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Telecommunications
Engineers***

**ENGINEERING COMMITTEE
Interface Practices Subcommittee**

AMERICAN NATIONAL STANDARD

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**Specification for
Underground Enclosure Integrity**

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1.0 SCOPE

- 1.1 SCOPE: This standard covers conformance tests and requirements for the integrity of grade-level enclosures containing telecommunication or other low voltage apparatus that may be exposed to the public.
- 1.2 PURPOSE: The purpose of this standard is to describe the requirements for a comprehensive integrity system for grade-level enclosures providing long installation life and minimal maintenance.

2.0 NORMATIVE REFERENCES

The following documents contain provisions, which, through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreement based on this standard are encouraged to investigate the possibility of applying the most recent editions of the documents listed below.

- 2.1 ASTM D543-95 (2001) "Standard Practices for Evaluating the Resistance of Plastics to Chemical Reagents"
- 2.2 ASTM D570-98 "Standard Test Method for Water Absorption of Plastics"
- 2.3 ASTM D756-93 "Practice for Determination of Weight and Shape Changes of Plastics Under Accelerated Service Conditions"
- 2.4 ASTM D2444-99 "Standard Test Method for Determination of the Impact Resistance of Thermoplastic Pipe and Fittings by Means of a Tup (Falling Weight)"
- 2.5 ASTM G154-00 "Standard Practice for Operating Fluorescent Light Apparatus for UV Exposure of Nonmetallic Materials"
- 2.6 US Dept. of Agriculture, Rural Utilities Service, RUS 7 CFR 1755.910 – 11/94 "Specification for Outside Plant Housings and Serving Area Interface Systems"
- 2.7 ASTM C1028-06 "Standard Test Method for Determining the Static Coefficient of Friction of Ceramic Tile and Other Like Surfaces by the Horizontal Dynamometer Pull-Meter Method"

3.0 INFORMATIVE REFERENCES

The following documents may provide valuable information to the reader but are not required when complying with this standard.

- 3.1 American Association of State Highway and Transportation Officials (AASHTO) “Standard Specification for Highway Bridges” 16th Edition.
- 3.2 National Fire Protection Association (NFPA) National Electric Code Section 314.30
- 3.3 Americans with Disabilities Act (ADA) “Accessibility Guidelines for Buildings and Facilities” (ADAAG) and the “Technical Bulletin: Ground and Floor Surfaces”. Both are free from US Government website <http://www.access-board.gov/>.

4.0 COMPLIANCE NOTATION

“SHALL”	This word or the adjective “REQUIRED” means that the item is an absolute requirement of this specification.
“SHALL NOT”	This phrase means that the item is an absolute prohibition of this specification.
“SHOULD”	This word or the adjective “RECOMMENDED” means that there may exist valid reasons in particular circumstances to ignore this item, but the full implications should be understood and the case carefully weighted before choosing a different course.
“SHOULD NOT”	This phrase means that there may exist valid reasons in particular circumstances when the listed behavior is acceptable or even useful, but the full implications should be understood and the case carefully weighed before implementing any behavior described with this label.
“MAY”	This word or the adjective “OPTIONAL” means that this item is truly optional. One vendor may choose to include the item because a particular marketplace requires it or because it enhances the product, for example; another vendor may omit the same item.

5.0 DEFINITIONS AND ACRONYMS

- 5.1 **GRADE-LEVEL ENCLOSURE** is defined as an enclosure which houses and protects distribution equipment, including but not limited to: splice cases, excess cable, and construction or pull-box equipment. These enclosures are typically non-metallic. They include a removable cover to support the anticipated loading requirements of the installation.

6.0 ENVIRONMENTAL TESTS

- 6.1 **CONTROL SAMPLES.** Six specimens of the enclosure material(s) shall be prepared. The thickness shall match the material thickness of the appropriate section of the enclosure. The length and width are determined by the testing equipment to be used. These specimens are the control samples. The control specimens shall be tested for ultimate flexural strength. The values of load and deflection at failure for each specimen shall be averaged to establish the control values.
- 6.2 **ACCELERATED SERVICE.** Three material coupons with the same dimensions as the control specimens shall be measured, weighed, and subjected to accelerated service exposure in accordance with ASTM D756 Procedure E, using a specified temperature of -40 °C (-40 °F) rather than -57 °C (-70.6 °F). After exposure, the three samples shall be measured, weighed and visually examined for changes. The specimens shall be tested for ultimate flexural strength. The values of load and deflection at failure for each specimen shall be averaged to establish the test values. The tested specimens must retain at least 75% of the control values for load and deflection and have no more than a 2% change in weight.
- 6.3 **CHEMICAL RESISTANCE.** Twenty seven (27) material coupons with the same dimensions as the control specimens shall be measured, weighed, and three specimens exposed to each of the following chemical reagents:

REAGENT	CONCENTRATION IN WATER SOLUTION
Sodium Chloride	5%
Sulfuric Acid	0.1N
Sodium Carbonate	0.1N
Sodium Sulfate	0.1N
Hydrochloric Acid	0.2N
Sodium Hydroxide	0.1N
Acetic Acid	5%
Kerosene	Per ASTM D543
Transformer Oil	Per ASTM D543

The exposure shall be in accordance with ASTM D543, Immersion Test, Practice “A”, Procedures 1 and 2, with both conducted at room temperature, using Standard Laboratory Atmosphere and seven days for all tests. After exposure, the samples shall be measured, weighed and visually examined for changes. The specimens shall be tested for ultimate flexural strength. The values of load and deflection at failure for each specimen shall be averaged to establish the test values for each reagent. The tested specimens must retain at least 75% of the control values for load and deflection and have no more than a 2% change in weight.

- 6.4 **SIMULATED SUNLIGHT EXPOSURE.** Three material coupons with the same dimensions as the control specimens shall be measured, weighed, and tested in accordance with ASTM G154 per Cycle #1 of Appendix X2 to simulate direct solar UV radiation. After exposure, the samples shall be measured, weighed and visually examined for changes. The specimens shall be tested for ultimate flexural strength. The values of load and deflection at failure for each specimen shall be averaged to establish the test values. The tested specimens must retain at least 75% of the control values for load and deflection and have no more than a 2% change in weight.
- 6.5 **WATER ABSORPTION.** Three material coupons with the same dimensions as the control specimens shall be measured, weighed, and tested in accordance with ASTM D570, sections 6, 7.1, and 7.5. After exposure, the samples shall be measured, weighed and visually examined for changes. The specimens shall be tested for ultimate flexural strength. The values of load and deflection at failure for each specimen shall be averaged to establish the test values. The tested specimens must retain at least 75% of the control values for load and deflection and have no more than a 2% change in weight.
- 6.6 **FLAMMABILITY.** Three material coupons with dimensions 25mm (1 inch) wide by 100mm (4 inch) long by finished product thickness shall be held in a horizontal position, be ignited on one end, and the rate of burning along the length determined. The burning rate must be less than 8mm (0.3 inch) per minute for each 3mm (0.1 inch) of thickness.

7.0 STRUCTURAL LOAD TESTS ON FULL-SIZE PRODUCTS

It is recognized that as wheels roll over an enclosure, loads are imparted laterally and vertically into the sidewall, and vertically onto the cover. The load tests shall use the three test positions as described in paragraphs 7.1 through 7.4 below to evaluate enclosures and match the intended application with enclosure performance: Use Figure 1 for all TIERS up to and including TIER 15; Use Figure 2 for TIER 22; Use Figure 3 for the Lateral Sidewall Test for enclosures which are longer than 48 inches long; Use Table 1 for the Load Requirements for all TIERS and all sizes of enclosures.

- 7.1 **LATERAL SIDEWALL LOAD TEST.** The design bearing pressure shall be uniformly distributed and applied parallel to the top surface of the enclosure on the longest wall as shown in Position 1 of Figures 1, 2, and 3. The loads shall be transmitted by flat, rigid plate(s) 610mm (24 inch) by 457mm (18 inch), bearing against any suitable medium which will conform to the shape and angle of the enclosure sidewall (such as sand bags) to achieve uniform loading. For enclosures with a long wall dimension less than or equal to 1219mm (48 inches), a single loading plate 24 inch wide x 18 inch deep shall be centered on the sidewall as shown in Figures 1 and 2. For enclosures with a long wall dimension longer than 1219mm (longer than 48 inches), two loading plates 24 inch deep x 18 inch wide shall be used, and the loading plates shall be located at the L/3 positions as shown in Figure 3 and the design bearing pressure listed in Table 1 shall be applied to both plates. For all lengths of enclosures, the opposite sidewall shall be supported in a like manner to achieve a uniform reaction, or it may be supported on ribs or stiffeners so long as no local failure occurs. A swivel head will be used in the testing machine. A typical cover will be installed for this test. A deflection measuring device will be positioned to measure the relative deflection between the testing machine table and the inside of the loaded sidewall of the enclosure. If a compressible medium is used for a reaction base, its deflection shall be measured and subtracted from the total to yield the net deflection. The deflection at the design bearing pressure (see Table 1) shall be recorded (see Figure 1, 2 and 3 Position 1). The test shall be repeated ten times to design load and the corresponding deflections recorded. The enclosure shall then be loaded to failure.
- 7.2 **VERTICAL SIDEWALL LOAD TEST.** For TIERS up to and including TIER 15, the loads shall be distributed over a 127mm (5 inch) x 254mm (10 inch) area (see Figure 1 Position 2). A 254mm (10 inch) x 254mm (10 inch) x 25mm (1 inch) thick steel load plate will be positioned over a 13mm (1/2 inch) thick rubber pad so that only a 127mm (5 inch) x 254mm (10 inch) area is effective in transferring the load. The ram will be centered in the 127mm (5 inch) x 254mm (10 inch) area. For TIER 22, the loads shall be distributed over a 127mm(5 inch) x 508mm (20 inch)area (see Figure 2 Position 2). A 254mm (10 inch) x 508mm (20 inch x 25mm (1 inch) thick steel load plate will be positioned over a 13mm (1/2 inch) thick rubber pad so that only a 127mm (5 inch) x 508mm (20 inch) area is effective in transferring the load. The ram will be centered in the 127mm (5 inch) x 508mm (20 inch) area. For all TIERS, the base shall be fully supported with rigid material. The loading pad will be centered on the long dimension and performed with a typical cover in-place. Deflection measuring devices shall be positioned to indicate vertical and lateral deflection wherever maximum deflection occurs. The Design Load must be cycled ten times. The enclosure shall then be loaded to failure. A vertical brace may be used across from the load plate if required for stability.

- 7.3 **COVER VERTICAL LOAD TEST.** For TIERS up to and including TIER 15, the vertical load shall be distributed over a 254mm (10 inch) x 254mm (10 inch) area (see Figure 1 Position 3). The load is to be applied with a 254mm (10 inch) x 254mm (10 inch) x 25mm (1 inch) thick steel load plate backed with a 13mm (1/2 inch) thick rubber shim. For TIER 22, the vertical load shall be distributed over a 254mm (10 inch) x 508mm (20 inch) area (see Figure 2 Position 3). The load is to be applied with a 254mm (10 inch) x 508mm (20 inch) x 25mm (1 inch) thick steel load plate backed with a 13mm (1/2 inch) thick rubber shim. For all TIERS, a spherical bearing swivel head shall be used in the testing machine. The cover will be mounted in a typical enclosure during the test. The loading pad will be centered over the portion of the cover which will produce the maximum deflection under load. Deflection measurements shall be taken perpendicular to the lid and wherever maximum deflection occurs. A deflection measuring device or devices will be positioned so as to measure only the deflection of the cover. The Design Load must be cycled ten times. The specimen shall then be loaded to failure.
- 7.4 **LOADING ACCEPTANCE CRITERIA.** Failure of any enclosure component shall not occur at less than the tabulated test load based on the test conducted and the application. See Table 1. The maximum deflection at the indicated Design Load is 13mm (0.5 inch) for vertical tests and 21mm per meter (0.25 inches per foot) of average wall length for lateral tests.
- 7.5 **COVER IMPACT.** Any exposed portion of the cover shall withstand a 51.6 Nm (70 foot pound) impact administered by a weight having a “C” tup per ASTM D2444 without puncturing or splitting. The test shall be conducted with the cover on a flat rigid surface such as concrete or steel plate.
- 7.6 **INTERNAL EQUIPMENT PROTECTION TEST.** The enclosure and the internal equipment therein shall remain suitable for use when tested for fire resistance in accordance with RUS specification PE-91 and paragraph xiii of “Performance Criteria and Test Procedures for Housings” in RUS 7 CFR 1755.910.

APPLICATION	LOADING REQUIREMENTS			
Light Duty Pedestrian Traffic Only	Vertical	Test Load	13.3kN	3000 pounds
TIER 5 Sidewalk applications with a safety factor for occasional non-deliberate vehicular traffic	Vertical	Design Load	22.2 kN	5000 pounds
	Lateral	Test Load	33.3 kN	7500 pounds
TIER 8 Sidewalk applications with a safety factor for non-deliberate vehicular traffic	Vertical	Design Load	28.7 kPa	600 pounds/sq.ft.
	Lateral	Test Load	43.1 kPa	900 pounds/sq.ft.
TIER 15 Driveway, parking lot, and off-roadway applications subject to occasional non-deliberate heavy vehicular traffic	Vertical	Design Load	35.6 kN	8000 pounds
	Lateral	Test Load	53.4 kN	12000 pounds
TIER 22 Driveway, parking lot, and off-roadway applications subject to occasional non-deliberate heavy vehicular traffic	Vertical	Design Load	28.7 kPa	600 pounds/sq.ft.
	Lateral	Test Load	43.1 kPa	900 pounds/sq.ft.
AASHTO H-20 Deliberate vehicular traffic applications.	Certified precast concrete, cast iron, or AASHTO-recognized materials.			

Table 1 – Test Loads

- 7.7 COEFFICIENT OF FRICTION TEST. A typical production cover shall be tested to assess the slip resistance of the walking surface that is or may be exposed to pedestrian traffic. The static coefficient of friction of this surface shall be a minimum of 0.50 as determined using ASTM C1028-06 Section 8, or any equivalent test method. Other test methods are described in Reference 3.3.

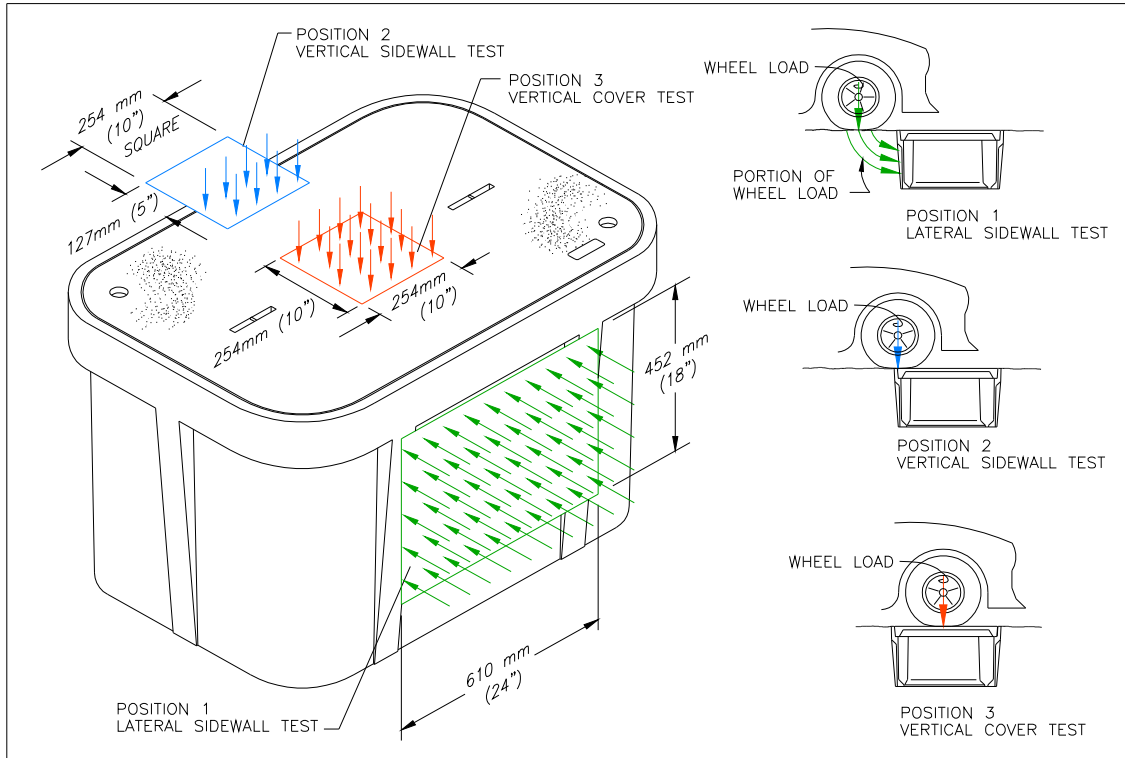


Figure 1 – PRODUCT TEST POSITIONS for TIERS 5, 8, and 15, for enclosures $\leq 1219\text{mm}$ (≤ 48 inch) long.

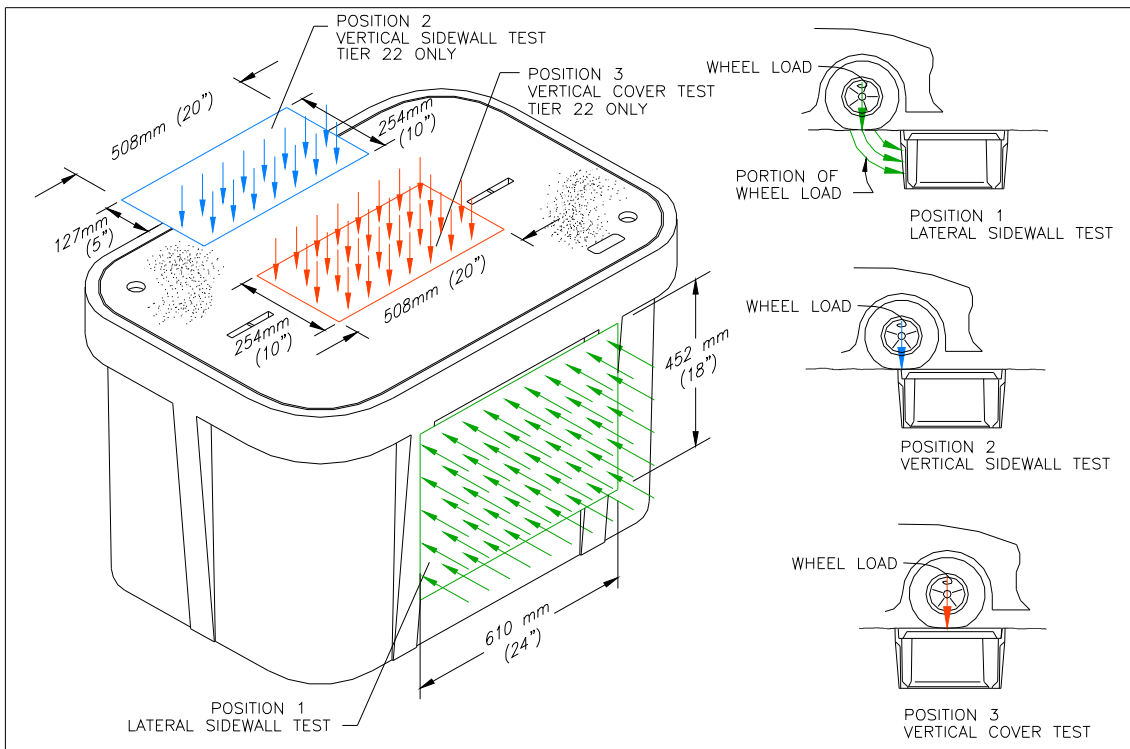


Figure 2 – PRODUCT TEST POSITIONS for TIER 22 only, for enclosures $\leq 1219\text{mm}$ (≤ 48 inch) long.

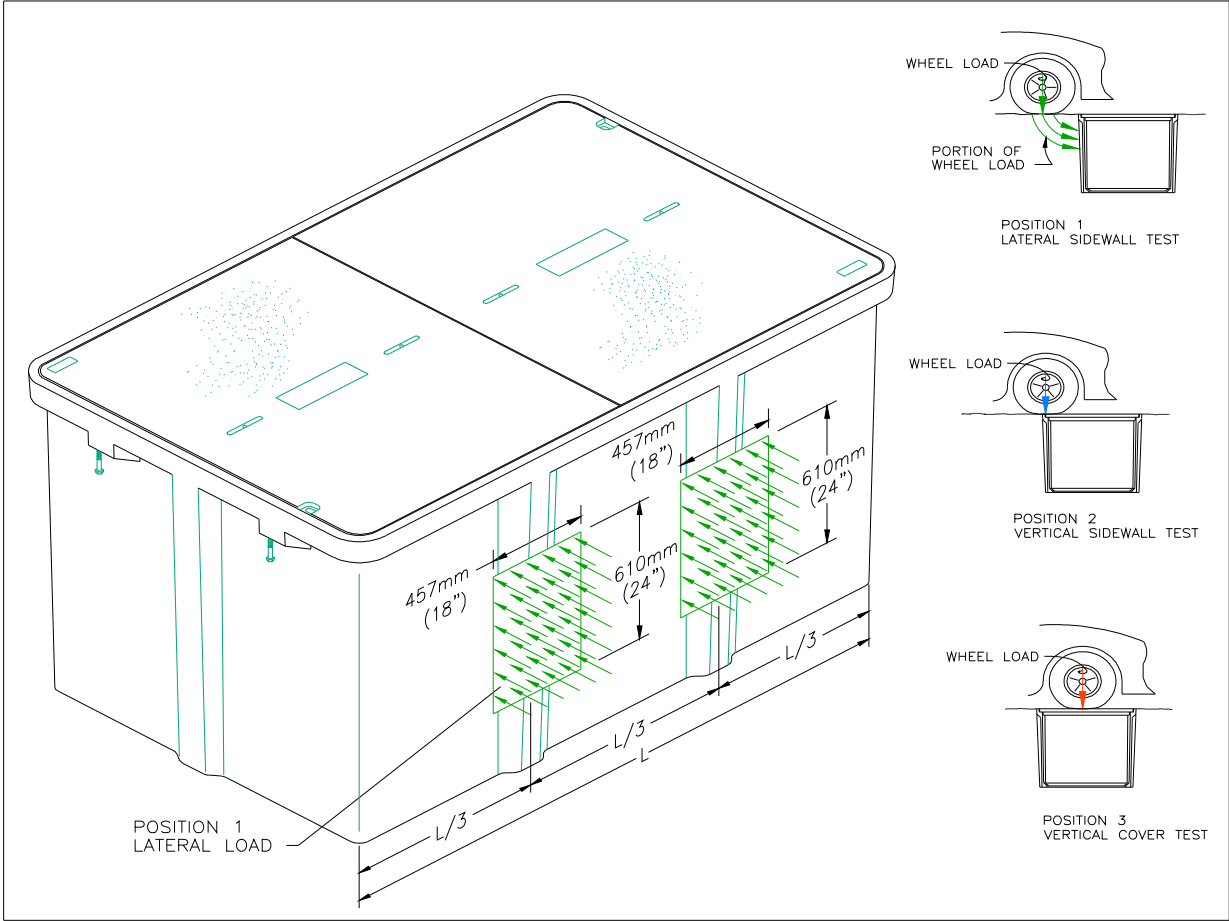


Figure 3 – LATERAL SIDEWALL LOAD TEST for TIERS 5, 8, 15 & 22 for enclosures > 1219mm (> 48 inch) long.