

**SPECIFICATION FOR
PLASTIC CONDUIT FOR UNDERGROUND INSTALLATION**

Specification No.: 366-200

Rev. G

May, 1999

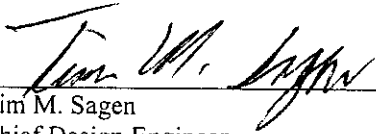
THE CITY OF FORT COLLINS

Light and Power Department
P.O. Box 580
Fort Collins, CO 80522

SPECIFICATION NO: 366-200

TITLE: PLASTIC CONDUIT FOR UNDERGROUND INSTALLATION

APPROVED BY:


Tim M. Sagen
Chief Design Engineer

Originated: 3/20/87

REVISED: 5/5/99

ITEMS COVERED BY THIS SPECIFICATION			
DESCRIPTION	ASTM REFERENCE	SERIAL	STORE'S NO.
2" P.V.C. Conduit	DB 120	02	6535-1081
4" P.V.C. Conduit	DB 120	04	6541-1120
5" P.V.C. Conduit	EB 35	05	6543-1142

PREVIOUS REVISION DESCRIPTIONS ON FILE

REVISION DESCRIPTION		CHANGE NOTICE	APPROVED
REVISION D:	ADD APPENDIX A, Approved Manufacturers	N/A	S. Coram Tim Sagen 3-12-92
REVISION E:	Update Appendix A, Remove Condux	N/A	Tim M. Sagen S. Coram 3-10-94
REVISION F:	Update Appendix A, Change Manufacturer (Quail Plastics to NAPCO)		O. Dick Tim Sagen 3/4/97
REVISION G:	Change 4" conduit to DB 120, wall thickness .154	N/A	<i>Tim M. Sagen</i> 5-26-99

LIST OF ACTIVE PAGES

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SPECIFICATION FOR PLASTIC CONDUIT**SPEC. #366-200**1.0 SCOPE

This Specification establishes the minimum requirements for 2", 4", and 5" plastic conduit to be used with electric power conductors and cables for aboveground use indoors or outdoors exposed to weather and sunlight at 5,000 feet altitude, and for underground use by direct burial or encasement in concrete.

2.0 APPLICABLE DOCUMENTS

This Specification is in accordance with the requirements of ASTM F512, titled "Standard Specification for Smoothwall Poly(vinyl Chloride) (PVC) Conduit and Fittings for Underground Installation", with exceptions as noted in the following paragraphs.

3.0 REQUIREMENTS3.1 GENERAL REQUIREMENTS FOR DESIGN

All conduit furnished under this Specification shall, unless otherwise specified, comply with ASTM F512. In case of conflict, the requirements of the following documents shall apply in the priority shown:

1. This Specification.
2. ASTM F512.
3. Other referenced standards.

3.1.1 MATERIAL

Conduit furnished under this Specification shall be made of virgin Polyvinyl-chloride (PVC) compound conforming to ASTM D1784 with the minimum cell classification shown in Table I of this Specification. Chemical resistance shall be in accordance with ASTM D1784, suffix A or B.

TABLE I				
ASTM D1784 Designation Order No.	Property and Unit	Value	ASTM Test Method	Minimum ASTM D 1784 Cell Classification Cell Limit No.
1	Base resin Homopolymer	Poly (vinyl Chloride)	NA	1
2	Impact strength (Izod)min ft-lb/in. of notch	0.65	D256	2
3	Tensile strength, Min psi.	5,000	D638	2
4	Modulus of elasticity in tension, min psi	500,000	D638	>6
5	Deflection Temperature under load, min 264 psi deg. F	158	D648	4
-	Flexural strength min psi	13,000	D790	-

3.1.2 Virgin compound is defined as compound which has not previously been used to make another product. Reworked material is defined as clean reground or repelletized material generated from a manufacturer's own conduit extrusion, and used by the same manufacturer who generates it. Clean is considered to exclude anything foreign to the specific compound designated by the manufacturer for use under this Specification. Rework material may be used provided that the conduit or fittings produced meet all of the requirements of this Specification.

3.1.3 CONDUIT TYPE

Conduit type shall be as specified in Specific Requirements for Design.

3.1.4 WORKMANSHIP

The conduit shall be homogeneous throughout and free from visible cracks, holes, foreign inclusions, or other injurious defects. The conduit bore shall be smooth and free from blisters, nicks or other imperfections which could mar conductors or cables.

3.1.5 SUNLIGHT RESISTANCE/COLOR

The conduit shall contain titanium dioxide pigment to produce a white color with a reflective factor of greater than eighty percent to allow outdoor storage and/or installation at 5,000 feet altitude for an indefinite period without deterioration.

3.1.6

LENGTH

Conduit shall be in lengths of twenty feet overall including integral bell. Tolerance of length shall be \pm one inch (\pm 25 mm).

3.2

SPECIFIC REQUIREMENTS FOR DESIGN

3.2.1

CONDUIT DIMENSIONS AND TOLERANCES

Dimensions, tolerances and pipe stiffness shall be in accordance with Table II of this Specification. Wall thicknesses shown in Table II are based on a minimum modulus of 500,000 psi.

Serial Number	Nominal Size (in.)	ASTM Type	Wall Thickness Min. In.	Average Outside Dia. Inches	Out-of-Round
366-200-02	2	DB 120	0.077	2.375 \pm .006	0.038
366-200-04	4	DB 120	0.154	4.497 \pm .006	0.082
366-200-05	5	EB 35	0.126	5.563 \pm .010	0.082

*Shaded items deviate from ASTM F512

3.2.2

BELLED ENDS

Each length of conduit shall have an integral belled end. Glued couplings are specifically prohibited. Belled end dimensions shall be based on the clearance fit system defined in Table 2 of ASTM F512 except socket depth and out-of-round requirements shall be in accordance with Table III of this Specification. Belled ends shall be centered on the longitudinal axis to provide a visible shoulder around the entire circumference of the conduit. Both ends of each length of the conduit shall be perpendicular to the longitudinal axis of the conduit, i.e., both ends shall be square cut.

Nominal Size Inches	Socket Entrance Inside Dia. Inches	Socket Bottom Inside Dia. Inches	Socket Depth Inches		Out-of-Round
			Min.	Max.	
2	2.400 \pm 0.006	2.381 \pm 0.006	2.250	2.500	0.038
4	4.544 \pm 0.009	4.509 \pm 0.009	4.000	4.250	0.082
5	5.614 \pm 0.010	5.573 \pm 0.010	5.000	5.250	0.082

*Shaded items deviate from ASTM F512

4.0 QUALITY ASSURANCE4.1 RESPONSIBILITY FOR INSPECTION

Unless otherwise specified, the vendor is responsible for the performance of all tests and inspection requirements specified herein. Except as otherwise specified, the vendor may utilize his own facilities or any commercial laboratory acceptable to the City of Fort Collins. The City reserves the right to perform or witness any of the tests and inspections set forth in this Specification, where such inspections are deemed necessary. If the City, upon receipt of the conduit, deems it necessary to have an independent laboratory perform tests and inspections set forth in this Specification, the manufacturer shall be responsible for all fees incurred in testing if any requirement of the specifications is not met and/or test results for that lot or shipment are not consistent with the manufacturer's certified test results.

4.2 REQUIREMENTS AND TEST METHODS4.2.1 COMPOUND TESTS

All the tests required by ASTM D1784, except the chemical resistance test, shall be made on a compound sample from each new lot or batch. The average value for all the tests made on each batch or lot shall comply with the requirements of paragraph 3.1.1 of this Specification and shall be reported in the certified test report. The chemical resistance test shall be performed annually or when compound suppliers are changed and test results shall be included in the certified test report.

4.2.2 SUNLIGHT RESISTANCE TESTS

Evidence that the compound being used has been qualified in accordance with all tests required by Paragraph 17 of UL 651 shall be included in the certified test report.

4.2.3 PERFORMANCE TESTS

Conduit furnished under this Specification shall pass all tests required by and performed in accordance with ASTM F512 except 2-inch conduit shall have a minimum impact resistance of 40-foot-pounds at 32°F (0°C).

4.2.4 EXTRUSION QUALITY TEST

The extrusion quality shall be determined by immersion in anhydrous acetone in accordance with ASTM D2152. Finished duct shall not flake or disintegrate when subjected to this test.

4.2.5

CERTIFICATION

The manufacturer shall furnish to the purchaser certified copies of the results of the tests on each lot or shipment and size of conduit ordered, prior to payment. The certified test report shall state the lot or control number and manufacturer of compound used and shall give specific test values for compound tests, stiffness test, and tests having other than a simple Pass/Fail result. Any conduit tested by the City that does not yield results consistent with the certified test reports for that lot or shipment will be sufficient reason for rejection of the entire lot or shipment. City of Fort Collins purchase order number shall be noted on the first page of each report. Copies shall be sent to the Design section of Fort Collins Light & Power. Unsigned copies are not acceptable even if accompanied by a signed cover letter.

5.0

PREPARATION FOR DELIVERY

Conduit shall be bundled by individual size into units suitable for shipping and stacked storage.

To protect the bells from deformation caused by pressure from adjacent conduits, each bundle shall be assembled such that bells are all at the same end of the bundle with the bell ends of alternating layers recessed at least the full length of the bells in adjacent layers. The bundles shall be secured using two steel bands with 2" x 4" minimum wooden boards under the bands, sets of bands and boards to be spaced appropriately along the length of the bundle forming adequate crate frames to provide the vertical stacking, frame to frame, to minimize stacked storage deformation with the stack height up to ten feet. Direct contact between the steel bands and the conduit anywhere on the perimeter of the bundle is expressly prohibited.

Bundles shall be shipped on an open bed truck.

APPENDIX A

Conduit purchased under this Specification shall be of the manufacturer shown below. Manufacturers not listed below may submit written proposals demonstrating compliance with these Specifications for consideration of addition to the accepted manufacturers list prior to the next request for bids. In addition to inclusion on the list below, manufacturer's conduit must also satisfy all requirements of this Specification to be acceptable.

MANUFACTURER

Can-Tex

Certainteed

North American Pipe Corporation (NAPCO)