

MATERIAL STANDARD

SCHEDULE 40 PVC CONDUIT AND FITTINGS



1. Scope

This material standard covers the requirements for Schedule 40 extruded rigid PVC (polyvinyl chloride) conduit and fittings consisting of elbows, couplings, adapters.

The requirements for Schedule 80 PVC conduit and fittings are located in Material Standard 7020.05.

2. Application

Schedule 40 PVC conduit and fittings are used to construct smooth raceways for the pulling in of cable installed in a variety of looped radial and network system applications:

- Service
- Secondary
- Primary
- Communication
- Control

Schedule 40 PVC conduit is not appropriate for riser pole applications.

Design engineers should be aware that different types of conduit have widely different physical properties that affect their application.

For new construction, design engineers are directed to utilize the following standard trade sizes (IPS):

- 1/2 in
- 3/4 in
- 2 in
- 3 in
- 4 in

2. Application, continued

Design engineers should gravitate away from utilizing these trade sizes (IPS):

- 1 in
- 1-1/4 in
- 1-1/2 in
- 2-1/2 in
- 3-1/2 in
- 6 in

Five inch (IPS) size conduit is a special case. Historically, at Seattle City Light, it has been widely used for new, primary construction, however, recently, 5 inch IPS fiberglass conduit, Material Standard 7025.05, has been selected to be the new standard for this application.

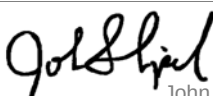
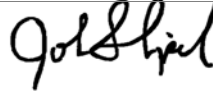
Five inch (IPS) size conduit is specified with both ends straight cut to minimize the gap at the conduit joints. Minimized gaps are less likely to catch debris during construction and lead to damaged cable.

Refer to Design Standard 9220.05 for more information matching conduit with cable and application.

Elbows are also known as bends. Large radius elbows are also known as sweeps.

For the purpose of this standard, 5 degree angle couplings shall be considered elbows.

The straight cut end of a section of conduit or elbow is also known as the spigot end.

standards coordinator	standards supervisor	unit director
 John Shipek	 John Shipek	 Pamela S. Johnson

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3. Industry Standards

Schedule 40 PVC conduit and fittings shall meet the requirements of the following industry standard:

UL 651 - Standard for Schedule 40 and 80 Rigid PVC Conduit and Fittings, 7th Edition, dated October 4, 2005

The following clarifications apply:

Five inch (IPS) size shall meet the requirements for specific applications, Section 4.5 (straight cut, without couplings or adapters).

All other (IPS) sizes shall meet the requirements for *general use*, Section 4.6 (one bell end).

4. Detailed Requirements**4.1 General**

Conduit and fittings shall be suitable for above ground use indoors or outdoors exposed to sunlight and weather, and for underground use by direct burial or encasement in concrete.

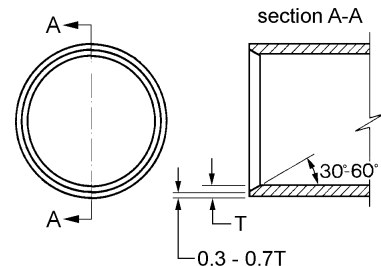
Conduit and fitting dimensions shall conform to UL 651 and the Iron Pipe Standard (IPS), where dimensions are based on outside diameters of iron pipe sizes.

Conduit and fitting color shall be medium to dark gray.

Conduit and fittings shall not have any features that can abrade or otherwise damage cable.

All conduit and elbow straight cut ends, 2 inch (IPS) and larger, shall be chamfered according to Figure 4.1.

Conduit, elbows, and fittings shall be designed and manufactured to be a system intended to guarantee complete interchangeability and compatibility between components.

Figure 4.1**4.2 Conduit**

Conduit shall be certified by Underwriters Laboratories or NSF International as meeting the requirements of Standard UL 651.

Manufacturer shall inform Seattle City Light in writing of all design changes that could affect the product's understood or published capabilities or attributes.

Dimensional information cited in Sections 4.2, 4.3, and 4.4 should be consistent with UL requirements and is provided for the convenience of Seattle City Light design engineers, construction crews, inspectors, and quality assurance personnel who do not have ready access to UL 651.

**Table 4.2a**

Stock Number	Trade Size, IPS, in	End #1	End #2	Outside Diameter, Min., in	Outside Diameter, Average, in	Outside Diameter, Max., in	Inside Diameter, Minimum, Average, in	Wall Thickness, Min., in	Weight, Nominal, lbs / ft
734525	1/2	bell	str. cut	0.832	0.840	0.848	0.578	0.109	0.16
734526	3/4	"	"	1.040	1.050	1.060	0.780	0.113	0.22
734527	1	"	"	1.305	1.315	1.325	1.004	0.133	0.32
734528	1-1/4	"	"	1.648	1.660	1.672	1.335	0.140	0.43
734529	1-1/2	"	"	1.888	1.900	1.912	1.564	0.145	0.52
734530	2	"	"	2.363	2.375	2.387	2.021	0.154	0.70
734531	2-1/2	"	"	2.860	2.875	2.890	2.414	0.203	1.11
734532	3	"	"	3.485	3.500	3.515	3.008	0.216	1.45
734533	3-1/2	"	"	3.950	4.000	4.050	3.486	0.226	1.74
734523	4	"	"	4.450	4.500	4.550	3.961	0.237	2.10
734524	5	str. cut	"	5.513	5.563	5.613	4.975	0.258	2.80
010334	6	bell	"	6.575	6.625	6.675	5.986	0.280	3.63

IPS = iron pipe standard; str. = straight

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4. Detailed Requirements**4.2 Conduit, continued**

Conduit shall meet the following performance requirements:

Table 4.2b

Description	UL 651 Section	Description	UL 651 Section
tensile strength	7	conduit for use with 90 degree C wire	17
deflection under heat and load	8	resistance to specific reagents	18
extrusion process	9	sunlight resistance	19
low-temperature handling	10	pipe stiffness	20
water absorption	11	pull - joint separation	21
resistance to crushing	12	bending and pull - joint separation	22
resistance to impact	13	joint water tightness	23
flame	14	elastomeric materials accelerated aging	24
		permanency of printing	25

4.3 Elbows**Table 4.3**

Stock Number	Trade Size, IPS, in	Degree Bend	End #1	End #2	Radius, in
734551	1/2	90	bell	str. cut	4
734671	3/4	90	"	"	4-1/2
734550	1	90	"	"	5-3/4
734546	1-1/4	90	"	"	7-1/4
734547	1-1/2	90	"	"	8-1/4
734548	2	90	"	"	24
734549	2-1/2	90	"	"	24
734553	1-1/4	45	"	"	7-1/4
734554	1-1/2	45	"	"	8-1/4
734555	2	45	"	"	18
734557	3	45	"	"	36
734558	3-1/2	45	"	"	36
734559	4	45	"	"	36
734560	5	45	str. cut	"	48
010337	6	45	bell	"	48
734561	2	22-1/2	"	"	18
734562	2-1/2	22-1/2	"	"	18
734563	3	22-1/2	"	"	24
734564	3-1/2	22-1/2	"	"	24
734566	4	22-1/2	"	"	24
734568	5	22-1/2	str. cut	"	24
010444	4	5	bell	"	n/a
010443	5	5	bell	"	n/a



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4. Detailed Requirements**4.4 Fittings**

Female adapters shall have straight threads. Coupling fittings, 2 inch (IPS) and larger, shall be of molded manufacture, not expanded.

Table 4.4

Stock Number	Trade Size, IPS, in	Description	Ends
734508	1/2	female adapter	S x F
734540	3/4	"	"
734541	1	"	"
734542	1-1/4	"	"
734543	1-1/2	"	"
734544	2	"	"
734545	2-1/2	"	"
734537	3	"	"
734538	3-1/2	"	"
734539	4	"	"
734536	5	"	"
010342	6	"	"
734920	1/2	male adapter	S x M
734914	3/4	"	"
734918	1	"	"
734924	1-1/4	"	"
734925	1-1/2	"	"
734926	2	"	"
734921	3	"	"
734923	4	"	"
010341	6	"	"
734512	1/2	straight coupling	S x S
734513	3/4	"	"
734514	1	"	"
734515	1-1/4	"	"
734516	1-1/2	"	"
734517	2	"	"
734518	2-1/2	"	"
734519	3	"	"
734520	3-1/2	"	"
734521	4	"	"
734522	5	"	"
010343	6	"	"



female adapter



male adapter



straight coupling

legend

F=female

M=male

S=slip

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5. Marking

Each conduit section shall be marked according to the requirements of UL 651, Section 25.

The outer surface of each conduit section shall be marked with the following minimum information:

- Trade Size
- Schedule Number or equivalent information
- Manufacturer's name or symbol
- Date (or period) of manufacture

Each fitting shall be marked according to the requirements of UL 651, Section 46.

The outer surface of each fitting shall be marked with the following minimum information:

- Manufacturer's name or symbol
- Catalog number

6. Testing

Conduit and fitting test data that establishes compliance with the requirements of UL 651 and this material standard shall be provided upon request.

7. Packaging

Straight conduit shall be furnished in 10 ft sections, unless specified otherwise on the purchase order.

Master bundles shall be secured with at least two bands of steel or UV-resistant plastic strapping.

Standard packaging for straight conduit shall be as follows:

Each master bundle shall be legibly marked with the following information:

- Manufacturer's identification
- Product description
- Seattle City Light's Purchase Order Number
- Seattle City Light's Stock Number
- Gross, net, and tare weight

8. Shipping

Conduit may be delivered on enclosed, covered, or flatbed trucks. If conduit is delivered on a flatbed truck, conduit shall be side-loaded.

Because Washington State law requires a 10 inch minimum side board when driving a forklift or pallet jack onto the bed of a truck or trailer, most flatbed trucks or trailers must be side-loaded to ease off-loading.

9. Issuance

Conduit	FT
Elbows	EA
All Other Fittings	EA

10. Approved Manufacturers**Conduit Straight Sections**

Cantex
Cresline NW
Heritage Plastics Incorporated
IPEX
JM Eagle
Prime Conduit (formerly Carlon)
Ridgeline Pipe Manufacturing
Royal Pipe Systems

Elbows

Cantex
Cresline NW
Heritage Plastics Incorporated
JM Eagle
Kraloy
Picoma Industries
Raceway Technology & Mfr.
Ridgeline Pipe Manufacturing
Thomas & Betts (formerly Carlon)

All Other Fittings

Cantex
Cresline NW
Heritage Plastics Incorporated
IPEX
JM Eagle
Kraloy
Picoma Industries
Ridgeline Pipe Manufacturing
Thomas & Betts (formerly Carlon)

11. References

7020.05; "Schedule 80 PVC;" Material Standard; SCL

7025.05; "Fiberglass Conduit and Fittings, Medium Wall, Five-Inch IPS;" Material Standard; SCL

7100.0; "Pipe Fittings, PVC Plastic, DWV and Schedule 40;" Material Standard; SCL

7345.2; "Conduit and Fittings, EPC 40 and EPC 80 Rigid Polyvinyl Chloride" (cancelled); Material Standard; SCL

9220.05; "Electric Power Cable and Conduit Application" (in development); Design Standard; SCL

F 512; "Standard Specification for Smooth-Wall Poly (Vinyl Chloride) (PVC) Conduit and Fittings for Underground Installation"; ASTM

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