load connections are to be made with 10 inch (254 mm) lengths of aluminum wire of the size used for the line connections brought to a common point and shorted.

Exception: Copper wire is to be used if the meter socket is marked for use with copper wire only.

15.5 The meter socket enclosure is to be connected through a 30-ampere, non-time delay type cartridge fuse to the line lead of the pole least likely to arc to the enclosure. This connection is to be made on the load side of the limiting impedance by a 10 AWG (5.3 mm^2) copper wire 4 – 6 feet (1.2 – 1.8 m) long.

15.6 The test circuit voltage, power factor, closing angle, available current, or time of current flow are not specified, but the required peak current must flow through the meter socket.

15.7 After a meter socket has been tested under the short circuit conditions described in 15.1– 15.6, the results are acceptable if the meter socket is in substantially the same mechanical condition as prior to the test, and it complies with all of the following conditions:

a) There is no permanent distortion or displacement of a meter jaw, bus bar, or strap that would affect the intended functioning of the meter socket or reduce an electrical spacing to less than the value specified in Table 8.1.

b) An insulator or support has not been broken or cracked to such extent that the integrity of the mounting of a live part is impaired.

c) The fuse mentioned in 15.5 has not opened.

d) The enclosure or a part of the enclosure has not been damaged nor displaced to the extent that a live part is accessible.

e) There is no arcing damage.

f) No conductor pulls out of a terminal connector, and there is no damage to the conductor insulation or the conductor.

g) The meter socket complies with the Dielectric Voltage-Withstand Test, Section 20.

15.8 Based on the test program covered in 15.1 – 15.7, a meter socket may be assigned short-circuit current ratings in accordance with Table 15.1. The meter socket shall be marked in accordance with 27.12.3 or 27.12.4, as appropriate.

Table 15.1
Maximum assigned short-circuit current values

Meter socket continuous ampere rating	Maximum rms symmetrical amperes (x1000)	Volts, maximum	Number of phases	Maximum overcurrent protection, amperes
Units using fuse protection				
0 – 320	100	600	1 and 3	400 Class J or T
0 – 200[a]	42	480	1 and 3	200 Class RK1
0 – 200[a]	200	600	1 and 3	200 Class J or T
0 – 100	100	600	1 and 3	100 Class RK5
0 – 320	50	300	1 and 3	600 Class T (300 Volt)
Units using circuit breaker protection				
0 – 320	14[b]	600	1 and 3	Any
0 – 320	18[b]	240	1	400
0 – 200[a]	18[b]	240	1 and 3	200
0 – 200[a]	22[b]	240	1	125
0 – 100	25[b]	240	1 and 3	100

[a] This rating may also be assigned to a meter socked for a Class 320 meter.

[b] This value is not to exceed the interrupting rating of the circuit breaker with which the meter socket is used. A higher rating may be assigned if tested and marked for use with specified circuit breakers as covered in the Short-Circuit Current Test with Specific Circuit Breaker, Section 16.

16 Short-Circuit Current Test with Specific Circuit Breaker

16.1 General

16.1.1 A meter socket to be marked for use with a specific circuit breaker as covered in 27.12.5 and having a short-circuit current rating higher than specified in Table 15.1 for circuit breaker protection shall, in addition to the Short-Circuit Current Test, Section 15, be subjected to a short-circuit current test with the specific circuit breaker in accordance with 16.1.2 – 16.5.2.

16.1.2 Sufficient tests shall be conducted to represent each construction to be marked as covered in 27.12.5, using the criteria of 15.2 and also representing the construction having the least electrical impedance to current flow.

16.1.3 In addition to samples of meter sockets, samples provided for tests are to include, as necessary:

a) A watthour meter as covered in 16.3.2;

b) Wire and conduit as covered in 16.3.4;

c) A fuse as covered in 16.3.3; and

d) A circuit breaker as covered in 16.3.5.

16.2 Test circuit calibration

16.2.1 The available rms symmetrical current and power factor at the test station terminals are to be determined in accordance with the Standard for Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit Breaker Enclosures, UL 489. The power factor is to be in accordance with Table 16.1.

Exception: If the physical arrangement in the test station requires leads longer than specified in 16.3.4, the additional length of leads is to be included in the test circuit calibration.

Table 16.1
Power factor of test circuits

Test circuits in rms symmetrical amperes		Maximum power factor
More than	Not more than	
10,000	20,000	0.3
20,000	200,000	0.2

16.2.2 A 3-phase test circuit having an open-circuit voltage at the supply connections of 100 – 105 percent of rated voltage for the test being conducted is to be used. The supply frequency is to be in the range of 48 – 60 hertz.

Exception No. 1: With the concurrence of those concerned, a voltage higher than 105 percent may be employed.

Exception No. 2: A 4-jaw meter socket that has no provision for a fifth jaw may be tested on a single-phase test circuit.

Exception No. 3: A 7-jaw meter socket may be tested with a single-phase test circuit having an open-circuit voltage not less than 115.5 percent of the meter socket voltage rating using adjacent pairs of jaws if the rms symmetrical short circuit current available at the test station terminals at this voltage is also at

least 115.5 percent of the meter socket short circuit rating. Such a test would use two poles of a 3-pole circuit breaker.

16.3 Sample preparation

16.3.1 The meter socket is to be mounted and supplied as in an intended installation.

16.3.2 A commercially-available watthour meter with a class rating not less than the continuous current rating of the meter socket is to be in place during the short circuit test.

16.3.3 The meter socket enclosure is to be connected through a 30-ampere, non-time delay type cartridge fuse to the line lead of the pole least likely to arc to the enclosure. This connection is to be made on the load side of the limiting impedance by a 10 AWG (5.3 mm^2) copper wire 4 – 6 feet (1.2 – 1.8 m) long.

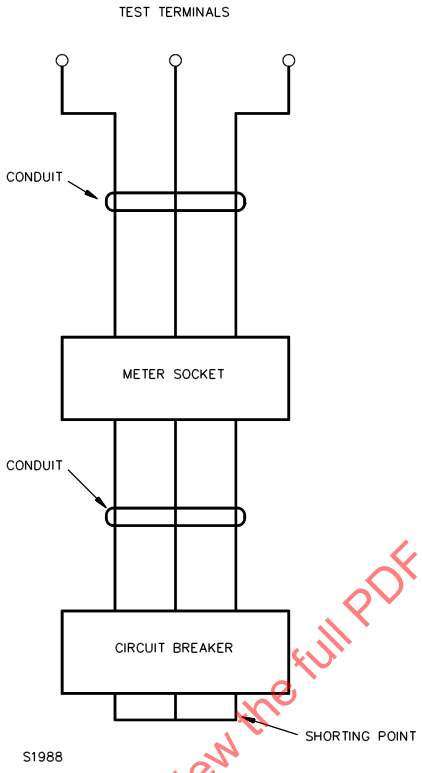
16.3.4 As shown in Figure 16.1, the meter socket is to be connected by up to 9 feet (2.7 m) of aluminum wire per phase, the length to be divided between the line and load terminals of the meter socket and the load side of the fuse or circuit breaker as desired. The wire is to have an ampacity as shown in Table 7.1 based on the 75°C (167°F) insulation nearest to but not less than the rating of the meter socket. The terminals are to be tightened to the torque specified by the meter socket manufacturer in accordance with 27.10.3. Line and load wires may enter the enclosure through 24 inch (610 mm) or shorter lengths of rigid steel conduit. There is to be no bracing of the cable inside the enclosure unless the construction includes instructions for such bracing. The provision for bracing may or may not be provided as part of the meter socket. Bracing hardware not provided as part of the meter socket shall be available to the installer. A cable may be braced as it leaves the enclosure.

Exception No. 1: The length of the supply wires may exceed 9 feet per phase if the excess length is included in the test circuit calibration as covered in the Exception to 16.2.1.

Exception No. 2: Copper wire is to be used if the meter socket is marked for use with copper wire only.

Figure 16.1

Line connection for tests



16.3.5 The load side of the meter socket shall be wired to a molded case circuit breaker of the manufacturer, type, and rating, as marked in accordance with 27.12.5. A circuit breaker having adjustable trip features is to have all adjustments set at the maximum current and time setting. Separate tests are required for each type of circuit breaker to be shown in the marking.

Exception: A 3-phase test with a 7-jaw meter socket and 3-pole circuit breaker may represent a 4-, 5-, 6-, or 8-jaw single phase construction for use with a 2-pole circuit breaker having the same maximum voltage rating, maximum ampere rating, and the same manufacturer and type.

16.4 Closing

16.4.1 Controlled closing is to be employed in a single-phase test. Closing is to occur within 10 electrical degrees of the zero point of the supply voltage wave. Random closing is to be employed in each 3-phase test. All tests are to be performed by closing the test circuit onto the series combination of meter socket and circuit breaker. The circuit breaker is to be in the closed position with its load terminals shorted together.

16.5 Peak let-through current

16.5.1 The maximum peak let-through current is to be measured during the short-circuit current testing of the meter socket. The short circuit rating of the meter socket shall be such that the measured value does not exceed 30,000 amperes.

16.5.2 In addition to the criteria specified in 16.5.1, the results shall be as specified in 15.7.

17 Rain Test

17.1 To determine if an enclosure complies with the rain test specified in the Standard for Enclosures for Electrical Equipment, Environmental Considerations, UL 50E, a complete enclosure with conduit connections (without pipe thread compounds) is to be mounted as in actual service and subjected to the rain test. The simulated rain shall be directed only at the front of a semi-flush meter socket enclosure. If any test results in the entrance of water above the lowest terminal lug, including a neutral or grounding connection or other live part within the enclosure, the enclosure is considered not to be acceptable. The equipment is to be mounted in its intended operating position, and for an enclosure marked only as Type 3R the meter opening is to be sealed so as to prevent entrance of water during the tests.

18 Concentric Knockout Rain Test

18.1 Three samples of an enclosure containing a concentric knockout located above live parts are to be tested as described in 18.2.

18.2 The meter socket enclosures containing a concentric knockout located above live parts are to have the inner knockout removed using a hammer and punch. The inner knockout is to be fitted with conduit secured by a Type 3R fitting. The samples are to then be subjected to the Rain Test, Section 17.

19 Insertion and Withdrawal Force Test for Meter Jaws

19.1 Five meter socket samples that have not been conditioned or lubricated shall be subjected to the insertion and withdrawal of a simulated meter as described in 19.3. During and after the test:

a) No operation shall require a force greater than 100 pounds (445 N) and

b) The base shall not fracture or become permanently deformed.

Exception No. 1: A meter socket employing jaws of the release type shall be investigated in accordance with 19.2.

Exception No. 2: Lubrication may be employed if usually supplied with the meter socket.

19.2 For jaw release sockets, the force required to remove the simulated meter from the clamped jaws of the meter socket shall be measured and recorded.

Exception: A force for withdrawal of greater than 40 pounds (178 N) per blade need not be applied.

19.3 The insertion and removal forces of 19.1 and 19.2 may be determined by either mechanized or manual equipment (tensile test equipment or spring scales) or by the application of dead weight. Rocking or manipulation of the meter in a vertical plane may be used to obtain insertion or removal of the blades.

19.4 The force required to remove a single blade from a jaw of the socket shall be determined. The removal force for each jaw of the socket is to be determined by inserting a single blade into the jaw and increasing the value of weight suspended from the blade until blade disengagement occurs. The removal forces are to be recorded.

Exception: The test is not applicable to jaw release sockets.

20 Dielectric Voltage-Withstand Test

20.1 General

20.1.1 A meter socket shall be subjected for a period of 1 minute to the application of a 60-hertz potential of 1000 volts plus twice the rated voltage of the device. There shall be no electrical breakdown.

20.1.2 A meter socket incorporating reduced spacings in accordance with note a or b of Table 8.1 shall be subjected for a period of 1 minute to the application of a 60-hertz potential of 6000 volts.

20.1.3 To determine if a meter socket complies with 20.1.1 (and 20.1.2, if applicable), it is to be stressed by means of a transformer having a capacity of at least 500 volt-amperes, the output voltage of which can be varied and is essentially sinusoidal.

20.1.4 The test potential is to be applied between:

a) Live parts and the enclosure and

b) Poles or circuits of opposite polarity. During this test, jaws are to have meter blades installed to simulate jaw position when a meter is installed.

20.1.5 The applied potential is to be increased from zero until the required test value is reached and is to be held at that value for 1 minute. The increase in the applied potential is to be at a uniform rate and as rapid as consistent with its value being correctly indicated by the voltmeter.

20.2 Insulating barriers

20.2.1 With regard to 9.1.3 and 9.1.4, the barrier material is to be placed between two metal electrodes. The electrodes are to be cylindrical brass or stainless steel rods 1/4 inch (6.4 mm) in diameter with edges rounded to a 1/32 inch (0.8 mm) radius. The test potential is to be increased to the test value and is to be maintained for 1 second. There shall be no dielectric breakdown.

21 Clamped Insulating Joint Test

21.1 With respect to 8.6, a clamped joint between two insulators is to be tested using two samples.

a) The first sample is to have the clamped joint opened up to produce a space 1/8 inch (3.2 mm) wide. This may be accomplished by loosening the clamping means or by drilling a 1/8 inch diameter hole at the joint between the insulators at a point of minimum spacing between the metal parts on the opposite sides of the joint. The drilled hole shall not decrease spacings between the opposite polarity parts as measured through the crack between the insulators. The 60-hertz dielectric-breakdown voltage through this hole is then to be determined by applying a gradually increasing voltage (500 volts per second) until breakdown occurs.

b) The second sample with the clamped joint intact is to be subjected to a gradually increasing 60-hertz voltage until 110 percent of the breakdown voltage of (a) has been reached. If the breakdown voltage of (a) was less than 4600 volts rms, the voltage applied to the second sample is to be further increased to 5000 volts rms and held for 1 second. The clamped joint may be used if there is no dielectric breakdown of the second sample.

22 Bonding Continuity Test

22.1 To determine if a meter socket complies with the requirements of 4.8 and 12.6, and to determine if contact exists between the cover and the enclosure, a 120-volt circuit is to be established through the

cover and the enclosing case, in series with a 60-watt test lamp. The lamp shall provide a visible indication of the continuity of the contact. This determination is to be made with paint and similar coatings undamaged as well as after the cover has been removed and replaced several times; and risk of corrosion is to be taken into consideration.

22.2 The resistance of the connection between adjacent enclosures shall not be more than 0.005 ohm. The determination of resistance is to be made in accordance with 22.3.

22.3 The enclosures are to be joined and installed in the intended manner, and a direct current of 30 amperes is to be passed between adjacent sections. The resulting voltage drop is to be measured between a point (file mark) on each enclosure 1/16 inch (1.6 mm) from the connection. The resistance is to be calculated from the measured voltage drop and the current passing through the enclosures.

23 Test of Insertion and Withdrawal Force on Meter Base

23.1 To determine compliance with the requirements in 5.9 during meter insertion, one sample of the meter socket complete with cover shall be subjected to a 200 pound (91 kg) static load applied to any two jaws (not diagonally opposite) for a period of 1 minute. The load is to be applied to the center of a rigid bar on which two meter blades are mounted for alignment purposes. The meter blades are to be positioned in a parallel or in line configuration depending on the disposition of the jaws to be tested, and may extend so as to bottom in the jaws. The insulating base shall not fracture or become permanently deformed.

23.2 To determine compliance with the requirements of 5.9 during meter removal, one sample of the meter socket is to be supported with the meter opening facing down. A static load of 40 pounds (18.1 kg) is to be applied simultaneously to each of any two jaws (not diagonally opposite) for a period of 1 minute. The insulating base shall not fracture and no supporting member shall become permanently deformed.

23.3 To determine compliance with the requirements of 5.9, one sample of the meter socket is to be supported on a rigid surface. A watt-hour meter is to be inserted until the back of the meter rests squarely on the flange of the socket or to the maximum depth permitted by the blades and jaws. Upon removal of the insertion force, the back of the meter shall not move away from the socket flange more than 1/16 inch (1.6 mm).

24 Strength Test of Insulating Base and Support

24.1 The insulating base shall not be damaged when:

a) Supporting a field wiring terminal where wire connectors securing short lengths of conductors of rated ampacity are torqued to 110 percent of the value marked on the meter socket.

b) With respect to 7.6 and 7.14, the hardware securing the wire connector is torqued to 110 percent of the value marked on the meter socket.

24.2 Damage is considered to have occurred if:

a) The base insulating material cracks or rotates such that spacings are reduced below the values specified in Spacings, Section 8;

b) Bosses, recesses, or other means to restrict turning do not perform their intended function;

c) Straps or bus bars bend or twist; or

d) Members move at electrical joints.

Minor chipping or flaking of brittle insulating material may occur if the performance is not otherwise impaired. Momentary flexing of metallic members without permanent deformation may occur.

25 Test of Torque and Force on Test Block

25.1 With respect to 6.3.3, one sample of a test block shall be subjected to the conditions described in 25.2 and 25.3. There shall be no damage to the insulating base or to the means restricting rotation of the disconnect nut stud, nor displacement of the disconnect stud greater than 1/8 inch (3.2 mm).

25.2 The test block disconnect nut assembly is to be tightened to a torque of 110 percent of the value marked in accordance with 27.11.1.

25.3 With the disconnect nut assembly removed from the securing stud, a 25-pound (111-N) force is to be applied inwardly and axially for 1 minute to the tip of the test block disconnect nut stud. Displacement of the stud is to be measured with the force applied.

RATINGS

26 Voltage and Current Ratings

26.1 Each meter socket shall be rated 300 or 600 volts alternating current and have a continuous ampere rating. A maximum ampere rating may also be provided in accordance with 27.3.5. No current rating of a single meter socket position shall be greater than 400 amperes.

Exception: A voltage rating less than, and in place of, 300 volts alternating current may be provided if the meter socket complies with the requirements applicable to a 300-volt rated meter socket.

26.2 A meter socket assembly with more than one meter position shall have an additional current rating for the assembly that denotes the continuous current rating of the line bus. This rating is to be:

a) Not less than the values shown in Table 26.1 and

b) Not more than the sum of the individual meter sockets, based on the continuous ampere rating used in accordance with 27.3.5.

Reference 27.3.4 and 27.3.6 for marking requirements for the line bus.

Table 26.1
Minimum ampere rating of assembly

Number of meter sockets assembled together	Percent of sum of ampere ratings[a]
2	50
3 – 5	45
6 – 7	44
8 – 10	43
11	42
12 – 13	41
14 or more	40

[a] Maximum ampere rating is used in accordance with 27.3.5.

MARKINGS

27 General

27.1 Location

27.1.1 A marking shall be located as shown in Table 27.1 and shall comply with Permanence of Marking, Section 28.

Table 27.1
Location of required markings

Markings	Reference paragraphs	Marking visible with:[a]	
		Cover removed	Cover and meter installed
Identification	27.2.1 a), c), and d)		X
Factory identification	27.2.2	X	
Ratings	27.2.1 b), 27.3.1– 27.3.7	X	
Enclosure	27.4.1		X
	27.4.2	b	b
	27.4.3	X	
Top (overhead) or bottom (underground) feed	27.5.1	X	
Accessories	27.6.1 – 27.6.3	X	
Circuit closers and disconnects	27.7.1		X
	27.7.2, 27.7.3	X	
Neutral	27.8.1	X	
Field installation	27.9.1	X	
Terminals	27.10.1 – 27.10.17	X	
Test blocks	27.11.1	X	
Short-circuit current	27.12.1 – 27.12.5	X	

[a] An "X" signifies that the marking is to be visible under the conditions specified.

[b] Marking is to be located on the flange as specified in 27.4.2.

27.2 Identification

27.2.1 A meter socket shall be marked with:

a) The manufacturer's name, trademark or other descriptive marking by which the organization responsible for the product may be identified;

b) The electrical rating;

c) An identifying designation such as a type or model number; and

d) Other appropriate markings as specified elsewhere in these requirements.

27.2.2 An open-type meter socket base shall be marked to specify that it shall be installed in an enclosure and used only with current transformers in commercial and industrial applications.

27.2.3 If a manufacturer produces or assembles meter sockets at more than one factory, each finished device shall have a distinctive marking, which may be in code, by which it may be identified as the product of a particular factory.

27.3 Ratings

27.3.1 A meter socket as mentioned in 14.10 shall be marked to restrict the voltage rating to single phase but may have an additional marking to accommodate use on a polyphase system in accordance with 14.11.

27.3.2 A meter socket having facilities for terminating more than one conductor at any line or load pole shall be marked with the ampere rating of each set of terminals.

27.3.3 The continuous ampere rating of a meter socket shall be marked as follows: "____ Amp Continuous."

27.3.4 Meter socket assemblies with more than one meter position shall be marked with an additional ampere rating as follows: "Line Bus Rating _____ Amp Continuous." or "Overall Assembly Rated _____ Amp Continuous", or other equivalent wording.

27.3.5 If a meter socket is marked with a maximum ampere rating, the complete marking shall appear as follows: "____ Amp (____ Amp Continuous)." The maximum ampere rating shall be 125 percent or less of the continuous ampere rating.

27.3.6 Meter socket assemblies with more than one meter position may also be marked with a maximum ampere rating, the complete marking shall appear as follows: Line Bus Rating _____ Amp (_____Amp Continuous)." or "Overall Assembly Rated _____ Amp (_____ Amp Continuous)", or other equivalent wording. The maximum line bus ampere rating shall be 125 percent or less of the continuous line bus ampere rating.

27.3.7 For a current rating as shown in note c of Table 7.1, a meter socket shall be marked to limit that rating to single-phase, 3-wire dwelling service applications. Such a rating shall not exceed 125 percent of the continuous ampere rating.

Exception: The word residential may be used in place of the word dwelling.

27.4 Enclosure

27.4.1 A meter socket shall be marked with a Type number (1, 2, 3, 3R, 3S, 4, or 4X) indicating the environmental conditions in which it is capable of being used as specified in the Standard for Enclosures for Electrical Equipment, Environmental Considerations, UL 50E. A meter socket that complies with the requirements for more than one type of enclosure is not prohibited from having multiple designations. A meter socket shall not be marked with an enclosure designation of Type 6, 6P, 11, 12, 12K, or 13.

Exception: Open-type meter socket bases are not required to be marked with a Type number.

27.4.2 With respect to 4.22, a meter socket of the semi-flush type shall be provided with markings to specify that when the enclosure is mounted as intended, the flange shall be covered by building paper or flashing. The marking shall be located on the front of the flange.

27.4.3 An enclosure of the gangable type shall be:

a) Provided with instructions on how the units are to be joined and

b) Marked to indicate by catalog number or other designation:

1) Those enclosures with which it can be joined and

2) The links or jumpers necessary to interconnect the current carrying parts.

27.4.4 With regard to note A of Figure 10.1 and Figure 10.2, if a conduit hub or factory provision for a hub is not provided and if the meter socket manufacturer intends to allow the wire entry to be located other than at the center line of the meter socket base, the location for an opening through which a conductor may enter or exit an enclosure shall be marked on the enclosure or on a wiring diagram provided with the meter socket.

27.5 Top (overhead) or bottom (underground) feed

27.5.1 Unless a meter socket is intended for supply wiring from both top and bottom of the enclosure, it shall be marked "Overhead feed only," or " Underground feed only," or the equivalent. The phrase "Top Feed" is considered equivalent to "Overhead Feed" and "Bottom Feed" is considered equivalent to "Underground Feed."

27.6 Accessories

27.6.1 If, in accordance with 3.2, an accessory is shipped from the factory separate from the meter socket with which it is intended to be used:

a) The accessory shall be marked with its own catalog number or the equivalent and with the name or trademark of the manufacturer;

b) The meter socket shall be marked to indicate the catalog number, or the equivalent, of any accessory that is for use with it; and

c) Installation instructions shall be furnished with the accessory or with the meter socket unless the construction makes the installation obvious.

27.6.2 Equipment provided with means to accommodate one or more separable conduit hubs and closure fittings shall be marked with the name or trademark of the manufacturer and with the conduit size and corresponding catalog designation of those fittings that are for use with that enclosure.

27.6.3 A separable conduit hub and a closure fitting shall be marked with the manufacturer's name or trademark and the catalog number or equivalent. Such a hub or fitting may be shipped separately, and any gaskets, hardware, and instructions necessary for installation shall be shipped with the fitting packaged with the enclosure.

27.7 Circuit closers and disconnects

27.7.1 A meter socket provided with a device that will automatically render load circuit parts live when the meter is not in place shall be marked "WARNING" and the following or the equivalent: "Removal of meter does not de-energize circuit."

27.7.2 A meter socket provided with a manually operated device that will render load circuit parts live when the meter is not in place shall be marked to caution that the circuit may be live with meter out.

27.7.3 A meter socket intended to provide a disconnect position for the insertion of a watthour meter, or that is not intended for use with disconnect sleeves, shall be marked to indicate the intended use or limitations.

27.8 Neutral

27.8.1 A meter socket that contains an insulated neutral shall be marked to indicate that the neutral terminal is bonded to the enclosure if that is the case.

27.9 Field installation

27.9.1 A meter socket and a mounting post or pedestal that can be installed together in the field as distribution equipment shall each be marked for use together. The marking shall include the manufacturer's name or trademark and catalog number of equipment to be used with it.

27.10 Terminals

27.10.1 If a wire terminal is rated for securing more than one conductor in an opening and is intended for such use, a marking indicating the number of conductors shall be provided.

27.10.2 If a factory-installed pressure terminal connector or terminal assembly covered in 7.6(d) requires use of a particular tool for securing a field installed conductor, any necessary instructions for using the tool shall be provided. The instructions shall be included in a visible location such as on the connector, on a wiring diagram, or on a tag secured to the connector.

27.10.3 With respect to 7.5, a meter socket shall be marked to show a range of values or a nominal value of tightening torque to be applied to the clamping screws of all terminal connectors for field wiring.

27.10.4 The size (AWG) and conductor metal (copper or aluminum) of the insulated wire intended to be field connected and for which the equipment is suitable with regard to:

a) Ampacity, as specified in Table 7.1;

b) The field wiring terminal, as specified in 7.4; and

c) Wire-bending distance, as specified in Wire-Bending Distance, Section 10,

shall be indicated by markings in a readily visible location. The marked wire range may include smaller sizes to allow for use of the meter socket at less than its rated current or larger sizes to allow for the voltage drop if the required wire-bending distance is provided for the maximum sized conductor specified in the marking. These markings may be provided on a wiring diagram or on the terminal connector if the terminal connector is an integral, nonremovable part of the meter socket jaw.

27.10.5 If a meter socket is intended for and has been tested for use with 90°C (194°F) ampacity-sized conductors on the line side of the meter socket in accordance with Exception No. 1 to 14.6, the meter socket shall be marked "Conductor sized for 90°C may be used on the line side of the meter socket" or the equivalent.

27.10.6 If any terminal is marked to indicate that aluminum wire may be used at that terminal (such as by being marked with the symbol A1), and if such marking is visible under the conditions described in 27.10.11, the equipment shall be marked in accordance with 27.10.7, 27.10.8, or 27.10.9, whichever applies.

27.10.7 If, because of wiring space or other factors, no terminal is rated for use with aluminum conductors, whether marked on the terminal or not, the equipment shall be marked "Use copper wire only."

27.10.8 If the wiring space and other factors are such that all terminals are rated for use with aluminum conductors as well as copper conductors, the equipment shall be marked "Use copper or aluminum wire."

27.10.9 If the wiring space and other factors are such that some terminals are rated for use with aluminum conductors as well as with copper conductors while the remainder of the terminals are rated for use with copper conductors only, the equipment shall be marked "Use copper wire only except at terminals...." The marking shall positively identify the terminals that are rated for use with aluminum wire.

27.10.10 The word "terminal" as used in 27.10.6 – 27.10.9 signifies any field wiring terminal of the equipment as well as all terminals of any component assembly that is installed or intended to be installed.

27.10.11 The term "visible" as used in 27.10.6 signifies a marking that will be visible when a cover has been removed. A marking on a separately supplied connector or a connector or part thereof that is likely to be removed or displaced during the wiring operation is considered to be visible.

27.10.12 Only the words within the quotation marks in 27.10.7 – 27.10.9 shall be used when these markings are provided, and any abbreviation for copper and aluminum shall be "Cu-Al" or "Al-Cu."

Exception: A marking employing a wording differing from that specified in 27.10.9 may be considered equivalent if it clearly and completely conveys the significant information.

27.10.13 The lettering in the marking described in 27.10.9 and the Exception to 27.10.12 shall not be less than 3/32 inch (2.4 mm) in height.

27.10.14 A terminal capable of securing two or more combinations of conductors in multiple, any of which has a current-carrying capacity rated for the application, shall be identified and marked unless the equipment is rated for use with the combination of conductors requiring the larger wiring space. The terminal shall be identified by a prominent marking that will state the number and size of conductor for which the terminal is intended.

27.10.15 The intended use of any terminal with respect to:

a) Number;

b) Size;

c) Material of conductor;

d) Application of joint compound; or

e) Terminal location

may be shown by a marking associated with other required markings (such as on a wiring diagram). Such markings shall be independent of any markings on the connectors.

Exception: The markings may appear on wire connectors of the integral type.

27.10.16 If it is intended that terminal connectors be field installed, the equipment shall be marked to indicate the identifying designation of acceptable terminal assemblies.

27.10.17 The terminal assembly or the packaging shall carry a marking comprising the manufacturer's name and identifying designation.

27.10.18 With respect to 7.6 and 7.14, tightening torque for the hardware that fastens the wire connector to the meter socket shall be provided in the equipment by the manufacturer.

27.11 Test blocks

27.11.1 A meter socket provided with a test block assembly shall be marked to show the value of torque to be applied to the disconnect nut.

27.12 Short circuit ratings

27.12.1 A meter socket shall be marked with the following:

a) The phrase "Short-circuit current rating," the rms symmetrical short-circuit current rating in amperes as noted in Table 27.2, and the phrase "Watthour meter not included in short-circuit current rating."

Exception: A meter socket rated 30 amperes or less (intended for use with current transformers) need not be so marked.

b) The maximum voltage rating for each marked short-circuit current rating.

c) Additional markings as covered in 27.12.3 – 27.12.5 if the rms symmetrical short-circuit current rating of the meter socket exceeds 10,000 amperes.

Table 27.2
Short circuit current

RMS symmetrical amperes		
10,000	30,000	85,000
14,000	35,000	100,000
18,000	42,000	125,000
22,000	50,000	150,000
25,000	65,000	200,000

27.12.2 The short-circuit current rating of a meter socket shall be located where it will be visible after the meter socket is installed. The location of the marking may be such that the cover or watthour meter must be removed to render the marking visible. This rating shall be:

a) An integral part of a marking containing the manufacturer's name or

b) An integral part of other required marking.

If there is more than one short-circuit current rating, all such ratings shall appear together.

27.12.3 If the short circuit current rating of a meter socket is dependent upon the use of a current limiting fuse, as covered in Table 15.1, the meter socket shall be marked "When used in conjunction with ____ ampere maximum Class ____ fuse, this meter socket is rated for use on a circuit capable of delivering not more than ____ RMS symmetrical amperes ____ volts maximum." The first blank space shall be filled with the fuse ampere rating; the second blank space shall be filled with the fuse class designation (J, RK1, RK5, or T); the third blank space shall be filled with the maximum short circuit current that the circuit can deliver; and the fourth blank space shall be filled with the circuit voltage rating.

27.12.4 A meter socket, marked with an assigned short-circuit current value based on use with a circuit breaker in accordance with Table 15.1, shall be marked "When used in conjunction with a circuit breaker rated no more than ____ amperes this meter socket is rated for use on a circuit capable of delivering no more than ____ RMS symmetrical amperes, ____ volts maximum (not in excess of the circuit breaker

interrupting rating)" or the equivalent. The value of amperes shall correspond to the symmetrical values given in Table 27.2.

27.12.5 If the short-circuit current rating of a meter socket is dependent upon the use of a specific circuit breaker, the meter socket shall be marked "When used in conjunction with a ____ circuit breaker rated not more than ____ amperes this meter socket is rated for use on a circuit capable of delivering not more than ____ RMS symmetrical amperes, ____ volts maximum (not in excess of the circuit breaker interrupting rating)" or the equivalent. The value of amperes shall correspond to the symmetrical values given in Table 27.2. The first blank space shall contain the manufacturer's name and type designation.

27.13 Low voltage rating

27.13.1 If a space is intended for low voltage wiring as specified in 9.3.1, a marking shall be located in the space identifying the space for such use.

28 Permanence of Marking

28.1 A required marking shall comply with the permanence of marking requirements located in the Standard for Enclosures for Electrical Equipment, Environmental Considerations, UL 50E.

POST AND PEDESTAL TYPE METER SOCKETS

CONSTRUCTION

29 General

29.1 Post and pedestal type meter sockets shall have enclosures intended for outdoor use.

29.2 A post or pedestal type assembly shall have mounting facilities provided as follows:

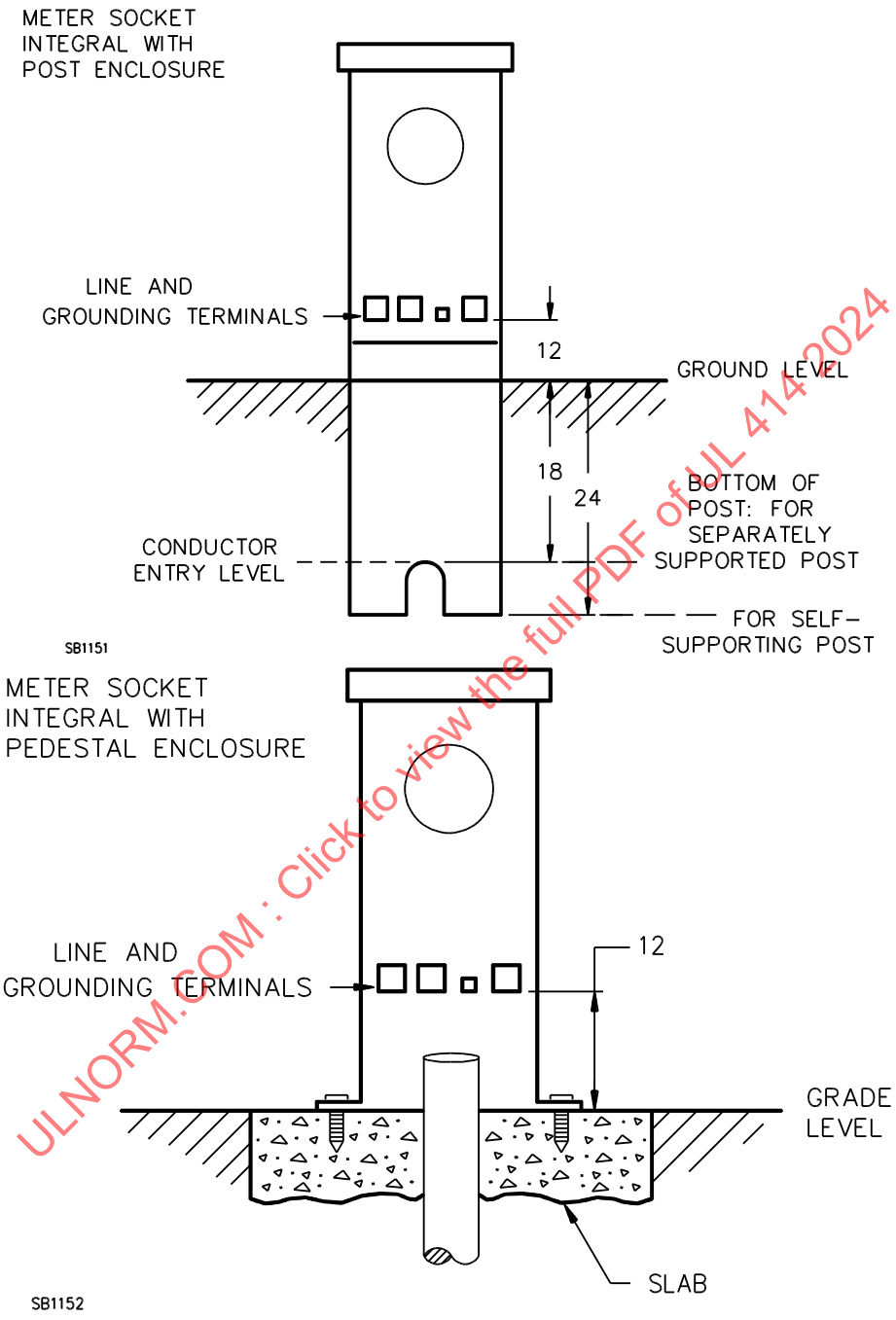
a) For a post type assembly, instructions for embedding the post at grade level in poured concrete shall be provided. A post not intended to be embedded in poured concrete shall be provided with other mounting means.

b) For a pedestal type assembly, mounting holes or similar facilities in the base for securing to a concrete slab.

29.3 As shown in Figure 29.1, a post or pedestal type meter socket comprises an integral or separate extension of the socket enclosure to form a raceway free from sharp projections and serving to route conductors from an underground run to terminals for equipment.

Figure 29.1

Typical post and pedestal



NOTE – All dimensions are minimum, in inches.

Inches	(mm)
12	305
18	457
24	610

30 Enclosure

30.1 The complete assembly of a meter socket and post or pedestal shall be fabricated:

a) Of galvanized steel in accordance with the Standard for Enclosures for Electrical Equipment, Non-Environmental Considerations, UL 50, and

b) In accordance with the modifications and additional requirements as specifically described for post and pedestal enclosures.

Such an assembly shall comply with the tests as a beam as described in the Beam Loading Deflection Test, Section 38, and for comparative resistance to crushing and torsion as described in the Torque Deformation Test, Section 37, and the Beam Loading Deflection Test.

Exception No. 1: With respect to 30.3 and 30.4, the complete assembly of a meter socket and post enclosure need not be tested if the enclosure is fabricated of galvanized steel, minimum 0.070 inch (1.78 mm) thick, or of aluminum minimum 0.095 inch (2.41 mm) thick, and the construction is such that the enclosure would structurally act as an integral unit.

Exception No. 2: A pedestal type meter socket fabricated of minimum 0.075 inch (1.91 mm) thick aluminum need not be tested.

30.2 Both inside and outside surfaces of that portion of a post below grade level and between grade level and 12 inches (305 mm) above grade level shall be painted in addition to being galvanized.

30.3 An enclosure can be considered as a structurally integral unit if all seams, joints, and removable panels or covers are secured by fastenings spaced a maximum of 6 inches (152 mm) along each side.

30.4 In a post-mounted assembly, a sheet metal cover shall have a thickness not less than that indicated for the enclosure.

Exception: A cover of steel at least 0.053 inch (1.35 mm) thick may be of any length if the width does not exceed 10 inches (254 mm).

31 Ventilation Openings

31.1 If ventilation openings are provided, they shall comply with 31.2 – 31.11.

31.2 Ventilation openings shall be guarded so that there is no direct access to a live part as covered in 31.3 and 31.4.

31.3 Ventilation openings shall be:

a) Screened or louvered openings with internal barriers or

b) Hoods or stacks with labyrinth air passages.

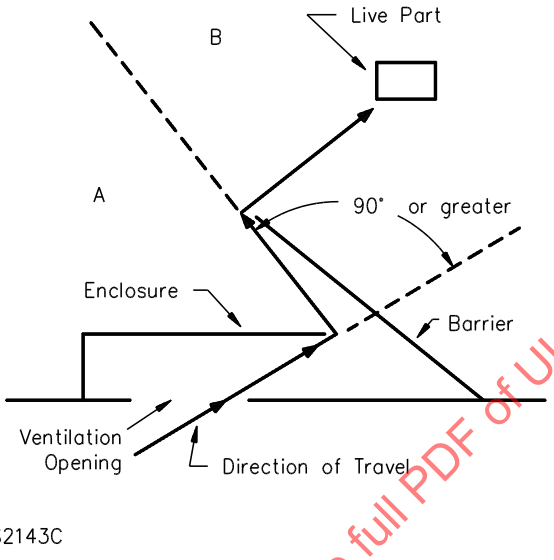
31.4 A barrier shall be of such dimensions and so located that a straight line drawn from any live part past the edge of the barrier will intersect the enclosure minimum 1/4 inch (6.4 mm) from the edge of an opening.

31.5 A ventilation opening (slot, louver, or the like), shall be protected by one or more baffles, barriers, or other obstructions of such dimensions and locations that any access path to a live part requires at least two changes of direction, one of which involves an angle of 90 degrees or more from a straight line as

shown in Figure 31.1. In addition, if the minor dimension of a ventilation opening is larger than 1/4 inch (6.4 mm), it shall be protected by a screen having a minor dimension not larger than 1/4 inch.

Figure 31.1

Angle of change of direction



NOTES

A – No live parts permitted in this area.

B – Live parts acceptable this side of barrier.

31.6 The size, shape, and location of a screened opening shall not weaken the overall enclosure.

31.7 The wires of a screen required to protect a ventilation opening shall not be smaller than 16 AWG (1.3 mm^2) and the openings in the screen shall not exceed 1/4 inch (6.4 mm) in any dimension.

31.8 Perforated sheet steel or expanded-steel mesh shall be minimum 0.042 inch (1.07 mm) thick if uncoated or 0.045 inch (1.14 mm) thick if zinc coated if the mesh openings or perforations are 1/2 square inch (3.23 mm^2) or less in area. For larger openings, the steel or mesh shall be minimum 0.080 inch (2.03 mm) thick if uncoated or 0.084 inch (2.13 mm) thick if zinc coated.

Exception: If deflection of the expanded-steel mesh will not alter the clearance between uninsulated live parts and grounded metal so as to reduce spacings to values below the minimum values specified in Table 8.1, expanded-steel mesh may be made of minimum 0.024 inch (0.61 mm) thick sheet steel if uncoated or 0.028 inch (0.71 mm) thick sheet steel if zinc coated.

31.9 The width of ventilation louvers in an enclosure shall be such that at least 1/6 of the enclosure material will remain at each end of the louver.

31.10 A separate louvered panel that is riveted or welded in place over a ventilation opening in the enclosure shall be no less than 0.032 inch (0.81 mm) thick sheet steel.

31.11 A ventilation opening in the top of the enclosure shall be covered by a hood or protective shield spaced above the opening to restrict the entry of foreign material and rain.

32 Mounting

32.1 Provisions for mounting of a pedestal-type enclosure shall support aluminum parts not less than 1/4 inch (6.4 mm) above the mounting surface.

Exception: A metallic or nonmetallic coating may be used to separate aluminum from a concrete pad if the coating is tested and found to have resistance to corrosion equivalent to that of galvanized steel (G90 zinc coating) 0.061 inch (1.5 mm) thick.

32.2 No aluminum part of a post type enclosure shall extend below a level 12 inches (305 mm) above the marked grade level.

33 Grounding

33.1 To provide a means for grounding the enclosure of a post or pedestal type of meter socket, exposed noncurrent carrying metal enclosing conductors or electric equipment, or forming a part of such equipment shall be conductively connected to a single pressure wire connector or appropriate terminal screw, mounted in and on the enclosure at a point accessible during installation.

33.2 The wire connector or terminal screw specified in 33.1 shall be capable of properly securing a grounding conductor selected in accordance with Table 12.1.

34 Grade Level

34.1 In a post or pedestal type of meter socket, the lowest live part (including terminals for the neutral or grounding conductors) or splicing area shall not be less than 1 foot (0.3 m) above the marked final grade level.

34.2 In a post-mounted meter socket the opening provided in the base for the entrance of underground wiring shall be rolled, flanged, or equipped with a bushing so that there will be a smooth, rounded surface against which the cables can bear. For a self-supporting post, the opening shall be at least 18 inches (457 mm) and the bottom of the post at least 2 feet (0.6 m) below the marked final grade level. For a post intended to be separately supported, the enclosure shall extend at least 18 inches below the marked final grade level.

PERFORMANCE

35 Sprinkler Test

35.1 In addition to the Rain Test, Section 17, meter socket equipment having an open bottom for underground wiring and intended for direct burial (post) or pad mounting shall be capable of withstanding sprays simulating a lawn sprinkler applied to exposed sides. As a result of the test, water may be present on the inside surfaces of the enclosure wall but not on any interior parts. The nozzle shall be the same as in the rain test covered in 17.1, but the pressure shall be 15 psi (103 kPa) and the nozzle shall be located at the marked final grade level 3 feet (0.9 m) from the enclosure and shall be aimed at a point on the enclosure 2 feet (0.6 m) above grade level. The sprays are to be applied for periods of 1 hour.

36 Crushing Deformation Test

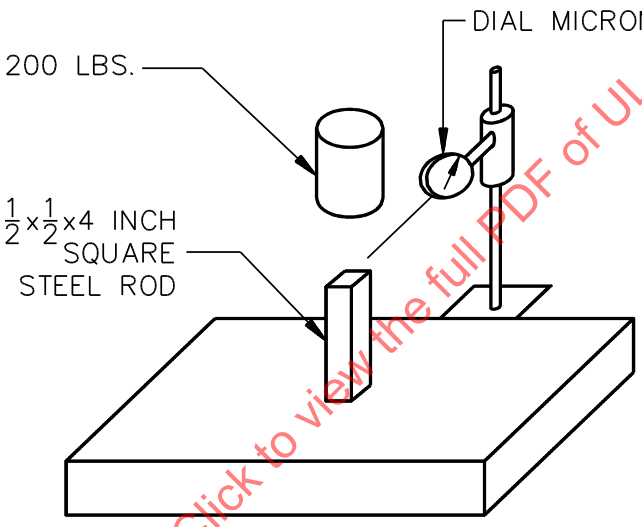
36.1 A post or pedestal meter socket enclosure shall be subjected to a crushing force created by the application of a weight of 200 pounds (92 kg) applied as described in 36.2. There shall be no permanent deformation of more than 0.125 inch (3.2 mm) nor a temporary deflection of more than 0.250 inch (6.4 mm).

36.2 The sample is to be prepared for the test described in 36.1 as shown in Figure 36.1. The sample is to be supported on a smooth, rigid, flat surface. The steel application rod is to be positioned at the center of the area to be tested. The position of the top of the application rod is to be noted by means of a dial micrometer, mounted on a test stand, both before, during, and after application of the 200-pound (92-kg) test weight. The stand for the dial micrometer is to rest on a surface that remains fixed at the same level as the back of the sample in the test area.

36.3 The deflection of the surface tested is the difference between readings of the dial micrometer before and during application of the test weight. The deformation of the surface tested is the difference between readings of the dial micrometer before the application of the test weight and after removal of the weight.

Figure 36.1

Crushing deformation test



SB1075

Inch	(mm)	Pounds	(kg)
1/2	12.7	200	92
4	102		

37 Torque Deformation Test

37.1 A mounting post or pedestal, when tested in accordance with 37.3, shall not have a vertical displacement "h" greater than the values shown in the formulas specified in 37.3. The vertical displacement is to be measured by means other than the weight bar shown in Figure 37.1 and is not to exceed an axial rotation of 2-1/2 degrees.

37.2 The sample of a post is to be prepared by securing the post to a fixed support at the grade level mark. When testing a pedestal, the sample is to be firmly mounted in the intended manner to the fixed support. The top of the post or pedestal is to be subjected to a torque of 2400 pound-inches (271 N·m) applied at right angles to the longitudinal axis of the post or pedestal. The weight "W" is to be attached to the horizontal weight bar at a distance "d_1," no less than 24 inches (610 mm) from the pivot, as shown in Figure 37.1.

$$\text{Torque} = Wd_1 = 2400\,\text{pound-inches}\,(271\,N \cdot m)$$

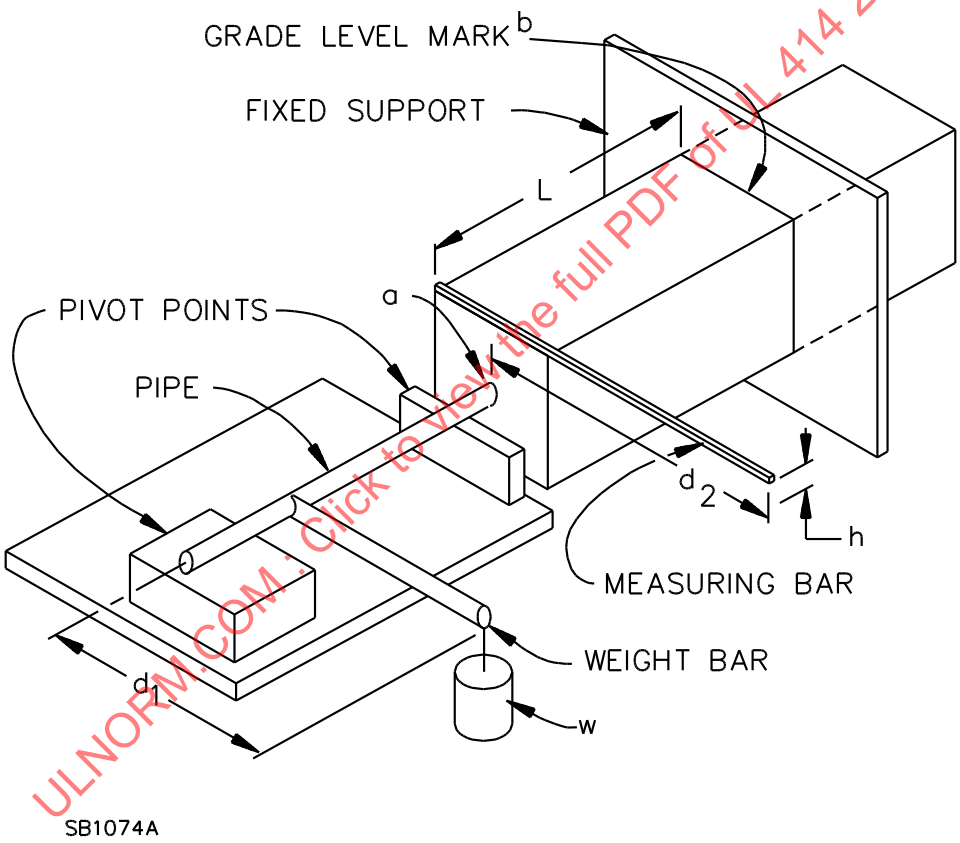
37.3 The vertical displacement "h" in inches (mm) is to be less than or equal to the constant 0.0437 (0.1432 for SI units) times the product of the length "d_2" in inches (mm) of the horizontal measuring bar and the length of the sample "L" in feet (m) as shown in Figure 37.1.

$$h(in) \leq 0.0437 \times d_2\,(in) \times L\,(ft)$$

$$h(mm) \leq 0.1432 \times d_2\,(mm) \times L\,(m)$$

Figure 37.1

Torque deformation



NOTES

[a] For a metallic post or pedestal having a flat top, a conduit hub may be used to apply the torque from the pipe to the sample. For a non-metallic enclosure or a post with an open top over which a power outlet is mounted, a four-sided frame shall be provided to maintain the shape of the power outlet. The frame is to be inside or outside the enclosure or post, overlapping no more than 1 inch (25.4 mm). The pipe shall be secured to the frame in any convenient manner to transmit the torque from the pipe to the sample.

[b] For a post, the hole in the fixed support is maintained at the grade level mark. For a pedestal, a hole is not necessary for the rigid surface since the sample is secured to the supporting surface by the mounting means.

d_1 – The horizontal distance from the center line of the pipe to the point on the weight bar where the weight is attached.

d_2 – The distance from the middle of the surface of the post or pedestal to the end of the measuring bar.

L – The length of the enclosure between the measuring bar and the rigid surface.

W – The weight applied to provide torque as specified in 37.2.

h – Vertical displacement.

38 Beam Loading Deflection Test

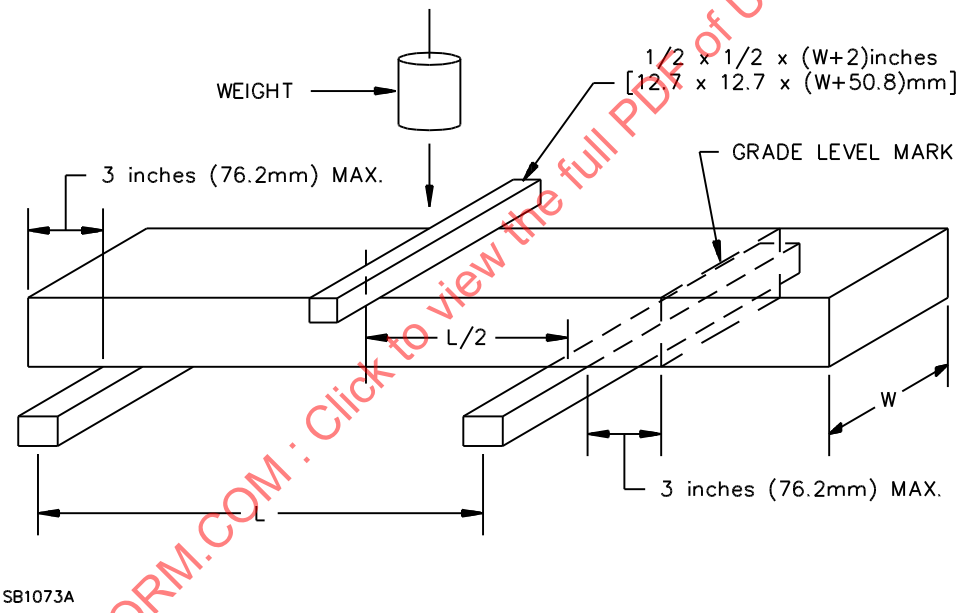
38.1 A mounting post or pedestal shall have such longitudinal stiffness that, when located as a beam supported near each end, a force created by placing a 200-pound (90.7-kg) weight on a 1/2- by 1/2-inch (12.7- by 12.7-mm) steel bar spanning the widest surface midway between the supports will produce a deflection not in excess of 0.015 inch per foot (1.25 mm/m) of distance between supports.

38.2 The sample is to be prepared for the test described in 38.1 by supporting it on two fixed members located not more than 3 inches (76.2 mm) from each end for a pedestal and no more than 3 inches from the top end and not more than 3 inches from the marked grade level as shown in Figure 38.1 for a post.

38.3 Deflection of the post or pedestal is determined by a dial micrometer used to measure the displacement on either lower side corner below the 1/2-inch (12.7-mm) square pressure bar.

Figure 38.1

Beam loading deflection



NOTES

Vertical Displacement (D) measured at point A with weight applied.

L is the measurement between support blocks [blocks 2- by 2-inch (50.8- by 50.8-mm) cross section]

$$Deflection = \frac{D(in\ thousands\ of\ an\ inch)}{L(in\ feet)} = 0.015\ inch\ per\ foot (1.25\ mm\ per\ m)\ maximum$$

MARKINGS

39 Post Type Enclosures

39.1 A post-mounted meter socket having an open bottom for the entry of underground conductors shall have the following:

a) A marking showing the final grade level, which shall be no less than 2 feet (0.6 m) above the lower end of the enclosure for a self-supported post and 18 inches (457 mm) for a separately supported post and

b) Instructions for setting the post in concrete or for securing to other mounting support.

40 Pedestal Type Enclosures

40.1 A pedestal type meter socket shall have a marking showing instructions for securing the pedestal to a concrete base through which the underground conductors enter the enclosure by means of conduit and specifying the recommended installation procedure to avoid damage to a pedestal having a coated aluminum base as covered in 32.1.

METERING TRANSFORMER CABINETS AND METERING TRANSFORMER CABINET INTERIORS

GENERAL

41 Details

41.1 These requirements cover metering transformer cabinets and metering transformer cabinet interiors intended for use with either window type or bar type current transformers rated maximum 6000 amperes at maximum 600 volts. Current transformer cabinets and metering transformer cabinet interiors with bus structures are considered “bus type” devices.

41.2 Devices intended for use with window type current transformers may include bus structures (bus type devices) or may be of the design to only accommodate insulated conductors.

41.3 Devices intended for use with bar type current transformers shall include bus structures (bus type devices).

41.4 Bus type metering transformer cabinets may have a maximum rms symmetrical short-circuit current rating of 200,000 amperes. Bus type metering transformer cabinet interiors not intended for use in a specific enclosure may have a maximum rms symmetrical short-circuit current rating of 50,000 amperes.

CONSTRUCTION

42 General

42.1 Cabinets and interiors

42.1.1 Metering transformer cabinets and metering transformer cabinet interiors shall comply with the applicable requirements specified in Sections 3 – 7, 9, 10 and 11.

42.1.2 Metering transformer cabinet interiors not intended for use in a specific enclosure shall require no field assembly of components. The interior shall be provided with a frame or backplate provided with mounting means for field installation into any intended enclosure that complies with the Standard for Enclosures for Electrical Equipment, Non-Environmental Considerations, UL 50.

42.2 Bus-to-bus and bus-to-wire connections

42.2.1 The connection of bus bars to bus bars or bus bars to wires shall comply with the applicable requirements for current-carrying parts as specified in the Standard for Switchboards, UL 891.

42.3 Sizing of bus bars

42.3.1 In addition to the requirements specified in Current-Carrying Parts, Section 6, bus bars shall comply with the applicable requirements for current-carrying parts as specified in the Standard for Switchboards, UL 891.

42.4 Spacings

42.4.1 The spacings for a metering transformer cabinet or metering transformer cabinet interior of the bus type shall be as indicated in Table 42.1.

Table 42.1
Minimum spacings

Voltage involved[a]		Between uninsulated live parts of opposite polarity				Between uninsulated live parts and any grounded dead metal			
		Over surface,[b]		Through air,		Over surface,		Through air,	
Greater than	Maximum	inches	(mm)	inch	(mm)	inch	(mm)	inch	(mm)
0	125	3/4	19.1	1/2	12.7	1/2	12.7	1/2	12.7
125	250	1-1/4	31.8	3/4	19.1	1/2	12.7	1/2	12.7
250	600	2	50.8	1	25.4	1	25.4	1/2	12.7

NOTE – An isolated dead-metal part (such as a screw head or washer) interposed between uninsulated live parts of opposite polarity or between an uninsulated live part and grounded dead metal is considered to reduce the spacing by an amount equal to the dimension of the interposed part along the path of measurement.

[a] It is assumed that the voltage from a grounded service conductor live part to grounded dead metal equals the line-to-neutral voltage of the system.

[b] In measuring an over surface spacing, any slot, groove, and the like that is 0.013 inch (0.33 mm) or less wide in the contour of insulating material is to be disregarded.

PERFORMANCE

43 Short-Circuit Test Performed

43.1 General

43.1.1 A metering transformer cabinet or metering transformer cabinet interior of the bus type shall be subjected to a short-circuit current test in accordance with the applicable short-circuit requirements in the Standard for Switchboards, UL 891. Load connections shall be made in accordance with 43.1.2.

Exception No. 1: Short-circuit testing is not required for a metering transformer cabinet or metering transformer cabinet interior having a maximum rms symmetrical short-circuit current rating of 10,000 amperes.

Exception No. 2: Short-circuit testing is not required for a bus type metering transformer cabinet or metering transformer cabinet interior rated 4,000 amperes or less having a maximum rms symmetrical short-circuit rating of 50,000 amperes if the product:

a) Is constructed in accordance with the Short-Circuit Test Not Performed, Section 44;

b) Complies with the performance requirements specified in 43.1.3; and

c) Is marked in accordance with 46.1.

43.1.2 Load connections to the shorting point shall be made with cable at least 4 feet (1.2 m) in length per terminal. The length of load cable used is to be subtracted from the allowable length of line cable.

Exception: If the equipment is intended for connection to other equipment only with bus bars, 12-inch (305 mm) bus bars may be used in place of the load cables.

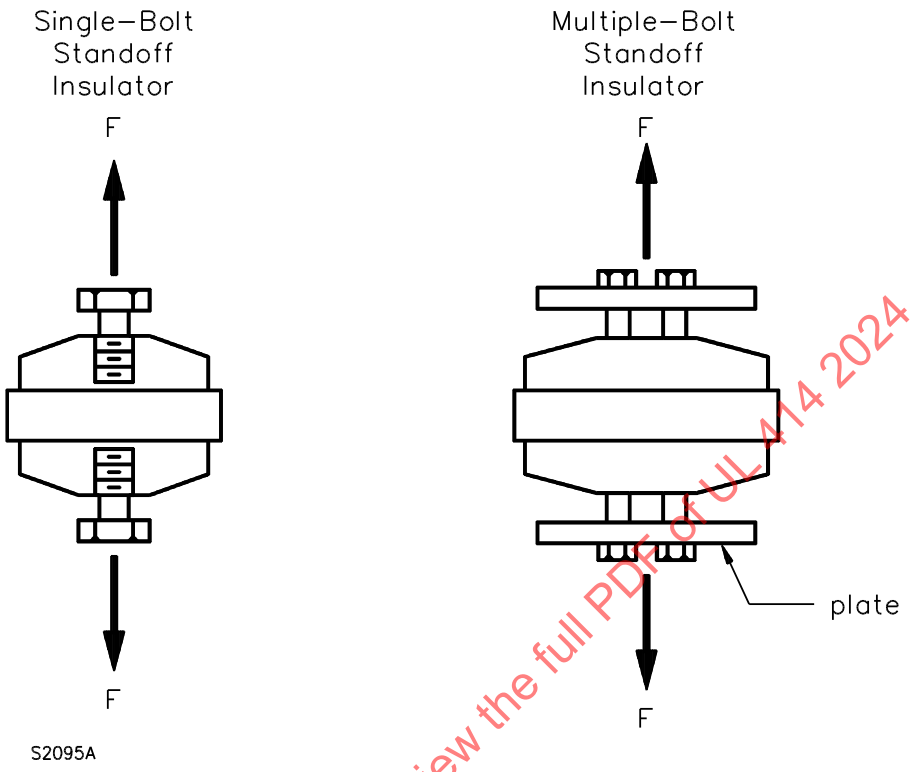
43.1.3 A standoff insulator or nonmetallic channel in equipment marked with a short-circuit rating greater than 10,000 amperes and utilizing Exception No. 2 to 43.1.1 shall be subjected to the test described in 43.2.1 and 43.3.1. Three samples shall be subjected to each test. The results are acceptable if the standoff insulator or nonmetallic channel does not crack.

43.2 Tensile force

43.2.1 The standoff insulator or nonmetallic channel, or representative sample, shall be subjected to a minimum tensile force of 1850 pounds (8229 N) applied between the simulated enclosure supporting means and bus bar support along the centerline of the mounting bolt. See Figure 43.1 for typical constructions. The force is to be applied by mechanical means moving apart at a rate of 10 inches (254 mm) per minute.

Figure 43.1

Method of applying tensile force



43.3 Cantilever force

43.3.1 The standoff insulator or nonmetallic channel, or representative sample, is to be:

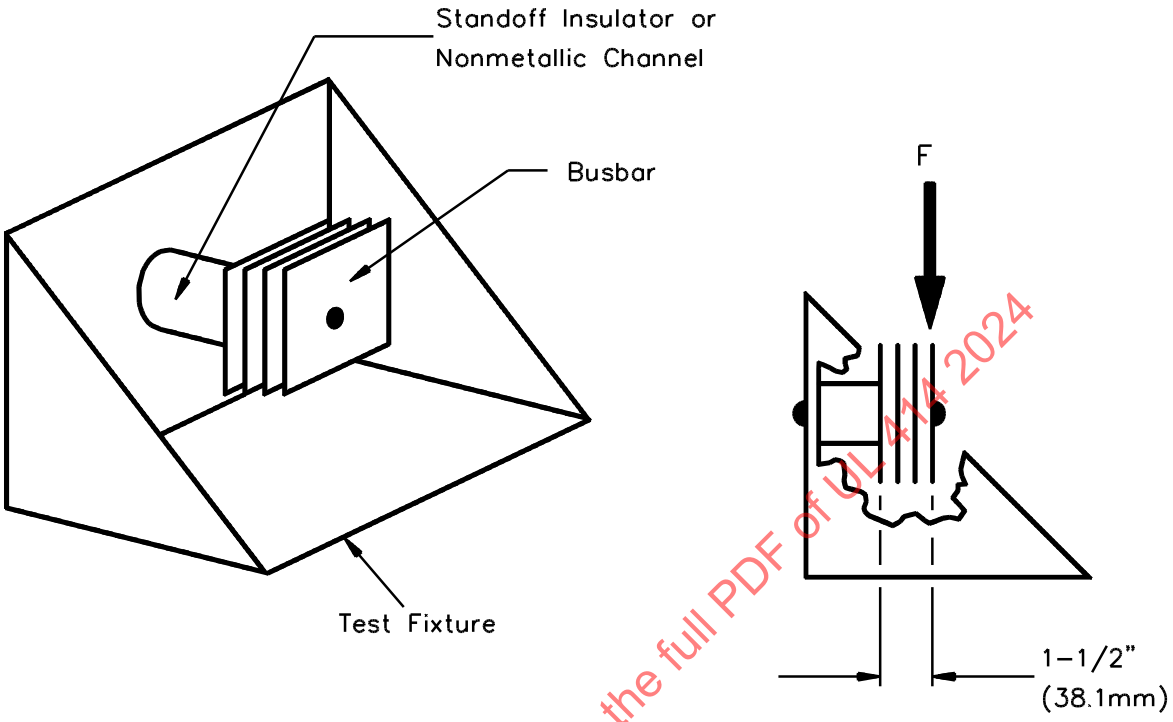
a) Mounted to a simulated enclosure steel plate and

b) Subjected to a minimum force of 675 pounds (3003 N), applied as specified and as shown in Figure 43.2.

A 4-inch (102-mm) length of 2 by 1/4 inch (50.8 by 6.4 mm) copper bus bar is to be mounted to the support at a distance of 1-1/2 inches (38.1 mm) from the standoff insulator or nonmetallic channel. The force is to be applied perpendicular to the 2 by 1/4 inch edge of the bus bar. The force is to be applied by a mechanical means moving at a rate of 10 inches (254 mm) per minute.

Figure 43.2

Method of applying cantilever force



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44 Short-Circuit Test Not Performed

44.1 General

44.1.1 These requirements cover metering transformer cabinets and interiors having rms symmetrical short-circuit current ratings for which short-circuit tests may be waived in accordance with Exception No. 2 to 43.1.1.

44.2 Construction

44.2.1 A maximum rms symmetrical short-circuit current rating as shown in Table 44.1 may be assigned to a metering transformer cabinet or metering transformer cabinet interior without conducting short-circuit tests if all of the following conditions are met:

a) The construction complies with 44.2.2 – 44.4.1.

b) The performance complies with 43.1.3 – 43.3.1.

c) The metering transformer cabinet or interior is marked in accordance with 46.2.

Table 44.1
Ratings and characteristics

Maximum rms sym. short-circuit current, amperes	Minimum ampere rating, amperes	Maximum ampere rating, amperes	Maximum voltage rating (single or three phase), volts	Minimum bus bar width,[a] inches[e]	Maximum bus bar width,[a] inches[e]	Bus bars FF or EE[b]	Number of phases	Minimum distance between opposite polarity bus bars[c]		Maximum distance between supports or fraction thereof,[d] inches[e]
								Closest point, inches[e]	Center to center, inches[e]	
50,000	0	2,000	600	2	4	EE	3 1	2 3	6 7	21
50,000	1,000	4,000	480[f]	2	4	FF	3 1	4 5	6 7	21

[a] Bus bars nominally 1/4 inch (6.4 mm) thick aluminum or copper, one to four per phase.

[b] Refer to 44.2.6. (EE refers to bus bars arranged edge-to edge; FF refers to bus bars arranged face-to-face.) See Figure 44.1 and Figure 44.2.

[c] Refer to 44.2.8 – 44.2.11 and Figure 44.3 and Figure 44.4.

[d] See 44.2.9 and 44.3.1 and Figure 44.1.

[e] See Table 44.2 for SI equivalencies.

[f] The maximum voltage rating may be 600 volts if the current rating does not exceed 2,000 amperes.

Table 44.2
SI equivalencies

Inches	(mm)
2	50.8
3	76.2
4	101.6
5	127
6	152.4
7	177.8
21	533.4

44.2.2 Copper or aluminum bus bars shall be nominally 1/4 inch (6.4 mm) thick and have a width as specified in Table 44.1; holes in bus bars shall not be larger than 0.448 by 0.813 inch (11.4 by 20.7 mm).

Exception: Larger holes may be provided as specified in 44.2.3.

44.2.3 At provisions for current transformers, copper or aluminum bus bars shall be minimum 1/4 inch (6.4 mm) thick and 2– 4 inches (50.8 – 101.6 mm) wide. Holes in bus bars at supports shall not be larger than 0.406 by 0.750 inch (10.3 by 19.1 mm), and holes for bus type current transformers shall not be larger than 9/16 by 1-13/32 inches (14.3 by 35.7 mm).

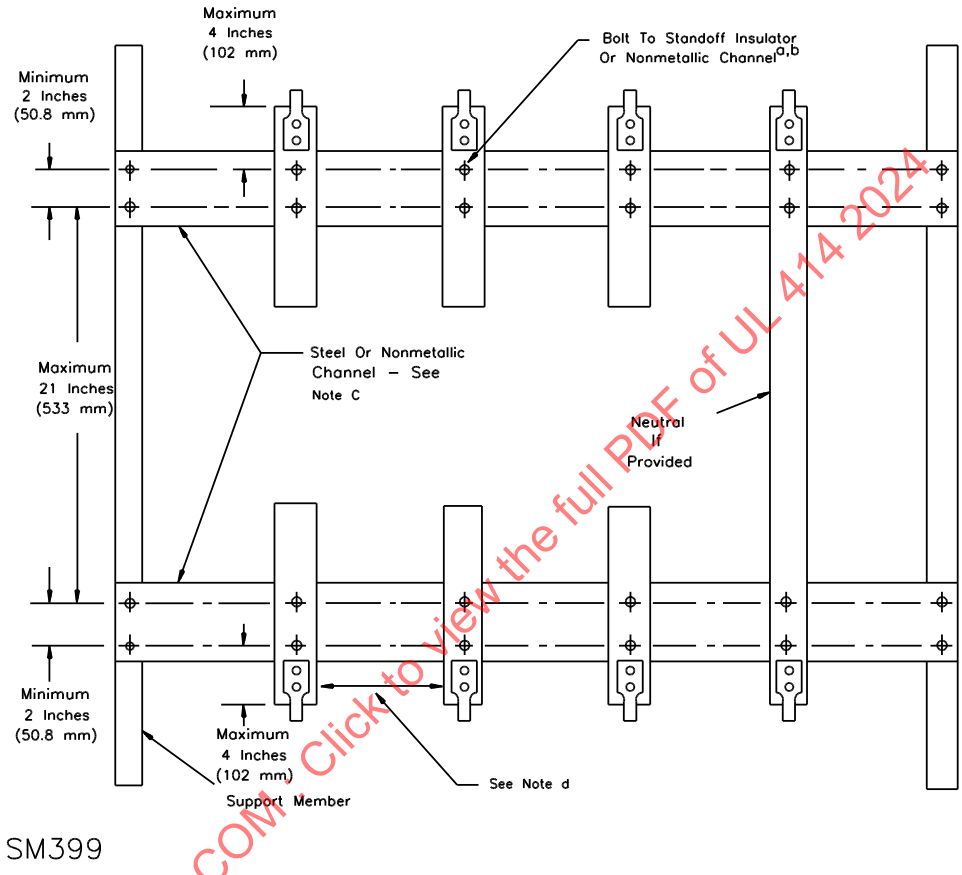
44.2.4 The bus bar configuration shall be flat and rectangular.

44.2.5 The number of bus bars shall not exceed four for each phase.

44.2.6 Phase bus bars, including neutral bus bars, shall be arranged edge-to-edge or face-to-face as described in Table 44.1 and shown in Figure 44.1 – Figure 44.4. Bus bars shall be secured by bolts as described in 44.3.3 and as shown in Figure 44.1.

Figure 44.1

Edge-to-edge bus bar construction



NOTES

[a] Bolts may be positioned horizontally if they are centered minimum 1-7/8 inches (47.6 mm) apart and not more than 21 inches (533.4 mm) between bolts in the upper and lower channels.

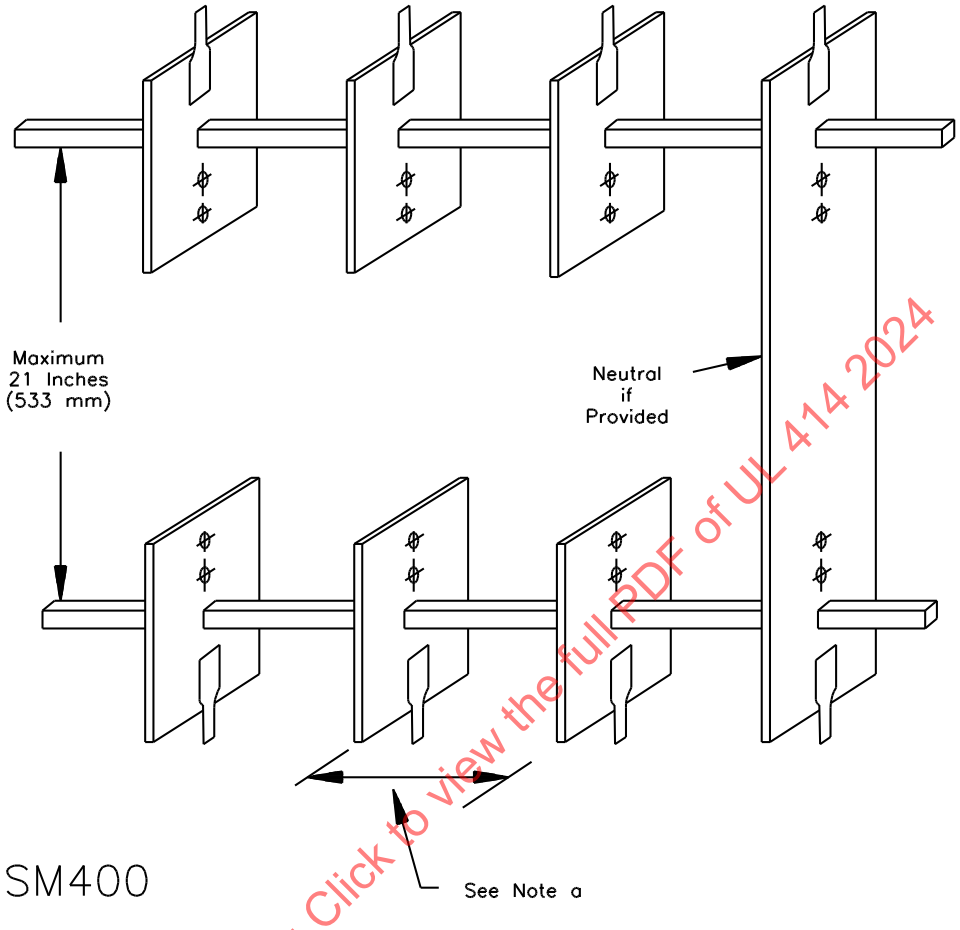
[b] Single bolts may be provided maximum 4-3/4 inches (120.7 mm) from the end of the neutral bus bar and not more than 21 inches (533.4 mm) between the bolts in the upper and lower channels.

[c] See 44.3.1.

[d] See Table 44.1.

Figure 44.2

Face-to-face bus bar construction



NOTE a – See Table 44.1.

Figure 44.3

Distances between edge-to-edge bus bars of opposite polarity

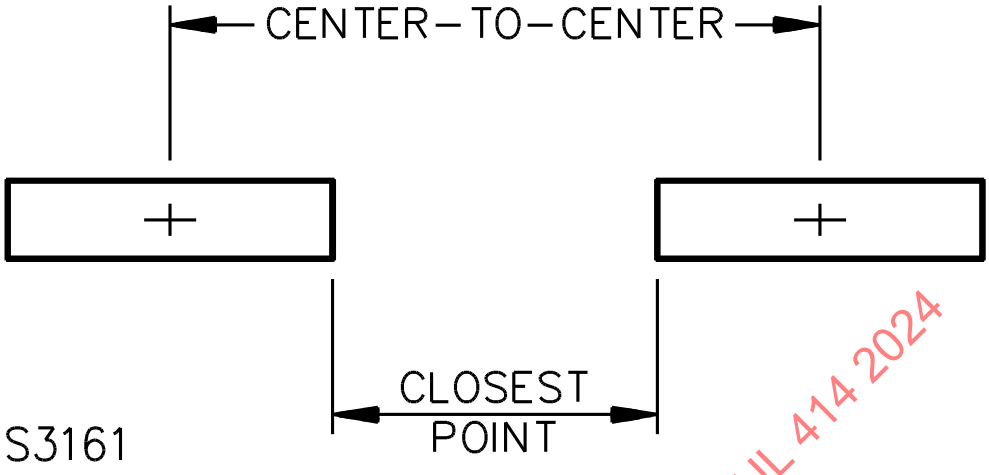
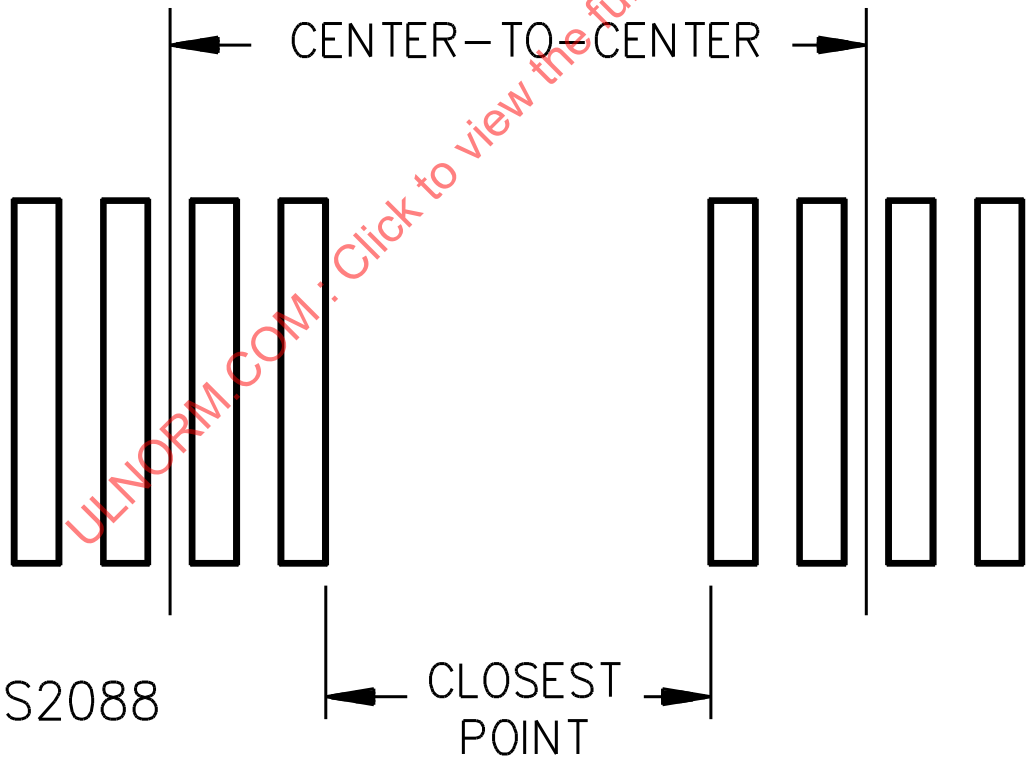


Figure 44.4

Distances between face-to-face bus bars of opposite polarity



44.2.7 Stacked bus bars shall not exceed a height of 1-3/4 inches (44.5 mm) measured from the standoff insulator or nonmetallic channel to the top of the top bus bar.

Exception: At a splice bus or a joint, the height of stacked bus bars shall not exceed 2 inches (50.8 mm).

44.2.8 The spacing between adjacent edges of bus bars of opposite polarity, arranged or mounted edge-to-edge as shown in Figure 44.1 and Figure 44.3, and the center-to-center distance shall not be less than as specified in Table 44.1. The line and load ends of bus bars shall not extend beyond the steel or nonmetallic channel by more than the distance shown in Figure 44.1.

44.2.9 The center-to-center spacing between adjacent groups of bus bars of opposite polarity, arranged or mounted face-to-face as shown in Figure 44.2 and Figure 44.4, and the distance between the closest points of opposite polarity shall not be less than as specified in Table 44.1. The distance between bolts securing a bus to a standoff insulator or a nonmetallic channel shall comply with the dimensions indicated in Table 44.1 and as shown in Figure 44.1.

44.2.10 The spacing between bus bars mounted or arranged edge-to-edge and grounded dead metal shall not be less than 1-3/8 inches (34.9 mm) in any direction. An insulating barrier is to be disregarded when measuring this spacing.

44.2.11 The spacing between bus bars mounted or arranged face-to-face and grounded dead metal shall not be less than:

a) 6 inches (152.4 mm) when measured perpendicular to the face of the bus bar and

b) 1-3/8 inches (34.9 mm) when measured perpendicular to the edge of the bus bar.

An insulating barrier is to be disregarded when measuring these spacings.

Exception: The spacing to grounded metal may be minimum 1-3/8 inches within 3 inches (76.2 mm) of the bolt securing the bus to the standoff insulator or nonmetallic channel.

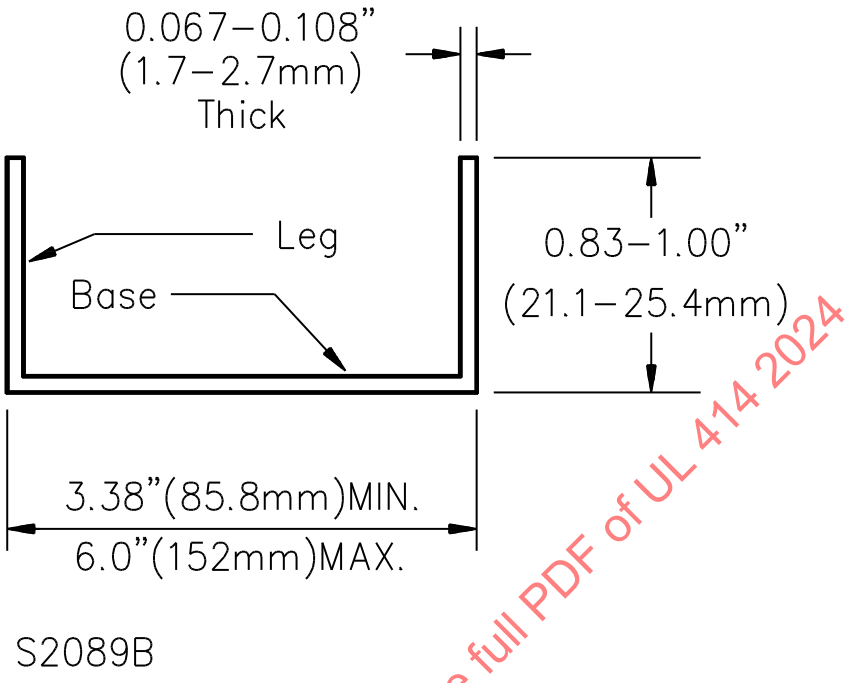
44.3 Supports

44.3.1 A bus bar standoff insulator used for direct support of live parts shall be secured by a bolt as described in 44.3.3 to a steel channel having the dimensions shown in Figure 44.5. The bolt shall pass through a clearance hole in the steel channel and shall not thread into it. Typical constructions are shown in Figure 44.6 and Figure 44.7.

Exception: A nonmetallic channel that is investigated in accordance with 43.1.3 – 43.3.1 may be used in place of the standoff insulators and steel channel.

Figure 44.5

Typical steel channel bus bar support dimensions



NOTE – Equivalent constructions may be used.

Figure 44.6

Bus bar support with standoff insulators mounted on steel channel base

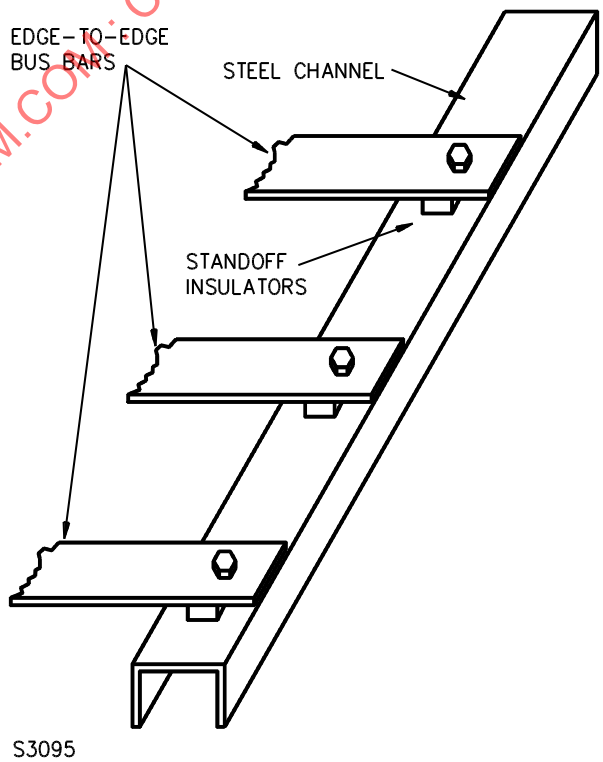
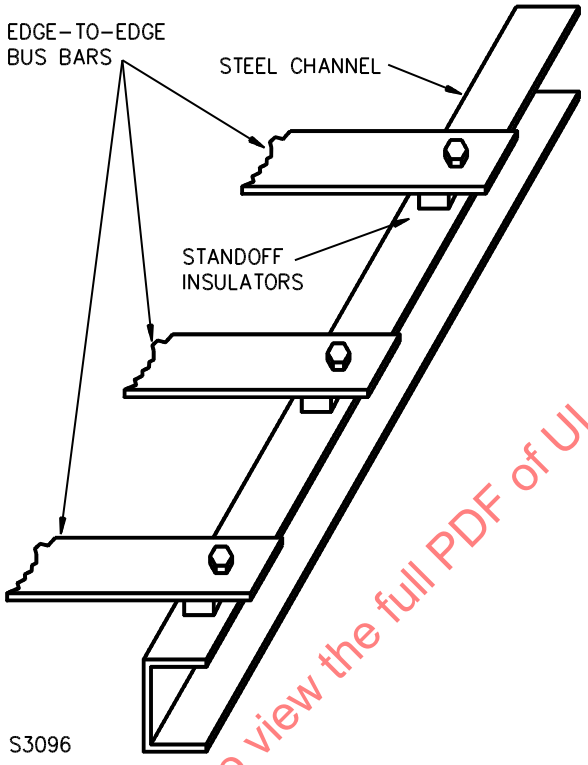


Figure 44.7

Bus bar support with standoff insulators mounted on steel channel leg



44.3.2 A bus bar shall be secured to a standoff insulator, a nonmetallic channel, or a splice bus bar by a bolt as described in 44.3.3.

44.3.3 A minimum SAE grade 5 3/8-16 steel bolt shall be used to secure a bus bar or standoff insulator and shall be torqued to a minimum 20 pound-feet (27.1 N·m). A steel washer at least 0.078 inch (1.98 mm) thick with a minimum outside diameter of 1 inch (25.4 mm) and a maximum inside diameter of 9/16 inch (14.3 mm) shall be located between the bolt head and the bus bar and also between a bolt head or nut and a steel or nonmetallic channel.

44.4 Bus bar rotation

44.4.1 A bus bar shall be prevented from rotating by means other than the mounting bolt specified in 44.3.2. Friction alone is not acceptable.

RATINGS

45 Details

45.1 A bus type metering transformer cabinet or interior shall be rated in volts, amperes, and rms symmetrical short-circuit current as shown in Table 45.1. An alternating current rating shall include the number of phases if other than single phase and the frequency designated by Hertz, Hz, cycles per second, or c/s if other than 50 or 60 Hz.

Exception: A metering transformer cabinet not intended for use with a specific interior shall not be rated.

Table 45.1
RMS symmetrical short-circuit current ratings

Amperes			
10,000	25,000	50,000	100,000
14,000	30,000	65,000	125,000
18,000	35,000	75,000	150,000
22,000	42,000	85,000	200,000

45.2 The number of phases, the frequency, or the letters "ac" may be used to denote alternating current voltages and the symbol Φ may be used in place of the word phase(s).

MARKINGS

46 Details

46.1 A bus type metering transformer cabinet or interior shall be marked in accordance with the applicable requirements specified in Markings, General, Section 27, and with the following information:

a) The phrase "short-circuit current rating" and the rms symmetrical short-circuit current rating or ratings in amperes as noted in Table 45.1 and

b) The maximum voltage rating for each short-circuit current rating.

Exception: A bus type metering transformer cabinet interior marked for use in a specific metering transformer cabinet that provides the markings need not be marked.

46.2 A bus type metering transformer cabinet having an assigned short-circuit current rating in accordance with the requirements in the Short-Circuit Test Not Performed, Section 44, or a bus type metering transformer cabinet interior not intended for use in a specific enclosure shall be marked as follows: "Wrap line cables together and load cables together with nylon rope nominally 3/8 inch (9.5 mm) in diameter or rope having a minimum tensile strength of 2000 pounds (8896 N). Minimum wrapping is to be:

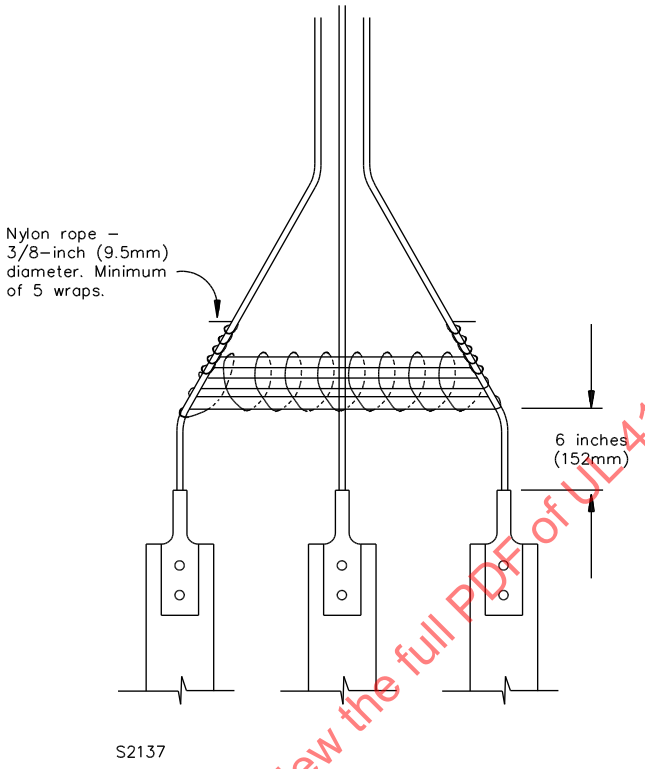
a) At 6 inches (152.4 mm) and at 12 inches (304.8 mm) from the terminals with five wraps and

b) Every additional 6 inches with five wraps or every 1 inch (25.4 mm) with one wrap," or the equivalent.

A drawing as shown in Figure 46.1, or the equivalent, may be provided with the metering transformer cabinet or interior.

Figure 46.1

Securement of cable



TEST SWITCHES

GENERAL

47 Details

47.1 These requirements cover test switches for transformer rated meters rated maximum 600 volts intended for use with meter sockets, metering transformer cabinets, and metering transformer cabinet interiors.

CONSTRUCTION

48 General

48.1 Test switches shall comply with the applicable requirements specified in Sections 1 – 12 and 20 in addition to the requirements in the Temperature Test, Section 49.

PERFORMANCE

49 Temperature Test

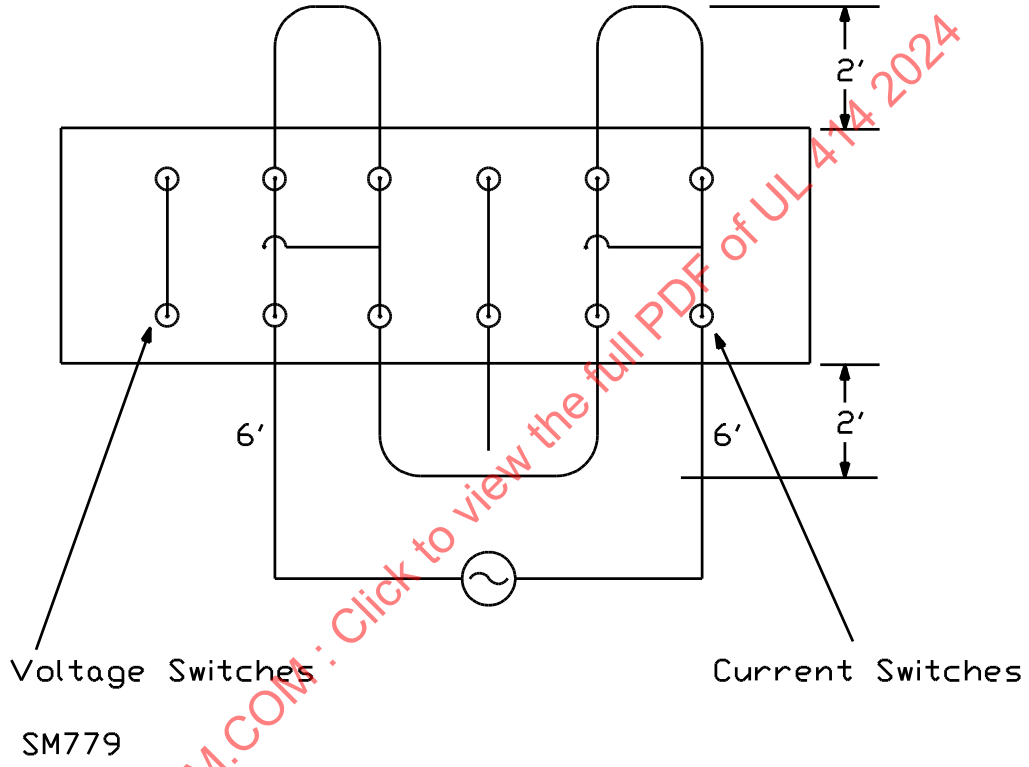
49.1 A test switch shall be capable of carrying rated current without any part showing a temperature rise greater than that specified in 49.6 at any constant ambient temperature in the range of 25 ±5°C (77 ±9°F) when tested as specified in 49.2 – 49.7.

49.2 During the test, the test switch is to be mounted in an enclosure considered representative of the intended use.

49.3 The test switch is to be wired in series with 10 AWG (5.3 mm^2) copper wire in the configuration shown in Figure 49.1. Minimum 4-foot (1.2-m) lengths of wire are to be used to connect the switches in series and minimum 6-foot (1.8-m) lengths of wire are to be used to connect the switch to the current source.

Figure 49.1

Test circuit



49.4 Temperature measurement points shall include the middle of the switch blade and the side of the contact jaw.

49.5 The following sequence of tests shall be performed:

a) A temperature test is to be conducted at 100 percent of the rated current at any convenient voltage until temperatures have stabilized as specified in 49.7.

b) Immediately following the temperature test, the current is to be increased to 150 percent of its rated value and each switch is to be opened and closed 18 times at a rate of 6 cycles per minute.

c) The test switch is to be allowed to cool for 2 hours or to room temperature (whichever occurs first).

d) The temperature test specified in (a) is then to be repeated at 100 percent of rated current.

49.6 The temperature rise observed in the test switch shall not exceed the following.

a) 30°C (54°F) for any location on the test switch.

b) 7°C (12.6°F) maximum increase for any location when tested in accordance with 49.5(d) as compared to the rise recorded when tested in accordance with 49.5(a).

49.7 Temperatures are considered to be stabilized if three successive readings taken at 15 minute intervals indicate no more than a 1°C (1.8°F) change.

SUPPLEMENT SA – METER SOCKET ADAPTERS

SA1 Scope

SA1.1 These requirements cover the interface of devices, other than watthour meters, intended to be connected to meter sockets.

SA1.2 These devices shall comply with the requirements in this standard and the additional requirements of the end-use application, if determined to be necessary.

SA2 Construction

SA2.1 The dimensions of the base of the adapter shall be in accordance with the appropriate envelope design as covered in Figures 2 – 10 in the Standard for Physical Aspects of Watt-hour Meters Electromechanical Watthour Meters, ANSI C12.10.

SA2.2 Metallic enclosures and exposed dead metal components of the meter socket adapters shall be provided with a means to bond the metallic components to the meter socket enclosure to which the adapter connects. The method of bonding shall comply with the requirements in Article 250 of the National Electrical Code, ANSI/NFPA 70.

SA2.3 Surge protection gaps: A meter socket adapter shall be provided with means to ground the grounding straps of surge gaps on watthour meters. The grounding means shall extend over the area defined in the appropriate envelope designs as covered in the Standard for Physical Aspects of Watt-hour Meters, ANSI C12.10. The straps shall either be bonded to the enclosure or exposed dead metal or connected to grounding straps on the male end of the meter socket adapter. Unless shown in Figures 2 – 10 in the Standard for Physical Aspects of Watt-hour Meters, ANSI C12.10, a meter socket adapter shall not have uninsulated conductors or uninsulated bonded metal parts in areas that may contain meter voltage coils, test links, or other live parts unless recessed or otherwise located to comply with the minimum electrical spacings of Table 8.1 with a meter installed.

SA2.4 Neutral leads shall only be provided on meter sockets for use as "power outlets for temporary site service equipment."

Exception: Meter socket adapters may be provided with a neutral wire if instructions for installation of the wire have been provided and have been investigated and found to be suitable. If kits are required for installation, the kits shall be available from the manufacturer of the meter socket adapter. See SA7.1.

SA2.5 Surge protective devices for use with meter socket adapters shall be evaluated for use on the line side of service equipment.

SA3 Performance

SA3.1 A representative sample of each rating, construction, and type of meter socket adapter shall be subjected to the tests described in Section SA4, Heating Test, Section SA5, Short-Circuit Current Test, and Section SA5A, Moment Test. Other than as noted in SA3.2, the adapter is to be tested in a meter socket calibrated as indicated in SA4.1.1. The purpose of the calibration is to ensure that the measured temperature rises will represent the use of the adapter in a meter socket that has the maximum temperature rise permitted by this standard.

SA3.2 A meter socket adapter marked in accordance with SA6.2 as being intended for use in a specific meter socket shall be tested in the specific meter socket for which it is marked. No correction factor is necessary.

SA4 Heating Test

SA4.1 General

SA4.1.1 Meter socket adapters containing a socket intended for installation of a watthour meter shall be subjected to the Heating Test, Section 14, with the additional considerations in SA4.2 – SA4.3.

SA4.1.2 Components, when provided, are to be energized as intended in normal use while the meter socket and meter socket adapter are carrying the rated continuous current. The components shall comply with the temperature rise requirements of the standard applicable to the component. The meter socket test fixture and meter socket adapter shall not attain a temperature rise greater than specified in 14.3, with the additional considerations specified in SA4.2 and SA4.3.

SA4.2 Meter socket adapters not intended for use in a specific meter socket

SA4.2.1 The meter socket used as a test fixture is to be calibrated before each test. The test fixture is to be calibrated by using a simulated watthour meter as described in 14.8 and Figure 14.2 – Figure 14.3. The meter socket is to be rated less than or equal to the continuous current ratings of the meter socket for which the adapter is intended. The test current to determine the correction factor of the adapter is to be equal to the rated current of the meter socket. The simulated meter is to have the same number of current jumper bars as current circuits in the adapter to be tested. A temperature rise is to be determined on the meter socket test fixture by applying the test current to all jumper bars in series until the temperature has stabilized. A temperature correction factor T_c is to be calculated based on the temperature rise at each individual meter socket jaw. The correction factor (T_c) equals 65°C (117°F) minus the measured temperature rise at the meter socket jaws. If the measured temperature rise exceeds 65°C, the test is considered inconclusive.

SA4.2.2 During subsequent temperature tests on the meter socket adapters, the adapters are to be tested at their rated current. The correction factor (T_c) is to be added to the final measured temperatures attained on the meter socket jaw and the busses connected to the meter socket jaw.

SA4.3 Meter socket adapters intended for use only in a specific meter socket

SA4.3.1 Meter socket adapters intended for use only in a specific meter socket shall be subjected to the Heating Test, Section 14, with the meter socket adapter installed in the specific meter socket with which the meter socket adapter is intended to be used.

SA4.3.2 If a meter socket adapter is intended for use with more than one specific meter sockets, the test shall be conducted with each of the specified meter sockets.

SA4.4 Meter socket adapters with provisions for connection of an alternative energy source

SA4.4 deleted

SA5 Short-Circuit Current Test

SA5.1 General

SA5.1.1 A meter socket adapter marked with a short-circuit current rating greater than 10,000 amperes shall be subjected to the Short Circuit Current Test, Section 15, or the Short-Circuit Current Test with Specific Circuit Breaker, Section 16, as appropriate. The test is to be conducted in addition to any short circuit test that may be required by the end-product standard.

SA5.2 Meter socket adapters with provisions for connection of an alternative energy source

SA5.2 deleted

SA5A Moment Test

SA5A.1 At the conclusion of the operations in SA5A.2 – SA5A.5, the meter socket and meter socket adapter shall comply with all of the following conditions:

a) There is no permanent distortion or displacement of a meter socket adapter jaw, bus bar, or strap that would affect the intended functioning of the meter socket adapter or reduce an electrical spacing to less than the value specified in Table 8.1;

b) A meter socket adapter insulator or support shall not break or crack to such extent that the integrity of the mounting of a live part is impaired; and

c) The meter socket adapter enclosure, meter socket test fixture, the junction between the meter socket adapter and meter, the junction between meter socket adapter and meter socket test fixture, or any other part of the enclosure assembly shall not be damaged nor displaced to the extent that a 1/8 inch (3.2 mm) rigid cylindrical probe can be inserted and contact a live part.

SA5A.2 When the meter socket adapter is marked for use with a specific meter socket(s) in SA6.2, the testing shall be performed with each meter socket identified by the marking.

SA5A.3 When the meter socket adapter is not marked for use with a specific meter socket(s), the testing shall be performed with a representative meter socket type at each continuous current rating as identified by the marking in SA6.3. The meter socket enclosure cover used for the testing shall be of a nominal 0.053 inch (1.35 mm) thick steel or 0.075 inch (1.91 mm) thick aluminum. A meter socket adapter which may be installed in ring and ringless style meter socket types, shall be tested on both types of assemblies. A meter socket adapter which may be installed in meter sockets with spring jaws and lever release type jaws, shall be tested in a meter socket with the spring jaw assemblies.

SA5A.4 The meter socket testing fixture as specified in SA5A.2 or SA5A.3 shall be mounted on a rigid vertical surface in accordance with meter socket manufacturer's instructions, or in normal use when instructions are not provided. The meter socket adapter shall be mounted to the meter socket testing fixture in accordance with the meter socket adapter's installation instructions, or in normal use when instructions are not provided. A commercial or simulated meter shall be installed on the meter socket adapter as intended in normal use. The meter sealing ring provided with meter socket adapter shall be used for securing the meter to the meter socket adapter. The meter sealing ring provided with meter socket shall be used for securing the meter socket adapter to the meter socket, when installed on a ring type meter socket. When the meter sealing ring is not provided as part of the assembly, the meter sealing ring shall be in accordance with Figure 6 in the Requirements for Watthour Meter Sockets, NEMA C12.7.

SA5A.5 A 75 pound force shall be applied on the commercial or simulated meter 2 inches (50.8 mm) outward from the meter socket adapter in a downward direction for a duration of 1 minute. After the removal of the force, compliance to SA5A.1 shall be checked. The testing shall then be repeated with the force applied in the upward direction on the commercial or simulated meter 2 inches (50.8 mm) outward from the meter socket adapter. After the removal of the force, compliance to SA5A.1 shall be checked.

SA6 Markings

SA6.1 A meter socket adapter shall be marked with the voltage, continuous current, and short circuit current ratings as indicated in this section. A meter socket adapter shall also be marked to indicate the type of meter socket for which it is intended.

SA6.2 A meter socket adapter tested for use in a specific meter socket as indicated in SA3.2 shall be marked to indicate the manufacturer's name and model number of the meter socket with which it is intended to be used.

SA6.3 A meter socket adapter not marked for use in a specific meter socket as indicated in SA3.2 shall be marked: "Rated ____ Continuous Amps When Used in a Meter Socket Rated ____ Continuous Amps," or equivalent. The first blank shall specify the test current of the meter socket adapter and the second blank shall specify the continuous current rating of the test fixture.

SA6.4 A meter socket adapter shall be marked with the following:

a) The phrase "Short-circuit current rating," the rms symmetrical short-circuit current rating in amperes as noted in Table 27.2, and the phrase "Watthour meter not included in short-circuit current rating."

Exception: A meter socket adapter rated 30 amperes or less (intended for use with current transformers) need not be so marked.

b) The maximum voltage rating for each marked short-circuit current rating.

c) Additional markings as specified in 27.12.3 – 27.12.5 if the rms symmetrical short-circuit current rating of the meter socket adapter is greater than 10,000 amperes.

SA6.5 The short-circuit current rating of a meter socket adapter shall be located where it will be visible after the meter socket adapter is installed. The location of the marking may be such that the cover or watthour meter must be removed to render the marking visible. This rating shall be an integral part of a marking containing the manufacturer's name or another required marking. If there is more than one short-circuit current rating, all such ratings shall be located together.

SA6.6 If the short circuit current rating of a meter socket adapter is dependent upon the use of a current limiting fuse, as specified in Table 15.1, the meter socket adapter shall be marked "When used in conjunction with ____ ampere maximum Class ____ fuse, this meter socket adapter is rated for use on a circuit capable of delivering not more than ____ rms symmetrical amperes, ____ volts maximum." The first blank space shall be filled in with the fuse ampere rating; the second blank space shall be filled in with the fuse class designation (J, RK1, RK5, or T); the third blank space shall be filled in with the maximum short circuit current that the circuit can deliver; and the fourth blank space shall be filled in with the circuit voltage rating.

SA6.7 A meter socket adapter, marked with an assigned short-circuit current value based on use with a circuit breaker in accordance with Table 15.1, shall be marked with the following or equivalent: "When used in conjunction with a circuit breaker rated not more than ____ amperes, this meter socket adapter is rated for use on a circuit capable of delivering not more than ____ rms symmetrical amperes, ____ volts maximum (not in excess of the circuit breaker interrupting rating)." The value of amperes specified shall correspond to the symmetrical values indicated in Table 27.2.

SA6.8 If the short circuit current rating of a meter socket adapter is dependent upon the use of a specific circuit breaker, the meter socket adapter shall be marked with the following or equivalent: "When used in conjunction with a ____ circuit breaker rated not more than ____ amperes this meter socket adapter is rated for use on a circuit capable of delivering not more than ____ rms symmetrical amperes, ____ volts maximum (not in excess of the circuit breaker interrupting rating)." The value of amperes specified shall correspond to the symmetrical values indicated in Table 27.2. The first blank space shall contain the manufacturer's name and type designation.

SA6.9 Meter socket adapters with surge arresters shall be marked as being suitable for use on the line side of service equipment.

SA7 Instructions

SA7.1 Meter socket adapters provided with wires intended for connection to the meter socket shall be provided with instructions for their connection. If the wires are intended for connection to a terminal that may not be required in a meter socket, the instructions shall contain instructions for the installation of the terminal in the meter socket. Terminal kits required for installation shall be available from the manufacturers of the meter socket adapter. The instructions shall be such that the meter socket will comply with the requirements in this standard after completion of any necessary modifications.

SA7.2 Meter socket adapters shall be provided with instructions for connecting the grounding conductors of the device to the meter socket to which the adapter is to be secured. These instructions shall be

prepared to take into consideration meter sockets that are not provided with terminals to which the connectors from the meter socket adapters can be secured.

SA7.3 Meter socket adapters shall be provided with instructions that inform service personnel on how to install the device without coming into contact with the meter socket jaws of the adapter.

SA7.4 The instructions for meter socket adapters with provisions for conduit connections shall state the following: “Conduit must be securely fastened within 12 inches of the meter socket adapter”.

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SUPPLEMENT SB – METER SOCKET ADAPTERS FOR USE WITH DISTRIBUTED GENERATION EQUIPMENT

SB1 Scope

SB1.1 These requirements cover meter socket adapters intended for use with distributed generation equipment, including energy generating and energy storage equipment.

SB1.2 These requirements cover meter socket adapters with provisions for connection of interactive equipment to the main circuit in addition to the blades and jaws of the meter socket adapter.

SB1.3 These requirements cover meter socket adapters that have components associated with distributed generation sources, with no provisions for connections to the main circuit other than through the blades and jaws of the meter socket adapter.

SB2 General

SB2.1 These devices shall comply with the requirements in this standard and the additional requirements in this Supplement. Where requirements in this supplement are different than those in this standard, the requirements of this supplement apply.

SB2.2 The dimensions of the base of the adapter shall be in accordance with the appropriate envelope design as covered in Figures 2 – 10 in the Standard for Physical Aspects of Watt-hour Meters, ANSI C12.10. Additional openings and slots may be provided in the base of the adapter.

SB2.3 Metallic enclosures and exposed metal components of the meter socket adapters shall be provided with a means to bond the metallic components to the meter socket enclosure to which the adapter connects. The method of bonding shall comply with the requirements in Article 250 of the National Electrical Code, ANSI/NFPA 70.

SB2.4 Surge protection gaps: A meter socket adapter shall be provided with means to ground the grounding straps of surge gaps on watthour meters. The grounding means shall extend over the area defined in the appropriate envelope designs as covered in the Standard for Physical Aspects of Watt-hour Meters, ANSI C12.10. The straps shall either be bonded to the enclosure or exposed dead metal or connected to grounding straps on the male end of the meter socket adapter. Unless shown in Figures 2 – 10 in the Standard for Physical Aspects of Watt-hour Meters, ANSI C12.10, a meter socket adapter shall not have uninsulated conductors or uninsulated bonded metal parts in areas that may contain meter voltage coils, test links, or other live parts unless recessed or otherwise located to comply with the minimum electrical spacings of Table 8.1 with a meter installed.

SB2.5 Neutral leads shall not be provided on meter socket adapters.

Exception No. 1: Neutral leads may be provided on mater socket adapters that are marked for use as "power outlets for temporary site service equipment."

Exception No. 2: Meter socket adapters may be provided with a neutral wire if instructions for installation of the wire have been provided and have been investigated and found to be suitable. If kits are required for installation, the kits shall be available from the manufacturer of the meter socket adapter. See SB15.1.

SB2.6 Surge protective devices installed in meter socket adapters shall be investigated in accordance with the Standard for Surge Protective Devices, UL 1449 and found suitable for use on the line side of service equipment.

SB2.7 Meter socket adapters shall be provided with means for sealing by the utility to prevent removal of the meter from the meter socket adapter and removal of the meter socket adapter from the meter socket without breaking the utility seal. Any covers or doors that provide access to any terminals or live parts within the meter socket adapter shall also have means for sealing by the utility.

SB3 Ventilation

SB3.1 Meter socket adapters provided with ventilation shall comply with Ventilation Openings, Section 31. Grilles and guards shall not be removable from the meter socket adapter without removing the meter socket adapter from the meter socket.

SB3.2 Meter socket adapters with forced ventilation shall comply with the environmental tests as required by 4.1 with the ventilation both operative and inoperative.

SB3.3 Meter socket adapters with filtered ventilation openings shall be constructed such that the filters can be replaced without removing the electric meter from the meter socket adapter or removing the meter socket adapter from the meter socket. During replacement of filters, any openings shall comply with Ventilation Openings, Section 31.

SB3.4 Filters for ventilation shall not be considered to be the barriers required by Ventilation Openings, Section 31 with respect to access to live parts or moving parts.

SB4 Overtemperature Detection and Protection

SB4.1 When overtemperature detection and protection is provided in a meter socket adapter, it shall act to prevent the assembly and parts therein from exceeding the temperature limits specified in 14.3 on the meter socket test fixture and meter socket adapter under all conditions, including inoperable forced ventilation and/or blocked ventilation filters. Additionally, no component or insulation shall exceed the rated maximum allowable temperature for the component or insulation.

SB4.2 Overtemperature detection shall be accomplished using a component that has been investigated and found to comply with the requirements of the Standard for Temperature-Indicating and -Regulating Equipment, UL 873, or the requirements of the Standard for Automatic Electrical Controls – Part 1: General Requirements, UL 60730-1 in combination with the Standard for Automatic Electrical Controls – Part 2-9: Particular Requirements for Temperature Sensing Controls, UL 60730-2-9.

SB4.3 Overtemperature detection shall detect an overtemperature condition prior to any component or insulation reaching the temperature limits specified in 14.3, and shall cause an action to prevent further temperature rise, for example, causing a switching device to open the main circuit of the meter socket adapter.

SB4.4 If overtemperature detection and protection circuitry relies upon control power that is provided from a source external to the meter socket adapter, the switching device referenced in SB4.3 shall open if the control power is interrupted.

SB4.5 Overtemperature detection and protection shall comply with this section under normal conditions and under single fault conditions. For purposes of this requirement, loss of fans or blocking of filters is not considered a fault condition.

SB4.6 If more than one cooling fan is provided, the overtemperature detection shall comply with this section with each single fan inoperable and also with all fans inoperable, If ventilation openings are provided with filters, the overtemperature detection shall comply with this section with the filters blocked completely, and also with 50% of the surface area of the filters blocked.

SB4.7 If overtemperature detection and protection relies upon software or firmware, it shall comply with the Standard for Software in Programmable Components, UL 1998.

SB4.8 All the necessary components for overtemperature detection and protection shall be contained within the meter socket adapter.

SB5 Overcurrent Protection and Disconnection Means

SB5.1 Meter socket adapters with provision for connection to circuits external to the adapter, other than circuits that pass through the load terminals of the associated meter socket, shall be provided with overcurrent protection and a disconnection means for those circuits. This requirement does not apply to low energy circuits as described in SB7.2.

Exception: The overcurrent protection and disconnection means is not required when the meter socket adapter is marked in accordance with SB14.12 and is provided with installation instructions in accordance with SB15.6.

SB5.2 The disconnection means required by SB5.1 shall be of the type that has been investigated for connection on the line side of the service. The meter socket adapter shall be marked in accordance with SB14.11.

SB5.3 Overcurrent devices installed in meter socket adapters shall be of the type that have been investigated for connection on the line side of the service.

SB5.4 If the meter socket adapter includes circuit breakers, they shall be manually resettable without removing the electric meter from the meter socket adapter or removing the meter socket adapter from the meter socket.

SB5.5 Other than as noted in SB5.7, if the meter socket adapter includes fuses, they shall be provided with extraction type fuseholders that allow replacement of the fuses without removing the electric meter from the meter socket adapter or removing the meter socket adapter from the meter socket. The fuseholder shall be of a design that captivates all parts of the fuseholder during and after fuse replacement. No energized portions of a fuse or of the meter socket adapter shall be accessible while replacing a fuse, including with the fuseholder in the open position with no fuse installed.

SB5.6 Lockable covers shall be provided to prevent replacement of fuses by unauthorized persons.

SB5.7 Under the following conditions, extraction type fuseholders are not required:

a) The fuses are not part of the main supply circuit;

b) The fuse(s) are located in a circuit that does not involve a fire or shock hazard as described in SB5.8;

c) Opening of the fuse(s) does not cause any safety circuitry to become ineffective; and

d) Replacement of the fuse does not expose the user to any energized portions of the meter socket adapter other than those that do not involve a fire or shock hazard as described in SB5.8.

SB5.8 With respect to SB5.7, a circuit does not involve a fire or shock when it involves a potential of no more than 42.4 peak, and is supplied by one of the following:

a) An energy limiting Class 2 transformer complying with the requirements of the Standard for Low Voltage Transformers – Part 3: Class 2 and Class 3 Transformers, UL 5085-3;

b) A Class 2 power supply complying with the Standard for Class 2 Power Units, UL 1310;

c) A combination of an isolated transformer secondary winding and a fixed impedance complying with the requirements of UL 1310; or

d) A dry cell battery having output characteristics not greater than those of a Class 2 power unit.

SB6 Spacings

SB6.1 Electrical spacings at the jaws and blades of the meter socket adapter shall comply with Spacings, Section 8.

SB6.2 Components connected directly to the jaws or blades of the meter socket adapter shall comply with Spacings, Section 8.

SB6.3 Spacings on printed wiring boards shall comply with the requirements of the Standard for Insulation Coordination Including Clearances and Creepage Distances for Electrical Equipment, UL 840. For purposes of this requirement, the meter socket adapter shall be considered to be operating in an Overvoltage Category of OVC IV, and in a pollution degree 3 environment. While the meter socket adapter is considered to be operating in an OVC IV environment, surge protective devices incorporated in the printed wiring board design may be investigated and shown to reduce the Overvoltage Category in portions of the circuit protected the overvoltage controls.

SB6.4 The surge protective devices referenced in SB6.3 shall be investigated for use on the line side of service equipment.

SB6.5 Spacings between live parts of a printed wiring board assembly and the jaws or blades of the meter socket adapter shall comply with Spacings, Section 8, when the parts are at opposite polarity.

SB7 Wiring Connections

SB7.1 External connections to power circuits

SB7.1.1 Connections for external circuits other than those described in SB7.2 shall comply with SB7.1.2 – SB7.1.6.

SB7.1.2 When external circuits are intended to be connected directly to the meter socket adapter, these circuits shall be connected only to the load side of the meter socket adapter. No external circuits shall be connected to the line side of the meter socket adapter.

Exception: A meter socket adapter may have provisions for connection of external circuits to the line side of the meter socket adapter when the adapter is marked in accordance with SB14.17 and is provided with instructions in accordance with SB15.10.

SB7.1.3 Terminals for connection of external circuits shall be located internally to the meter socket adapter, such that the terminations are inaccessible with the meter socket adapter installed in the meter socket and a meter installed in the meter socket adapter.

Exception: Terminals may be located in a separate compartment of the meter socket adapter, if this compartment has provisions for application of a seal or lock by the serving utility.

SB7.1.4 Terminals for connection of external circuits shall comply with Wiring Terminals, Section 7.

SB7.1.5 When external circuits are intended to be connected directly to a meter socket adapter, the meter socket adapter shall be provided with fittings for connection of a flexible liquid-tight conduit system. These fittings shall comply with the Standard for Conduit, Tubing, and Cable Fittings, UL 514B.

SB7.1.6 Meter socket adapters shall not be provided with receptacles for connection to external circuits other than communication or control circuits in accordance with SB7.2.

SB7.2 External Connections for low energy communication and control circuits

SB7.2.1 Meter socket adapters may have provisions for connection of low energy communication and control circuits in accordance with SB7.2.2 – SB7.2.6.

SB7.2.2 Other than as described in SB7.2.3, the connection point for low energy communication or control circuits shall be located on the exterior of the meter socket adapter, such that it is accessible with the meter socket adapter and associated meter installed and sealed by the utility.

SB7.2.3 Provisions for connection to external communication or control circuits may be through a cord that is intended to be spliced at the installation. Cords shall comply with all of the following:

a) The cord shall be attached to the meter socket adapter at the factory, and shall exit the body of the adapter through a close fitting grommet;

b) That portion of the cord that is internal to the meter socket adapter shall be insulated for the highest voltage in the meter socket adapter, or shall be securely routed from all parts operating at voltages higher than the insulation rating of the cord;

c) Cords shall not exit the meter socket adapter through the base of the meter socket unless they are provided with insulation having a voltage rating no less than the voltage rating of the meter socket adapter; and

d) Cords shall be secured to relieve the conductors from strain, including twisting, where they are connected within the meter socket adapter. Knots in conductors shall not be used as strain relief. It shall not be possible to push the cord into the equipment to an extent which could damage the conductor or cause the cord to contact parts operating at voltages above the insulation rating of the cord.

SB7.2.4 The connection point shall be constructed such that the meter socket adapter will meet the requirements of the Rain Test, Section 17 both with and without the associated wiring installed.

SB7.2.5 With the meter socket adapter installed and energized, and no external connection made to the connection point for communication and control circuits, there shall be no voltage at the connection point.

SB7.2.6 The meter socket adapter shall be marked in accordance with SB14.14.

SB8 Switching Components Installed in Meter Socket Adapters

SB8.1 Switching components in meter socket adapters shall comply with the requirements of the standard applicable to that component, and shall have ratings no less than the load which may be switched during normal operations.

SB8.2 Switching devices in meter socket adapters shall have a short-circuit current rating no less than the short-circuit rating of the meter socket adapter.

SB8.3 Switching components shall be rated no less than the continuous current rating of the meter socket specified in SB14.2 or SB14.3.

Exception: Switching components for the distributed energy circuit, that do not carry the full load of the meter socket may be rated based on the current rating of the distributed energy circuit as marked in SB14.16.

SB8.4 Switching devices that are used to isolate connected circuits from the incoming service shall be capable of withstanding a dielectric voltage withstand test across the isolating gap. The test voltage shall be equal to 1100 V plus 2.2 times the maximum rated voltage of the meter socket adapter.

SB9 Metering Circuits in Meter Socket Adapters

SB9.1 Meter socket adapters may be provided with circuitry for metering of the circuits connected to the meter socket adapter. This metering is not considered to be a replacement for the metering provided by the meter that is to be inserted into the meter socket adapter.

SB9.2 When metering circuits are provided, the spacing requirements of Section SB6 are applicable.

SB10 Communication Circuits in Meter Socket Adapters

SB10.1 Meter socket adapters may be provided with circuitry to provide for communication purposes. Communication circuitry that is connected by wire or cable to external circuits shall comply with SB7.2.

SB10.2 Wireless communication circuits shall comply with the appropriate FCC requirements.

SB10.3 When communication circuits are provided, the spacing requirements of Section SB6 are applicable.

SB10.4 Failure of communication circuits, including loss of wireless communication, shall not result in a fire or shock hazard.

SB11 Performance

SB11.1 A representative sample of each rating, construction, and type of meter socket adapter shall be subjected to the tests described in Section SB12, Heating Test, Section SB13, Short-Circuit Current Test and Section SA5A, Moment Test,. Other than as noted in SB11.2, the adapter is to be tested in a meter socket calibrated as indicated in SB12.1.1. The purpose of the calibration is to ensure that the measured temperature rises will represent the use of the adapter in a meter socket that has the maximum temperature rise permitted by this standard.

SB11.2 A meter socket adapter marked in accordance with SB14.2 as being intended for use in a specific meter socket shall be tested in the specific meter socket for which it is marked. No correction factor is necessary.

SB12 Heating Test

SB12.1 General

SB12.1.1 Meter socket adapters containing a socket intended for installation of a watthour meter shall be subjected to the Heating Test, Section 14, with the additional considerations in SB12.1.2 – SB12.1.7.

SB12.1.2 Other than as noted in SB12.1.5, overtemperature sensing and protection shall not terminate the heating test. The overtemperature sensing and protection may be defeated during the 120 percent current cycling described in 14.2(e).

SB12.1.3 Meter socket adapters provided with forced ventilation shall be subjected to the heating test with all ventilation inoperative. If the test is terminated by the overtemperature sensing and protection as described in SB12.1.5, the heating test shall be repeated with the ventilation operative in accordance with SB4.6, and the temperature limits of SB4.1 shall not exceed at any point during the testing at 100 percent of continuous current in 14.2(b) and 14.2(f).

SB12.1.4 Meter socket adapters provided with filtered ventilation shall be subjected to two tests, one with the filters blocked completely, and one with 50% of the surface area of each filter blocked. If either test is terminated by the overtemperature sensing and protection as described in SB12.1.5, the test shall be repeated with the filters unblocked, and the temperature limits of SB4.1 shall not exceeded at any point during the applications in 14.2(b) or 14.2(f) testing at 100 percent of continuous current in 14.2(b) and 14.2(f).

SB12.1.5 When a meter socket adapter is provided with overtemperature sensing and protection in accordance with Section SB4, the heating tests with inoperative ventilation and blocked filters required by SB12.1.3 and SB12.1.4 may be terminated by the overtemperature sensing and protection. The temperature limits of SB4.1 shall not be exceeded at any point during the tests.

SB12.1.6 The Heating Tests of SB12.3 and SB12.4 may be combined by conducting a single Heating Test with the fans inoperable and the filter openings blocked completely, If the test is not terminated by overtemperature sensing and protection, and the temperature limits specified in SB4.1 are not exceeded at any point during the test, overtemperature detection and protection is not required.

SB12.1.7 Components, when provided, shall be energized as intended in normal use while the meter socket and meter socket adapter are carrying the rated continuous current.

SB12.2 Meter socket adapters not intended for use in a specific meter socket

SB12.2.1 The meter socket used as a test fixture is to be calibrated before each test. The test fixture is to be calibrated by using a simulated watthour meter as described in 14.8 and Figure 14.2 – Figure 14.3. The meter socket is to be rated less than or equal to the continuous current ratings of the meter socket for which the adapter is intended. The test current to determine the correction factor of the adapter is to be equal to the rated current of the meter socket. The simulated meter is to have the same number of current jumper bars as current circuits in the adapter to be tested. A temperature rise is to be determined on the meter socket test fixture by applying the test current to all jumper bars in series until the temperature has stabilized. A temperature correction factor T_c is to be calculated based on the temperature rise at each individual meter socket jaw. The correction factor (T_c) equals 65°C (117°F) minus the measured temperature rise at the meter socket jaws. If the measured temperature rise exceeds 65°C, the test is considered inconclusive.

SB12.2.2 During subsequent Heating Tests on the meter socket adapters, the adapters are to be tested at their rated current. The correction factor (T_c) is to be added to the final measured temperatures attained on the meter socket jaw and the busses connected to the meter socket jaw.

SB12.3 Meter socket adapters intended for use only in a specific meter socket

SB12.3.1 Meter socket adapters intended for use only in a specific meter socket shall be subjected to the Heating Test, Section 14, with the meter socket adapter installed in the specific meter socket with which the meter socket adapter is intended to be used.

SB12.3.2 If a meter socket adapter is intended for use with more than one specific meter socket, the test shall be conducted with each of the specified meter sockets.

SB12.4 Meter socket adapters with provisions for connection of an distributed generation source

SB12.4.1 For meter socket adapters with provisions for connection of an distributed generation source, the test method described in Section 14 shall be modified as described in SB12.4.2 – SB12.4.4.

SB12.4.2 The test described in 14.2(b) shall be conducted with a total load of 100 percent of the continuous current rating of the meter socket adapter, supplied through the utility source terminals.

SB12.4.3 The test described in 14.2(e) shall be conducted with a total load of 120 percent of the continuous current rating of the meter socket adapter, supplied through the utility source terminals.

SB12.4.4 The test described in 14.2(f) shall be conducted two times:

a) One test shall be conducted with a total load of 100 percent of the continuous current rating of the meter socket adapter. For this test, the distributed generation source terminals shall carry 100 percent of the continuous ampere rating of the distributed generation circuit, and the utility source

terminals shall carry sufficient current so the total current supplied by the two sources is no less than the 100 percent of the continuous ampere rating of the meter socket adapter; and

b) The second test shall be conducted with a total load of 100 percent of the continuous current rating of the meter socket adapter, supplied through the utility source terminals.

SB13 Short-Circuit Current Test

SB13.1 General

SB13.1.1 All meter socket adapters for use with distributed generation shall be subjected to short-circuit current tests. The requirements of SB13.1.2 – SB13.5.3 apply to all short-circuit tests. Multiple tests may be necessary based upon the product configurations and circuits as noted:

a) Short-Circuit Current Test, Section 15, and Short-Circuit Current Test with Specific Circuit Breaker, Section 16, apply to the meter socket adapters main power circuits;

Exception: Meter socket adapters having switching devices in the main power circuit shall be tested in accordance with SB13.8.

b) SB13.6 applies to meter socket adapters with connections to external power circuits other than the main power circuit, that are provided with internal overcurrent protection for the external circuits;

c) SB13.7 applies to meter socket adapters with short-circuit ratings greater than 10 kA, having connections to external circuits that are not provided with internal overcurrent protection; and

d) SB13.8 applies to meter socket adapters containing switching devices.

SB13.1.2 Sufficient tests shall be conducted to represent each construction to be represented, including the construction having the least electrical impedance to current flow.

SB13.1.3 In addition to samples of meter sockets adapters, samples provided for tests are to include, as necessary:

a) A watthour meter as covered in SB13.3.2;

b) Wire and conduit as covered in SB13.3.4; and

c) A fuse as covered in SB13.3.3.

SB13.2 Test circuit calibration

SB13.2.1 The available rms symmetrical current and power factor at the test station terminals are to be determined in accordance with the Standard for Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit Breaker Enclosures, UL 489. The power factor is to be in accordance with Table SB13.1. The available rms symmetrical current shall be no less than the short circuit rating of the meter socket adapter.

Exception: If the physical arrangement in the test station requires leads longer than specified in SB13.3.4, the additional length of leads is to be included in the test circuit calibration.

Table SB13.1
Power factor

Short-circuit current, symmetrical amperes	Maximum power factor
0 – 10,000	0.5
10,001 – 20,000	0.3
20,001 and higher	0.2

SB13.2.2 A 3-phase test circuit having an open-circuit voltage at the supply connections of 100 – 105 percent of rated voltage for the test being conducted is to be used. The supply frequency is to be in the range of 48 – 60 hertz.

Exception No. 1: With the concurrence of those concerned, a voltage higher than 105 percent may be employed.

Exception No. 2: A 4-jaw meter socket adapter that has no provision for a fifth jaw may be tested on a single-phase test circuit.

Exception No. 3: A 7-jaw meter socket adapter may be tested with a single-phase test circuit having an open-circuit voltage not less than 115.5 percent of the meter socket adapter voltage rating using adjacent pairs of jaws if the rms symmetrical short circuit current available at the test station terminals at this voltage is also at least 115.5 percent of the meter socket adapter short circuit rating. Such a test would use two poles of a 3-pole circuit breaker.

SB13.3 Sample preparation

SB13.3.1 The meter socket adapter is to be inserted into a commercially available meter socket that is mounted and supplied as in an intended installation.

SB13.3.2 A commercially-available watthour meter with a class rating not less than the continuous current rating of the meter socket adapter is to be in place during the short circuit test.

SB13.3.3 The meter socket enclosure is to be connected through a 30-ampere, non-time delay type cartridge fuse to the line lead of the pole least likely to arc to the enclosure. This connection is to be made on the load side of the limiting impedance by a 10 AWG (5.3 mm^2) copper wire 4 – 6 feet (1.2 – 1.8 m) long.

SB13.3.4 The length of the supply conductors to the meter socket shall not exceed 1.2 m (4 feet) per terminal. The length of the load conductors on the meter socket shall not exceed 1.2 m (4 feet) per terminal. The length of the conductors on the distributed generation shall not exceed 1.2 m (4 feet) per terminal. The wire is to have an ampacity as shown in Table 7.1 based on the 75°C (167°F) insulation nearest to but not less than the rating of the meter socket or distributed generation circuit. The terminals are to be tightened to the torque specified by the meter socket manufacturer. Line and load wires may enter the enclosure through 24 inches (610 mm) or shorter lengths of conduit. External power circuits that are connected directly to the meter socket adapter shall use the flexible conduit type specified by the manufacturer for the installation. There is to be no bracing of the cable inside the meter socket enclosure or field installed cable inside of the adapter unless the construction includes instructions for such bracing. The provision for bracing may or may not be provided as part of the meter socket or meter socket adapter. Bracing hardware not provided as part of the meter socket or meter socket adapter shall be available to the installer. A cable may be braced external to the enclosure.

Exception No. 1: The length of the supply conductors may exceed 4 feet per phase if the excess length is included in the test circuit calibration as covered in the Exception to SB13.2.1.

Exception No. 2: Copper wire is to be used at any termination point marked for use with copper wire only.