C111/A21.11. Insertion valves shall have a minimum design working water pressure of 200 psi.

(2) Pipe-Seated Insertion Valves

Use a pipe-seated insertion valve composed of a tapping sleeve assembly and a valve bonnet. Use ductile iron or Type 304 stainless steel tapping sleeve type bodies. Use either the split sleeve type with mechanical joint ends or the full circle type with double seals. Manufacture the outlet flange to mate with the bonnet. For buried service use insertion valves with non-rising stems, 2 inch square operating nuts, O-ring seals and which open by turning counterclockwise. Insertion valves shall have a minimum design water pressure of 200 psi. Coat iron bodies and bonnets at the factory with an epoxy in conformance with AWWA C210 or AWWA C213.

**(E) Plug Valves**

Use plug valves which conform to AWWA C517. Provide mechanical joint ends conforming to AWWA C111/A21.11.

### 1036-8 SLEEVES, COUPLINGS AND MISCELLANEOUS

**(A) Tapping Sleeves**

Use ductile iron or Type 304 stainless steel tapping sleeves pressure rated at 200 psi. Use either the split sleeve type with mechanical joint ends or the full circle type with double seals. Manufacture the outlet flange to mate with the tapping valve flange.

**(B) Transition Sleeves and Couplings**

Use sleeve type couplings for transitioning between plain ends of different pipe types. Manufacture couplings in conformance with AWWA C219 for a rated working pressure of 200 psi. Coat the coupling at the factory with an epoxy in conformance with AWWA C210 or AWWA C213.

### 1036-9 SERVICE LINE VALVES AND FITTINGS

Use corporation stops and curb stops of all bronze material and high-pressure construction conforming to AWWA C800.

Use tapping saddles of high-pressure construction, shaped to conform to the pipe and in conformance with AWWA C800.

Use high-pressure fittings manufactured in conformance with AWWA C800.

# SECTION 1040
# MASONRY

### 1040-1 BRICK

Use clay or shale brick that meets ASTM C62 or ASTM C216 for Grade SW, except as otherwise provided herein.

Use brick of uniform standard commercial size, with straight and parallel edges and square corners that are burned hard and entirely true, free from injurious cracks and flaws, tough, strong and have a clear ring when struck together. The sides, ends and faces of all brick shall be plane surfaces at right angles and parallel to each other.

Brick of the same manufacturer shall not vary more than ± 1/16 inch in thickness, ± 1/8 inch in width and ± 1/4 inch in length.

Concrete brick may be used instead of clay or shale brick when designated in the plans or in the specifications. Concrete brick shall meet ASTM C55 for Grade S-II except that the absorption of brick used in minor drainage structures shall not exceed 10 pcf.

## 1040-2 CONCRETE BUILDING BLOCK

Use concrete building block from sources that participate in the Department's *Solid Concrete Masonry Brick/Unit QC/QA Program*. A list of these sources in North Carolina and adjoining states is available from the Materials and Tests Unit in Raleigh.

Use concrete building block that meets ASTM C90. Block shall be pink in color and substantially free from chips and cracks.

Use solid concrete block instead of clay brick for minor drainage structures that meet ASTM C139 except that the nominal dimensions shall be 4 inches x 8 inches x 16 inches.

Concrete block for block manholes shall meet ASTM C139.

## 1040-3 CONCRETE PAVING BLOCK

Use concrete paving block from sources that participate in the Department's Solid Concrete Masonry Brick/Unit QC/QA Program. A list of these sources in North Carolina and adjoining states is available from the Materials and Tests Unit in Raleigh.

Use concrete paving block that meet ASTM C139, except that the nominal dimensions shall be 4 inches x 8 inches x 16 inches. The block shall have a uniform surface color and texture.

## 1040-4 SEGMENTAL RETAINING WALL UNITS

Use segmental retaining wall (SRW) units from sources that participate in the Department's *Solid Concrete Masonry Segmental Retaining Wall Units QC/QA Program*. A list of these sources in North Carolina and adjoining states is available from the Materials and Tests Unit in Raleigh.

Use freeze-thaw durable SRW units when noted in the contract. Unless required otherwise in the contract, provide SRW units with a vertical straight face and a concrete gray color with no tints, dyes or pigments. Do not begin unit production until sample SRW units of the type, face and color proposed for the project are approved by the Engineer.

Use SRW units that meet ASTM C1372 except for Table 1040-1 requirements.

**TABLE 1040-1**
**SRW UNIT REQUIREMENTS**

| Property | Requirement | Test Method |
|---|---|---|
| Compressive Strength for SRW Units | 4,000 psi min | ASTM C140 |
| Compressive Strength for Freeze-Thaw Durable SRW Units | 5,500 psi min | ASTM C140 |
| Absorption | 5% max | ASTM C140 |
| Durability for Freeze-Thaw Durable SRW Units | 1% max[A] | ASTM C1262 |

**A.** Weight loss for 4 of 5 specimens after 150 cycles in water.

## 1040-5 CEMENT

Portland cement shall meet Article 1024-1.

Masonry cement shall meet ASTM C91.

## 1040-6 HYDRATED LIME

Hydrated lime shall meet ASTM C207 for Type N.

## 1040-7 MORTAR SAND

Mortar sand shall meet Article 1014-1, except it shall meet the gradation requirements for No. 4S sand shown in Table 1005-2.

## 1040-8 WATER

Water shall meet Article 1024-4.

**1040-9 MORTAR**

Proportion mortar used in all brick and block masonry by volume as shown below. Do not add any more water than is necessary to make a workable mixture.

Mix No. 1: 1 part Portland cement
1/4 part hydrated lime
3 3/4 parts mortar sand (maximum)

Mix No. 2: 1 part Portland cement
1 part masonry cement
6 parts mortar sand (maximum)

Apply Articles 1040-5, 1040-6, 1040-7 and 1040-8 to all cement, hydrated lime, mortar sand and water.

For the hydrated lime and cement portion of Mix No. 1, the Contractor may substitute Type M or Type S masonry cement that meets ASTM C270 for Type S masonry cement the minimum compressive strength of the test specimens shall be 2,500 psi at 28 days and the test specimens shall be composed of one part Type S masonry cement and 3 parts sand. Furnish a Type 3 certification for the Type M or Type S masonry cement in accordance with Article 106-3.

**1040-10 ADMIXTURES**

Use admixtures that are on the NCDOT APL.

# SECTION 1042
# RIP RAP MATERIALS

Use field stone or rough unhewn quarry stone for plain rip rap. Use stone that is sound, tough, dense, resistant to the action of air and water and suitable in all other respects for the purpose intended. Where broken concrete from demolished structures or pavement is available, it may be used in place of stone provided that such use meets with the approval of the Engineer. However, the use of broken concrete that contains reinforcing steel will not be permitted.

All stone shall meet the approval of the Engineer. While no specific gradation is required, there shall be equal distribution of the various sizes of the stone within the required size range. The size of an individual stone particle will be determined by measuring its long dimension.

Stone or broken concrete for rip rap shall meet Table 1042-1 for the class and size distribution.

**TABLE 1042-1**
**ACCEPTANCE CRITERIA FOR RIP RAP AND STONE FOR EROSION CONTROL**

| Class | Required Stone Sizes, inches | | |
|---|---|---|---|
| | Minimum | Midrange | Maximum |
| A | 2 | 4 | 6 |
| B | 5 | 8 | 12 |
| 1 | 5 | 10 | 17 |
| 2 | 9 | 14 | 23 |

No more than 5.0% of the material furnished can be less than the minimum size specified nor no more than 10.0% of the material can exceed the maximum size specified.