



## **MSU Solid Climbing Rungs**

### **All MSU Solid Climbing Rungs conform to the following standard**

Ontario Provincial Standard 1351

#### **1351.04.02.04 Manhole Steps**

Manhole steps, that are cast, mortared or attached by mechanical means into the walls of risers or conical top sections, shall be designed according to ASTM C478M except that the steps shall be aligned to form a continuous ladder with steps evenly spaced in the assembled manhole at a stance of 300 mm centre to centre. Steps shall be located a minimum of 150 mm from the ends of the sections. The clearance between the wall face and the centre of the inside surface of the step shall not be less than 150mm.

#### **1351.05.06 Manhole Steps**

Manhole steps shall be made of plastic encased or unencased, steel or aluminum. Steel steps shall be made of deformed steel bars with a carbon content of 0.25 percent, conforming to CSA Standard G30.12 M or G30.16M, and shall be hot dip galvanized according to CSA Standard G164M to provide a zinc coating of not less than 600 g/m<sup>2</sup>. Aluminum steps shall conform to CSA Standard HA.5M.

For plastic encased steps, the casing shall be of a solid, low-density virgin polyethylene material which has been deemed "nonobjectionable" by the Health Protection Branch of Health and Welfare Canada based on the Canadian Food and Drug Act and Regulations, Division 23. In addition, the polyethylene material must be in compliance with Title 21 of the United States Code of Federal Regulations, Section 177.1520 (Olefin Polymers).

The minimum thickness of the polyethylene material shall not be less than 3 mm along the top wearing surface of the step, excluding anchor portion. The bottom part of the step and the entire anchor portion shall have a polyethylene coating not less than 2 mm in thickness

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### **1351.08.02 Manhole Step Testing**

#### **1351.08.02.01 Horizontal Load Testing Manhole Steps**

The horizontal load testing of manhole steps shall conform to ASTM C478M, except that a load of 1.3 kN shall be applied on the tread over the width of 90 mm, next to the point the step turns into the wall to form the anchorage. If the step sustains a permanent set of 6 mm or less after application of the horizontal load, then the test is acceptable.

#### **1351.08.02.02 Vertical Load Testing - Manhole Steps**

The vertical load testing of manhole steps shall conform to ASTM C478M. If the step sustains a permanent set of 10 mm or less after application of the vertical load, then the test is acceptable.

#### **1351.08.02.03 Integrity of Plastic Encased Manhole Steps for Installation in New Manholes and Valve Chambers**

This test applies only to steps installed in new concrete, less than 1 hour old for dry cast and less than 12 hours old for wet cast. Three steps of the same type shall be tested for integrity of the plastic coating in the following manner. The step shall be maintained at  $23^{\circ}\text{C} \pm 2^{\circ}\text{C}$  for 24 hours. The step shall then be left at room temperature  $20^{\circ}\text{C} \pm 2^{\circ}\text{C}$  for 24 hours commencing of the test procedure. The steps shall then be cut in half, vertically, at the midpoint of the tread and the coating removed at the cut end of each half step to expose approximately 10 mm of metal. A water solution containing sodium chloride, concentration 3 % by mass, and a wetting agent, i.e. liquid detergent, 0.25 % by volume, shall be prepared. A wire shall be connected from an anode in the salt/detergent solution to an ohm meter. Each half step shall then be tested separately for integrity of the plastic coating by connecting the exposed end to the ohm meter and placing the sample in the salt/detergent solution to within 50 mm of the exposed metal end for at least 5 minutes.

For acceptance of the steps, the following criteria shall apply:

- a. There shall be no cracking, fracturing or openings through the plastic encasement. An unacceptable casing will be indicated by a resistance of less than 1 Megaohm after 5 minutes in the salt/detergent solution. An acceptable coating will be indicated by a near infinite resistance greater than 1 Megaohm, after 5 minutes in the salt/detergent solution.
- b. If any single half step of the three complete steps tested proves to be unacceptable, then three new complete steps of the same type shall be tested in accordance with the above procedures. If any of these three steps subsequently tested do not meet the requirements of this specification, then the product shall be deemed to be unacceptable.

#### **1351.08.02.04 Integrity of Plastic Encased Manhole Steps for Installation in Existing Manholes and Valve Chambers**

This test applies only to steps to be installed in existing concrete, older than 1 hour for dry cast and older than 12 hours for wet cast. Three steps of the same type shall be tested for integrity of the plastic coating in the following manner. The steps shall be maintained at  $-23^{\circ}\text{C} \pm 2^{\circ}\text{C}$  for 24 hours.



Within 5 minutes of removal from the cold room, the steps shall be driven into holes of the proper size in 30 Mpa concrete, cured for at least 2 days, using a standard 1.45 kg rubber mallet. Taking care to avoid damage to the casing, the concrete shall be chipped away from around the steps and the steps left at room temperature at  $20^{\circ}\text{C} \pm 2^{\circ}\text{C}$  for 24 hours.

The steps shall be cut in half vertically at the midpoint of the tread and the coating removed at the cut end of each half step to expose approximately 10 mm of metal. A water solution containing sodium chloride, concentration 3 % by mass, and a wetting agent, liquid detergent, 0.25 % by volume, shall be prepared. A wire shall be placed from an anode in the salt/detergent solution to an ohm meter. Each half step shall then be tested separately for integrity of the plastic coating by connecting the exposed end to the ohm meter and placing the sample in the salt/ detergent solution to within 50 mm of the exposed metal end for at least 5 minutes.

For acceptance of the steps, the following criteria shall apply:

- a. There shall be no cracking, fracturing or openings through the plastic encasement. An unacceptable casing will be indicated by a resistance of less than 1 Megaohm after 5 minutes in the salt/detergent solution. An acceptable coating will be indicated by a near infinite resistance, greater than 1 Megaohm, after 5 minutes in the salt/detergent solution.
- b. If any single half step of the three complete steps tested proves to be unacceptable, then three new complete steps of the same type shall be tested in accordance with the above procedures. If any of these three steps subsequently tested do not meet the requirements of this specification, then the product shall be deemed to be unacceptable