

---

## Standard Method of Test for

# Determining Chloride Ions in Concrete and Concrete Materials by Specific Ion Probe

AASHTO Designation: TP 55-98 (2004)<sup>1</sup>



---

## 1. SCOPE

- 1.1. This method covers the procedures for determining acid-soluble chloride ions in concrete and concrete mix ingredients.
- 1.2. The age of concrete, mortar, or hydrated portland cement at the time of sampling will have an effect on the acid-soluble chloride ion content. Therefore, unless early age studies are desired, it is recommended that the material be well cured and at least 28 days of age before sampling.
- 1.3. *This standard may involve hazardous materials, operations, and equipment. This standard does not purport to address all of the safety problems associated with its use. It is the responsibility of the user of this procedure to establish appropriate safety and health practices and to determine the applicability of regulatory limitations prior to use.*

---

## 2. REFERENCED DOCUMENTS

- 2.1. *AASHTO Standards:*
- M 92, Wire-Cloth Sieves for Testing Purposes
  - M 231, Weighing Devices Used in the Testing of Materials
  - T 260, Sampling and Testing for Chloride Ion in Concrete and Concrete Raw Materials
- 2.2. *ASTM Standards:*
- D 1193, Specifications for Reagent Water
  - E 1, Specifications for ASTM Thermometers

---

## 3. SUMMARY OF TEST METHOD

- 3.1. A 3.0-g drilled concrete powder sample is digested in 20 mL of an acid digestion solution and stabilized by the addition of 80 mL of a stabilizing solution. Millivolt readings, taken for the sample solution using a specific chloride ion probe, are converted mathematically into equivalent total percent chloride content or chloride content in kg/m<sup>3</sup> (lb/yd<sup>3</sup>) of concrete.

---

## 4. INTERFERENCES

- 4.1. The operational response of the specific ion electrode is subject to interference by the presence of OH<sup>-</sup>, S<sup>2-</sup>, Br<sup>-</sup>, I<sup>-</sup>, and CN<sup>-</sup> in the measured solution and is based on the electrode manufacturer's allowable chloride interference ratio.

- 4.2. Sulfides are known to interfere with the determination of chloride in solution. This test procedure is, therefore, unsuitable for determining the chloride content of concrete containing mineral aggregates containing significant quantities of pyrite.

---

## 5. SIGNIFICANCE AND USE

- 5.1. This method provides a rapid means of sampling and testing for total chloride ions in concrete in the field.

---

## 6. APPARATUS

- 6.1. *Impact Hammer*—A heavy-duty rotary impact hammer with a drilling stop gage is used. See Figures 1 through 3.

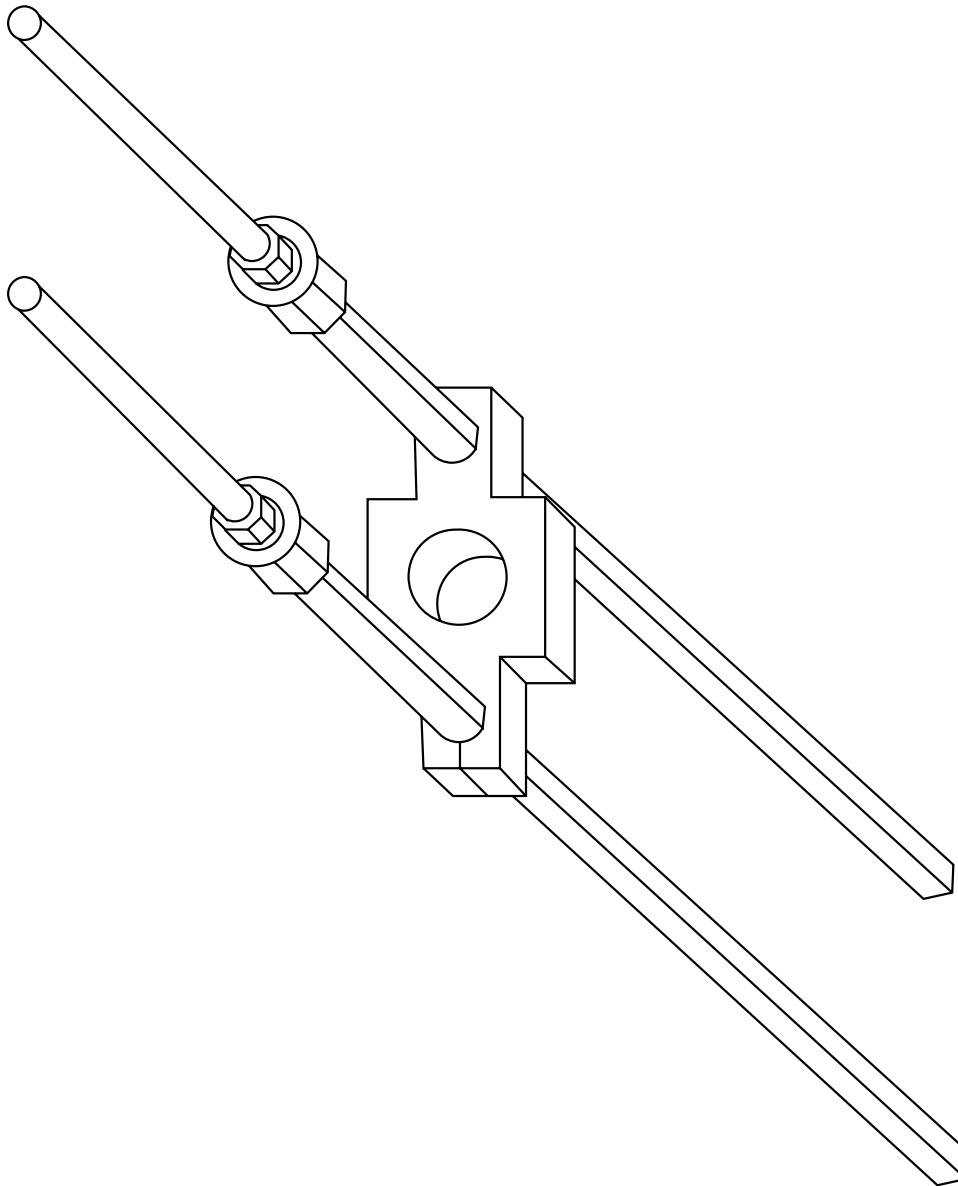
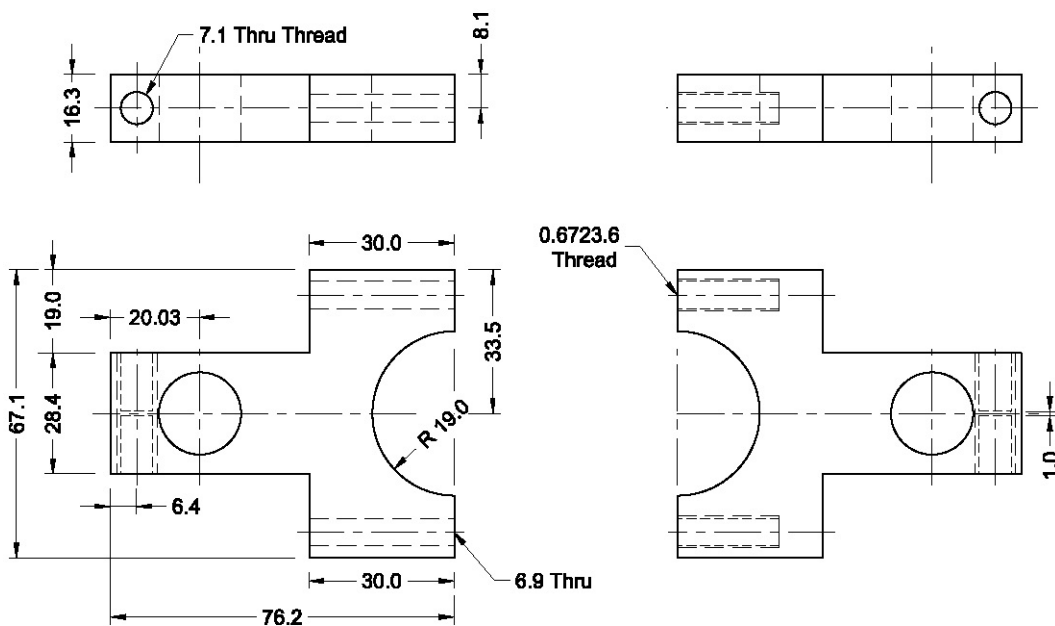
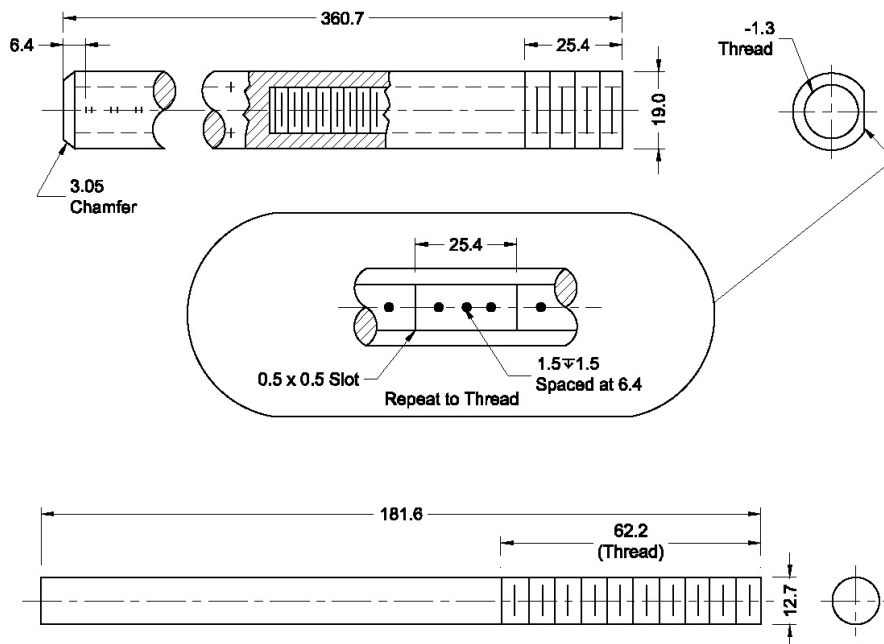


**Figure 1**—Overall View of the Drilling Stop Gage to Be Mounted on the Impact Hammer



Note: All dimensions shown in millimeters unless otherwise noted.

**Figure 2**—Details of the Split Ring Collar for the Drilling Stop Gage



Note: All dimensions shown in millimeters unless otherwise noted.

**Figure 3**—Details of the Depth Rods for the Drilling Stop Gage

- 6.2. *Bit*—A vacuum bit with a diameter equivalent to 1.5 times the maximum aggregate size in the concrete is used. A 28-mm (1.25-in.) bit size is recommended for a maximum coarse aggregate size of 19 mm (0.75 in.). The bit grinds the concrete to a fineness of 99 percent passing the 850  $\mu\text{m}$  (No. 20) sieve conforming to M 92. The finely ground powder is drawn into the collection unit through a coaxial hole in the bit.
- 6.3. *Sample Collection Unit*—A cylindrical polymethyl methacrylate vacuum chamber is connected to the carbide bit through a vacuum hose for sample collection. Vacuum is provided by a 2.25-HP wet/dry shop vacuum unit. Figures 4 through 8 present the details of the sample collection unit that is to be attached to the wet/dry shop vacuum unit.
- 6.4. *Filter*—An inexpensive coffee filter is adequate for collecting the powdered concrete samples in the polymethyl methacrylate chamber.
- 6.5. *Plastic Bottles/Containers*—Widemouth polypropylene bottles with screw caps in the following two sizes are needed:
- 6.5.1. For calibration solutions and for storing powdered concrete samples: 30 mL.
- 6.5.2. For digestion solution: 125 mL.
- 6.6. *Weighing Papers*—76  $\times$  76 mm (3  $\times$  3 in.) size weighing papers are needed for determining the mass of the powdered concrete samples.
- 6.7. *Spatula*—A stainless steel small spoon spatula is needed for transferring small quantities of the powdered concrete samples from the plastic container for mass determinations.
- 6.8. *Balances*—An electronic balance sensitive to 0.1 g is needed to determine the mass of the specimens. An electronic balance sensitive to 0.0001 g is needed to determine the mass of sodium chloride for the calibration and stabilizing solutions.