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Origin of ASTM F3128:

The original request for addition of this product to Canada was to incorporate ASTM F891 into the National Plumbing Code (NPC). The following is Section 1.1 from the scope of ASTM F891:

1.1 This specification covers coextruded poly(vinyl chloride) (PVC) plastic pipe with a cellular core and concentric inner and outer solid layers, and is produced using a multilayer coextrusion die for nonpressure use in three series: an IPS Schedule 40 series for DWV; a PS series with an iron pipe size (IPS) outside diameter with varying wall thickness as required for pipe stiffnesses of 25, 50, and 100 for communication conduit, and a sewer and drain series.

This was rejected by the Standing Committee, as the standard covered several end uses for the product. ASTM F3128 was established as a standard that included only the DWV requirements from F891, the following is the scope section from F3128:

1.1 This specification covers coextruded poly(vinyl chloride) (PVC) plastic drain, waste and vent pipe made to Schedule 40 iron pipe sizes (IPS) and produced by the coextrusion process with concentric inner and outer solid PVC layers and the core consisting of closed-cell cellular PVC.

Additional revisions were made to the standard to remove details and requirements listed for the products which had been removed from the scope.

After submission for a code change to add ASTM F3128 to the NPC, a comment from the standing committee was that the standard should have a cold temperature impact test requirement as a test for field handling during winter construction. As the standard for cellular core ABS DWV pipe was already referenced in the NPC, the cold temperature impact requirements from that standard were incorporated into F3128.

The references from the U.S. in the following pages show where ASTM F891 has been incorporated into the Unified Plumbing Code and the International Plumbing Code. As detailed above, ASTM F3128, which was developed for use in Canada, copied the DWV details from F891.

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Cellular Core PVC DWV Pipe in other Codes:

International Codes Council (ICC): International Plumbing Code (IPC) 2021

SECTION 702
MATERIALS

702.1 Above-ground sanitary drainage and vent pipe.

Above-ground soil, waste and vent pipe shall conform to one of the standards listed in Table 702.1.

TABLE 702.1ABOVE-GROUND DRAINAGE AND VENT PIPE

MATERIAL	STANDARD
Acrylonitrile butadiene styrene (ABS) plastic pipe in IPS diameters, including Schedule 40, DR 22 (PS 200) and DR 24 (PS 140); with a solid, cellular core or composite wall	ASTM D2661; ASTM F628; ASTM F1488; CSA B181.1
Cast-iron pipe	ASTM A74; ASTM A888; CISPI 301
Copper or copper-alloy pipe	ASTM B42; ASTM B43; ASTM B302
Copper or copper-alloy tubing (Type K, L, M or DWV)	ASTM B75; ASTM B88; ASTM B251; ASTM B306
Galvanized steel pipe	ASTM A53
Glass pipe	ASTM C1053
Polyolefin pipe	ASTM F1412; CSA B181.3
Polyvinyl chloride (PVC) plastic pipe in IPS diameters, including Schedule 40, DR 22 (PS 200), and DR 24 (PS 140); with a solid, cellular core or composite wall	ASTM D2665; ASTM F891; ASTM F1488; CSA B181.2
Polyvinyl chloride (PVC) plastic pipe with a 3.25-inch O.D. and a solid, cellular core or composite wall	ASTM D2949; ASTM F1488
Polyvinylidene fluoride (PVDF) plastic pipe	ASTM F1673; CSA B181.3
Stainless steel drainage systems, Types 304 and 316L	ASME A112.3.1

702.2 Underground building sanitary drainage and vent pipe.

Underground building sanitary drainage and vent pipe shall conform to one of the standards listed in Table 702.2.

TABLE 702.2UNDERGROUND BUILDING DRAINAGE AND VENT PIPE

MATERIAL	STANDARD
Acrylonitrile butadiene styrene (ABS) plastic pipe in IPS diameters, including Schedule 40, DR 22 (PS 200) and DR 24 (PS 140); with a solid, cellular core or composite wall	ASTM D2661; ASTM F628; ASTM F1488; CSA B181.1
Cast-iron pipe	ASTM A74; ASTM A888; CISPI 301
Copper or copper-alloy tubing (Type K, L, M or DWV)	ASTM B75; ASTM B88; ASTM B251; ASTM B306
Polyethylene (PE) plastic pipe (SDR-PR)	ASTM F714
Polyolefin pipe	ASTM F714; ASTM F1412; CSA B181.3
Polyvinyl chloride (PVC) plastic pipe in IPS diameters, including Schedule 40, DR 22 (PS 200) and DR 24 (PS 140); with a solid, cellular core or composite wall	ASTM D2665; ASTM F891; ASTM F1488; CSA B181.2
Polyvinyl chloride (PVC) plastic pipe with a 3.25-inch O.D. and a solid, cellular core or composite wall	ASTM D2949; ASTM F1488
Polyvinylidene fluoride (PVDF) plastic pipe	ASTM F1673; CSA B181.3
Stainless steel drainage systems, Type 316L	ASME A112.3.1

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TABLE 702.3BUILDING SEWER PIPE

MATERIAL	STANDARD
Acrylonitrile butadiene styrene (ABS) plastic pipe in IPS diameters, including Schedule 40, DR 22 (PS 200) and DR 24 (PS 140); with a solid, cellular core or composite wall	ASTM D2661; ASTM D2680; ASTM F628; ASTM F1488; CSA B181.1
Acrylonitrile butadiene styrene (ABS) plastic pipe in sewer and drain diameters, including SDR 42 (PS 20), PS 35, SDR 35 (PS 45), PS 50, PS 100, PS 140, SDR 23.5 (PS 150) and PS 200; with a solid, cellular core or composite wall	ASTM D2751; ASTM F1488
Cast-iron pipe	ASTM A74; ASTM A888; CISPI 301
Concrete pipe	ASTM C14; ASTM C76; CSA A257.1; CSA A257.2
Copper or copper-alloy tubing (Type K or L)	ASTM B75; ASTM B88; ASTM B251
Polyethylene (PE) plastic pipe (SDR-PR)	ASTM F714
Polypropylene (PP) plastic pipe	ASTM F2736; ASTM F2764; CSA B182.13
Polyvinyl chloride (PVC) plastic pipe in IPS diameters, including Schedule 40, DR 22 (PS 200) and DR 24 (PS 140); with a solid, cellular core or composite wall	ASTM D2665; ASTM F891; ASTM F1488
Polyvinyl chloride (PVC) plastic pipe in sewer and drain diameters, including PS 25, SDR 41 (PS 28), PS 35, SDR 35 (PS 46), PS 50, PS 100, SDR 26 (PS 115), PS 140 and PS 200; with a solid, cellular core or composite wall	ASTM F891; ASTM F1488; ASTM D3034; CSA B182.2; CSA B182.4
Polyvinyl chloride (PVC) plastic pipe with a 3.25-inch O.D. and a solid, cellular core or composite wall	ASTM D2949; ASTM F1488
Polyvinylidene fluoride (PVDF) plastic pipe	ASTM F1673; CSA B181.3
Stainless steel drainage systems, Types 304 and 316L	ASME A112.3.1
Vitrified clay pipe	ASTM C4; ASTM C700

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International Association of Plumbing and Mechanical Officials (IAPMO): Uniform Plumbing Code (UPC)

SANITARY DRAINAGE

TABLE 701.2
MATERIALS FOR DRAIN, WASTE, VENT PIPE AND FITTINGS

MATERIAL	UNDERGROUND DRAIN, WASTE, VENT PIPE AND FITTINGS	ABOVEGROUND DRAIN, WASTE, VENT PIPE AND FITTINGS	BUILDING SEWER PIPE AND FITTINGS	REFERENCED STANDARD(S) PIPE	REFERENCED STANDARD(S) FITTINGS
ABS (Schedule 40)	X	X	X	ASTM D2661, ASTM D2680*	ASME A112.4.4, ASTM D2661, ASTM D2680*
Cast-Iron	X	X	X	ASTM A74, ASTM A888, CISPI 301	ASME B16.12, ASTM A74, ASTM A888, CISPI 301
Co-Extruded ABS (Schedule 40)	X	X	X	ASTM F628	ASME A112.4.4, ASTM D2661, ASTM D2680*
Co-Extruded Composite (Schedule 40)	X	X	X	ASTM F1488	ASME A112.4.4, ASTM D2661, ASTM D2665, ASTM F794*, ASTM F1866
Co-Extruded PVC (Schedule 40)	X	X	X	ASTM F891, ASTM F1760	ASME A112.4.4, ASTM D2665, ASTM F794*, ASTM F1336*, ASTM F1866
Copper and Copper Alloys (Type DWV)	X	X	X	ASTM B43, ASTM B75, ASTM B251, ASTM B302, ASTM B306	ASME B16.23, ASME B16.29
Galvanized Malleable Iron	—	X	—	—	ASME B16.3
Galvanized Steel	—	X	—	ASTM A53	—
Polyethylene	—	—	X	ASTM F714, ASTM F894	—
PVC (Schedule 40)	X	X	X	ASTM D1785, ASTM D2665, ASTM F794*	ASME A112.4.4, ASTM D2665, ASTM F794*, ASTM F1866
PVC (Sewer and Drain)	—	—	X	ASTM D2729	ASTM D2729
PVC PSM	—	—	X	ASTM D3034	ASTM D3034
Stainless Steel 304	—	X	—	ASME A112.3.1	ASME A112.3.1
Stainless Steel 316L	X	X	X	ASME A112.3.1	ASME A112.3.1
Vitrified Clay (Extra strength)	—	—	X	ASTM C700	ASTM C700

* For building sewer applications.

Installation Guide/Expansion-Contraction

Temperature

NAPCORE is safe for use for non-pressure applications where the pipe wall temperature does not exceed 140°F (60°C).

Expansion/Contraction of Cellular Core PVC DWV Pipe

PVC pipe expands and contracts with changes in temperature. The amount of expansion or contraction depends on the length of pipe run, the material coefficient of linear expansion and the change in temperature of the pipe. This expansion/contraction sometimes means expansion joints are required.

The coefficient of linear expansion for PVC Cellular Core DWV pipe is as follows:

Imperial: 3×10^{-5} in (expansion/contraction) / in. (pipe length) / °F (change in temperature)

Metric: 5.4×10^{-5} mm (expansion/contraction) / mm (pipe length) / °C (change in temperature)

- The charts on the next page show the amount of expansion expected for (ΔT) and length.
- If the pipe is installed in an exposed location, 17°C (30°F) should be added to the amount of temperature change (ΔT) due to the effects of radiant heat.

EXPANSION JOINTS			
Part Number	Trade Size	Type (I or II)	Maximum Travel (E)
DL631	1½"	I	4.5"
DL632	2"	I	4.5"
DL633	3"	II	8.0"
DL634	4"	II	8.0"

Expansion Joint (Fully Retracted)

Expansion Joint (Fully Extended)

Installation

Westlake Pipe & Fittings PVC DWV Expansion Joints are for **Vertical Installation Only**.

- Install expansion joint with the barrel at the bottom and the piston at the top
- Start with the expansion joint in the fully retracted position and set the position as shown below

---

Expansion/Contraction of Cellular Core PVC DWV Pipe

Use the following equations to determine expansion joint piston set position during installation:

$$\text{Piston Setting (in.)} = \frac{\text{(Max. Temp. (°F) - Install Temp. (°F)) X Expansions Joint Max Travel (in.)}}{\text{Total Expected Temp. Change (°F)}}$$

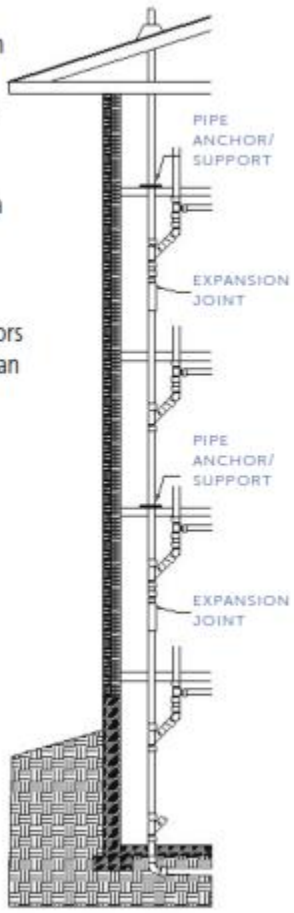
$$\text{Piston Setting (mm)} = \frac{\text{(Max. Temp. (°C) - Install Temp. (°C)) X Expansions Joint Max Travel (mm)}}{\text{Total Expected Temp. Change (°C)}}$$

Compensating for Building Movement

When working with wood-framed construction, shrinkage and settlement can be significant. The amount of shrinkage will depend on the humidity and moisture content and height of the framing.

To limit movement between two floors of a building:

- Install an expansion joint every second floor.
- Support the pipe stack on alternating floors such that any movement is directed into an expansion joint (see example at right).



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Anticipated Cost Savings/Benefits

Expansion of the use of PVC cellular core DWV pipe will increase competition for materials, which is anticipated to significantly decrease the cost of plumbing.

Estimated pipe and fittings required per 2,000 to 2,200 ft^2 residential:

Pipe:	550 lb/home
Fittings:	254 lb/home

Current pricing for PVC cellular core pipe:	$1.65/lb
Current pricing for PVC fittings:	$5.92/lb

With 30% markup (to account for fees for distribution and contractors)

Pipe:	$2.15/lb
Fittings:	$7.70/lb

Total cost per home: $3,138.30

It is anticipated that the expansion of use of PVC cellular core DWV pipe will induce a **10% to 20% market savings**, which translates into an estimated **$314 to $628 savings per typical house**.

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Comparison of ASTM F3128 and F628 Requirements:

The following pages present a comparison between PVC and ABS Cellular Core products which demonstrates that PVC Cellular Core either meets or exceeds product performance when compared to ABS Cellular Core, making it a functionally equivalent product.

PERFORMANCE LEVEL EVALUATION

ABS Cellular Core DWV Pipe, manufactured to meet ASTM F628 has existed in the NBC for many years. PVC Cellular Core DWV Pipe made to ASTM F3128 meets or exceeds all of the same requirements as the ABS product, including bond between layers, stiffness, flattening/compression, and resistance to impact.

Table 1 documents that PVC cellular core has additional test requirements than ABS cellular core pipe. The remainder of the document describes these testing differences.

Table 1: Performance Requirement Comparison

Property	Test Required in PVC Cellular Core, ASTM F3128	Test Required in ABS Cellular Core, ASTM F628
Bond Between Layers	Yes	Yes
Cellular Structure	Yes	No
Extrusion Quality	Yes	No
Stiffness	Yes	Yes
Flattening/Compression	Yes	Yes
Resistance to Impact	Yes	Yes

Compression/Flattening

ASTM F628 for ABS Cell Core pipe, and ASTM F3128 require compression/flattening tests to ASTM Test Method D2412 “Test Method for Determination of External Loading Characteristics of Plastic Pipe by Parallel-Plane Loading”.

Both standards require that there be no evidence of cracking, delamination or rupture for three samples.

ASTM F3128 requires that the Cellular Core PVC DWV Pipe pass this test when deflected 60% of the initial inside diameter as shown in Figure 1 below. Comparably, ASTM F628 for the ABS Cell Core pipe requires a deflection of 25%.

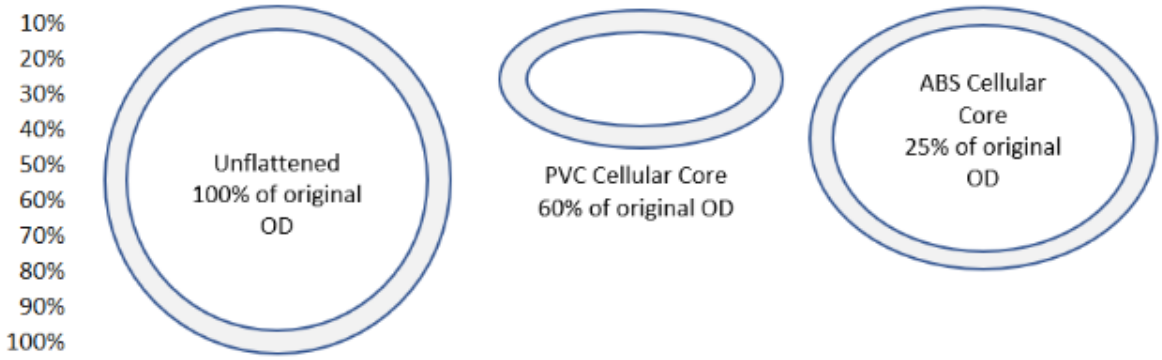

Figure 1: ASTM F628 for ABS Cell Core pipe and ASTM F3128 compression/flattening tests

Stiffness

ASTM F628 and ASTM F3128 both require a stiffness test to Test Method D2412. The minimum stiffness requirements for both products are summarized in Table 2.

Table 2: Comparison of Stiffness Requirements

Size (in)(mm)	Minimum Stiffness Requirement (psi) (MPa)	
	F628	F3128
1.25 (31.75)	600 (4.13)	600 (4.13)
1.5 (38.1)	535 (3.69)	600 (4.13)
2 (50.8)	300 (2.07)	300 (2.07)
3 (76.2)	280 (1.93)	300 (2.07)
3.5 (88.9)	-	250 (1.72)
4 (101.6)	175 (1.21)	200 (1.38)
5 (127)	-	120 (0.83)
6 (152.4)	75 (0.52)	120 (0.83)

As is shown in the table, the minimum stiffness requirements applicable to the Cellular Core PVC DWV Pipe meet or exceed the minimum requirements applicable to ABS Cell Core pipe for comparable pipe sizes.

It is noted that the F3128 minimum stiffness requirements for each diameter meet the minimum stiffness of 0.32 MPa (320 kPa) and makes the PVC Cellular Core piping suitable for underground building sewer applications.

Extrusion Quality

Extrusion Quality tests are specific to PVC pipes with minimum requirements set out in F3128 and B181.2.

Solid wall and Cellular Core PVC DWV Pipe both must meet the requirements of Test Method D2152 "Test Method for Adequacy of Fusion of Extruded Poly (Vinyl Chloride) (PVC) Pipe and Molded Fittings by Acetone Immersion". The sample must not flake or disintegrate during the test.

There is no extrusion quality test details at all in F628 for ABS cellular core pipe.

Bond

Evaluation of the bond between layers is required for cellular core pipes per F628 and F3128.

In both tests the bond between layers is required to be strong and uniform such that it is not possible to separate any two layers with a probe or point of a knife so that the layers separate cleanly. Additionally, the separation of the bond cannot occur between layers during other tests performed under the requirements of the specification.

Cellular Structure

This test is to ensure that the cellular structure in the core layer of the pipe is non-interconnecting so that fluid cannot pass through the cellular structure. An evaluation of the cellular structure is not required for the piping materials selected for comparison such as ABS Cellular Core DWV pipe.

However, in accordance with ASTM F3128-19, Cellular Core PVC DWV Pipe is subject to a water passage test for the closed cell foamed core. Failure occurs where the foamed core sample permits the passage of water within 30 min when one end is exposed to water at a pressure of 10±1 psi.

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Impact

An evaluation of impact resistance is common for all products selected for comparison.

In F628 and F3128 the impact resistance is evaluated using Test Method D2444 “Test Method for Determination of the Impact Resistance of Thermoplastic Pipe and Fittings by Means of a Tup (Falling Weight)”. The failure criterion is shattering or any crack or break extending entirely thought the pipe wall and visible to the unaided eye. The minimum required impact energy and test temperature listed in F3128 is equal to the values in F628 for trade sizes 6” and below.

Chemical/Water Resistance

This test is required for solid wall ABS and PVC pipes but is not referenced in F628 for ABS Cellular Core pipes.

Similarly, F3128 does not require this test for Cellular Core PVC DWV Pipe.

Dimensional Stability

This test is required for solid wall ABS and PVC pipes but is not referenced in F628 for ABS Cellular Core pipes.

Similarly, F3128 does not require this test for Cellular Core PVC DWV Pipe.

Flame Spread

Flame Spread Index is a measure of how quickly flames travel across the surface of a material once the material is ignited. Recent 3rd party testing conducted on 1 ½ “ trade size PVC Schedule 40 cellular core DWV pipe (F3128) and 1 ½” Schedule 40 ABS cellular core pipe (F628) yielded flame spread of 0 for PVC piping and 270 for ABS piping, making it a safer option for plumbing products used in residential applications.

PROJECT PRECEDENCE

PVC Cellular Core made to the ASTM F891 standard has a greater than 30-year history of use in residential and commercial DWV applications throughout the United States market. ASTM F891 was modified to create ASTM F3128 to cater to Canadian specific concerns, notably the inclusion of additional cold temperature impact requirements which aligned with the approved ABS Cell Core product. For 2024, 2025, and 2026 to date Westlake has had over 1200 houses in Canada plumbed with NAPCORE™ Cellular Core PVC DWV pipe with no pipe performance issues reported.

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APPENDIX I: CMHC: Research Project on the Noise Produced by DWV Pipes made of Cast Iron, PVC, and ABS

RESEARCH HIGHLIGHT

February 2003

Technical Series 02-117

Research Project on the Noise Produced by DWV Pipes Made of Cast Iron, PVC and ABS

INTRODUCTION

MJM Acoustical Consultants Inc. of Montréal was retained by the Cast Iron Soil Pipe Association to measure the noise produced by several 7.62 cm (3 in.) diameter DWV (drain, waste and vent) pipes made of cast iron, PVC (flexible plastic) and ABS (rigid plastic). The purpose was to study the type of noise emitted by DWV pipes during a 6-litre (1.6 gallon) toilet flush in a typical single-family dwelling or multi-unit building.

Eight series of acoustical measurements were conducted: four were with cast iron soil pipes, three with PVC and one with ABS. Acoustical measurements were conducted in an experimental setting in a Domtar Acoustical Laboratory.

METHODOLOGY

The experimental set-up for the study was typical of a DWV pipe installation found in most residential dwellings (single family or multi-unit): a toilet discharging into a 7.62 cm (3 in.) horizontal waste pipe connected to a 7.62 cm (3 in.) vertical waste stack and enclosed in a wall made of 1.27 cm (0.5 in.) gypsum board.

All pipes were installed, by a certified union plumber, in an identical physical configuration. They were tested under the same acoustical conditions, strictly following the same procedure to allow for direct comparison of the sound pressure results.

Background noise in the 90 m^3 reverberation chamber in which the pipes were installed was monitored to ensure it was always 10 dB below the noise radiated by unenclosed pipes for frequencies above 125 Hz. In the case of enclosed pipes, the noise radiated by the pipes, especially at high frequencies, was not always 10 dB higher than the background noise.

For each pipe tested, the noise measured was exclusively emitted by the pipe being tested. Monitoring confirmed there was no extraneous noise altering the results. Tests were repeated for each type of pipe being tested.

RESULTS

An increase or decrease of 3 dB or less is generally considered marginal. An increase of 10 decibels gives the subjective impression that a sound has doubled, and decreasing the sound pressure level by 10 decibels gives an impression that the sound has been reduced by half.

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There was little variation in the noise levels radiated by different types of PVC pipes, as the variation did not exceed 3 dBA. The same minimal variation occurred in vertical cast iron pipes, but differences of up to 7 dBA were noted for horizontal cast iron pipes.

Tests performed on partially enclosed assemblies highlighted significant differences in the radiation pattern of horizontal drain and vertical stacks. With cast iron pipe assemblies, the vertical pipes radiated more noise than the horizontal ones during flushing of a toilet. In the case of PVC and ABS pipes, the opposite behaviour was noted: horizontal pipes produced significantly more noise than the vertical ones.

The extent of noise reduction provided by a drywall enclosure (15 dBA to 17 dBA) does not seem to be dependent on the pipe assembly tested.

The outcome of the testing is shown in the two figures below. The first one provides a summary of the noise levels emitted by each pipe. Results are given for the four configurations for which the tests were conducted. The second figure graphically illustrates the results.

Figure 1 Sound pressure levels

	Global sound pressure level (dBA, ref 20 microPa)			
Type of pipe	Bare pipes	Enclosed pipes	Vertical pipe unenclosed	Horizontal pipe unenclosed
XH (extra heavy) — ASTM A74	40	24	39	32
No-Hub long — CISPI 301, CSA B70	42	25	41	36
No-Hub short — CISPI 301, CSA B70	41	24	40	36
SV (service) — ASTM A74	43	26	41	39
System 15 (solid wall)	49	32	42	48
PVC 7300 — ASTM D2665 (solid wall)	48	33	43	47
PVC 4300 — ASTM F891 (cellular core)	51	34	45	48
ABS 3300 — ASTM F628 (cellular core)	55	39	49	54
Average cast iron	41	25	40	36
Average PVC	49	33	43	48

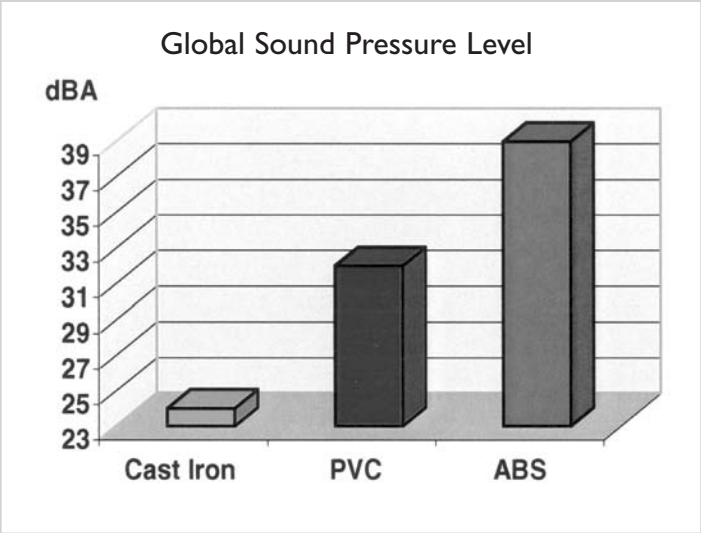

Figure 2 Comparison of sound pressure levels for cast iron, PVC and ABS

CONCLUSIONS

The study clearly established that DWV pipes made of cast iron are quieter than PVC and ABS pipes. There is a difference of 6 to 10 dBA between cast iron and PVC, with an average difference of 8 dB, and as much as 15 dBA between cast iron and ABS.

Prepared for: Cast Iron Soil Pipe Association

CMHC Contact: Duncan Hill

Research Report: *Research Project on the Noise Produced by DWV Pipes Made of Cast Iron, PVC and ABS, 2000*

Research Consultants: MJM Acoustical Consultants Inc.

Housing Research at CMHC

Under Part IX of the ***National Housing Act***, the Government of Canada provides funds to CMHC to conduct research into the social, economic and technical aspects of housing and related fields, and to undertake the publishing and distribution of the results of this research.

This fact sheet is one of a series intended to inform you of the nature and scope of CMHC's research.

To find more ***Research Highlights*** plus a wide variety of information products, visit our website at

www.cmhc.ca

or contact:

Canada Mortgage and Housing Corporation
700 Montreal Road
Ottawa, Ontario
K1A 0P7

Phone: 1-800-668-2642
Fax: 1-800-245-9274

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APPENDIX II: ULC S102.2 (Flame Spread Rating, Smoke Developed) Test Data

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TEST REPORT

SCOPE OF WORK
REPORT OF TESTING 1 ½ IN. ID SCHEDULE 40 PVC CELLULAR CORE PIPE FOR COMPLIANCE WITH THE APPLICABLE REQUIREMENTS OF THE FOLLOWING CRITERIA: CAN/ULC S102.2-18 STANDARD METHOD OF TEST FOR SURFACE BURNING CHARACTERISTICS OF FLOORING, FLOOR COVERING, AND MISCELLANEOUS MATERIALS AND ASSEMBLIES.

REPORT NUMBER
106011396COQ-002 R1

TEST DATE(S)
03/19/25 - 03/24/25

ISSUE DATE **REVISION DATE**
03/27/25 04/07/25

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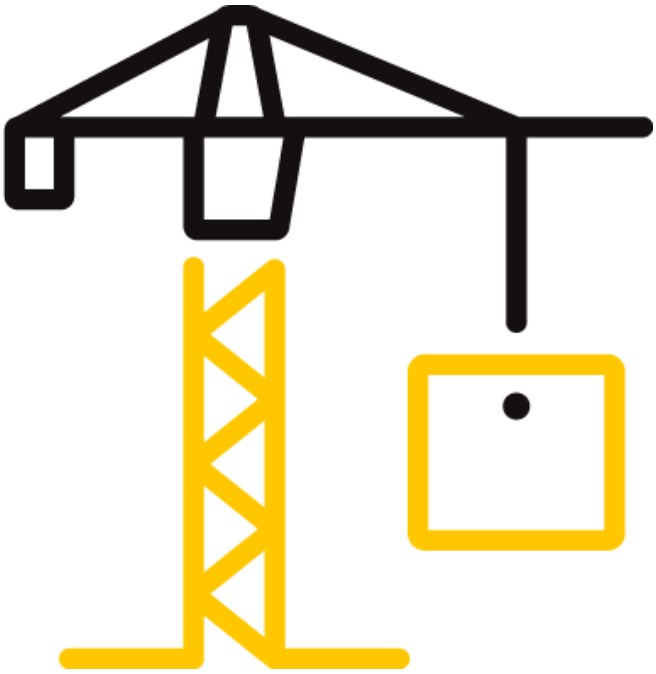


1500 Brigantine Drive
Coquitlam, BC V3K 7C1

Telephone: 604-520-3321
www.intertek.com/building

TEST REPORT FOR WESTLAKE PIPE & FITTINGS CORPORATION

Report No.: 106011396COQ-002 R1
Date: 03/27/25

REPORT ISSUED TO

WESTLAKE PIPE & FITTINGS CORPORATION
2801 POST OAK BLVD
HOUSTON, TX 77056 USA

SECTION 1

SCOPE

Intertek Building & Construction (B&C) was contracted by Westlake Pipe & Fittings Corporation 2801 Post Oak Blvd Houston, TX 77056 USA. to perform testing in accordance with CAN/ULC S102.2-18 Standard Method of Test for Surface Burning Characteristics of Flooring, Floor Covering, and Miscellaneous Materials and Assemblies., on their 1 ½ in. id Schedule 40 PVC Cellular Core Pipe. Results obtained are tested values and were secured by using the designated test method(s). Testing was conducted at Intertek Testing Services NA Ltd. (Intertek) test facility at 1500 Brigantine Drive Coquitlam, BC Canada.

Unless differently required, Intertek reports apply the "Simple Acceptance" rule also called “Shared Risk approach,” of ILAC-G8:09/2019, Guidelines on Decision Rules and Statements of Conformity.

Intertek B&C will service this report for the entire test record retention period. The test record retention period ends four years after the test date. Test records, such as detailed drawings, datasheets, representative samples of test specimens (where required by Certification or Accreditation bodies), or other pertinent project documentation, will be retained for the entire test record retention period.

1500 Brigantine Drive
Coquitlam, BC V3K 7C1

Telephone: 604-520-3321
www.intertek.com/building

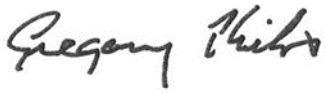
TEST REPORT FOR WESTLAKE PIPE & FITTINGS CORPORATION
Report No.: 106011396COQ-002 R1
Date: 03/27/25

SECTION 2
SUMMARY OF TEST RESULTS

The samples of 1 ½ in. id Schedule 40 PVC Cellular Core Pipe submitted by Westlake Pipe & Fittings Corporation were tested in accordance with CAN/ULC S102.2-18 Standard Method of Test for Surface Burning Characteristics of Flooring, Floor Covering, and Miscellaneous Materials and Assemblies.

The product test results are presented in Section 10 of this report.

For INTERTEK B&C:

COMPLETED BY:	Sean Fewer	**REVIEWED BY:**	Greg Philp
TITLE:	Technician B&C	**TITLE:**	Reviewer- B&C
SIGNATURE:		**SIGNATURE:**	
DATE:	04/07/25	**DATE:**	04/07/25

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TEST REPORT FOR WESTLAKE PIPE & FITTINGS CORPORATION
Report No.: 106011396COQ-002 R1
Date: 03/27/25

SECTION 3
TEST METHOD(S)

The specimens were evaluated in accordance with the following:

CAN/ULC S102.2-18 Standard Method of Test for Surface Burning Characteristics of Flooring, Floor Covering, and Miscellaneous Materials and Assemblies.

SECTION 4
MATERIAL SOURCE/INSTALLATION

Samples were submitted to Intertek directly from the client and were not independently selected for testing and Intertek accepts no responsibility for any inaccuracies provided.

The test samples were received by the test facility on 12/18/24 (Coquitlam ID# Coquitlam ID# VAN2412181053-001).

SECTION 5
EQUIPMENT

ASSET #	DESCRIPTION	MODEL	CAL DUE DATE
WH2189	Photocell	Huygen 856	05/16/25
WH 2190	Smoke Opacity Meter	Huygen	05/16/25
WH 1052	Data Logger	Phidgets DAQ 2020	11/06/25
WH 2190	FS Tunnel	N/A	12/23/25

SECTION 6
LIST OF OFFICIAL OBSERVERS

NAME	COMPANY
Sean Fewer	Intertek B&C

1500 Brigantine Drive
Coquitlam, BC V3K 7C1

Telephone: 604-520-3321
www.intertek.com/building

TEST REPORT FOR WESTLAKE PIPE & FITTINGS CORPORATION
Report No.: 106011396COQ-002 R1
Date: 03/27/25

SECTION 7
TEST CALCULATIONS

The results of the tests are expressed by indexes, which compare the characteristics of the sample under tests relative to that of select grade red oak flooring and inorganic-cement board.

(A) Flame Spread Rating:

This index relates to the rate of progression of a flame along a sample in the 7620 mm tunnel. A natural gas flame is applied to the front of the sample at the start of the test and drawn along the sample by a draft kept constant for the duration of the test. An observer notes the progression of the flame front relative to time.

The test apparatus is calibrated such that the flame front for red oak flooring passes out the end of the tunnel in five minutes, thirty seconds (plus or minus 15 seconds).

(B) Smoke Developed:

A photocell is used to measure the amount of light, which is obscured by the smoke passing down the tunnel duct. When the smoke from a burning sample obscures the light beam, the output from the photocell decreases. This decrease with time is recorded and compared to the results obtained for red oak, which is defined to be 100.

SECTION 8
TEST SPECIMEN DESCRIPTION

Upon receipt of the samples at the Intertek Coquitlam laboratory they were placed in a conditioning room where they remained in an atmosphere of 23 ± 3°C (73.4 ± 5°F) and 50 ± 5% relative humidity.

The sample material was identified as " 1 ½ in. id Schedule 40 PVC Cellular Core Pipe". The product was made per ASTM F3128.

For each trial run, two single 7315mm. lengths of pipe were placed on the floor of the tunnel directly under each burner port. A layer of 6 mm. reinforced cement board was then placed on the upper ledges of the tunnel, the tunnel lid was lowered into place, and the samples were then tested in accordance with CAN/ULC S102.2-18 at a room temperature of 20 °C and 53% humidity.

1500 Brigantine Drive
Coquitlam, BC V3K 7C1

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TEST REPORT FOR WESTLAKE PIPE & FITTINGS CORPORATION
Report No.: 106011396COQ-002 R1
Date: 03/27/25

SECTION 9
TEST RESULTS

(A) Flame Spread

The resultant flame spread ratings are as follows:
(Rating rounded to nearest 5)

1 ½ in. PVC Cellular Core Pipe	Flame Spread	Flame Spread Rating
Run 1	0	0
Run 2	0	
Run 3	0	

(B) Smoke Developed

The areas beneath the smoke developed curve and the related classifications are as follows:
(Classification rounded to nearest 5)

1 ½ in. PVC Cellular Core Pipe	Smoke Developed	Smoked Developed Classification
Run 1	353	320
Run 2	296	
Run 3	312	

Observations

During the test runs, surface ignition occurred between 48 and 120 seconds. The flame then began to progress along the sample length until it reached the maximum flame spread. This was the case for all three test runs.

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TEST REPORT FOR WESTLAKE PIPE & FITTINGS CORPORATION
Report No.: 106011396COQ-002 R1
Date: 03/27/25

SECTION 10
CONCLUSION

The samples of 1 ½ in. id Schedule 40 PVC Cellular Core Pipe submitted by Westlake Pipe & Fittings Corporation exhibited the following flame spread characteristics when tested in accordance with CAN/ULC S102.2-18 Standard Method of Test for Surface Burning Characteristics of Flooring, Floor Covering, and Miscellaneous Materials and Assemblies.

A series of three test runs of material was conducted to conform to the requirements of the National Building Code of Canada.

Sample Material	Flame Spread Rating	Smoke Developed Classification
1 ½ in. PVC Cellular Core Pipe	0	320

The conclusions of this test report may not be used as part of the requirements for Intertek product certification. Authority to Mark must be issued for a product to become certified.

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TEST REPORT FOR WESTLAKE PIPE & FITTINGS CORPORATION
Report No.: 106011396COQ-002 R1
Date: 03/27/25

SECTION 13
REVISION LOG

REVISION #	DATE	PAGES	REVISION
0	03/27/25	N/A	Original Report Issue
1	04/07/25	1,2.3,5.6,7	Added Cellular Core to Description

intertek
Total Quality. Assured.

WESTLAKE PIPE & FITTINGS CORPORATION

TEST REPORT

SCOPE OF WORK
REPORT OF TESTING 1 ½ IN. ID SCHEDULE 40 ABS CELLULAR CORE PIPE FOR COMPLIANCE WITH THE APPLICABLE REQUIREMENTS OF THE FOLLOWING CRITERIA: CAN/ULC S102.2-18 STANDARD METHOD OF TEST FOR SURFACE BURNING CHARACTERISTICS OF FLOORING, FLOOR COVERING, AND MISCELLANEOUS MATERIALS AND ASSEMBLIES.

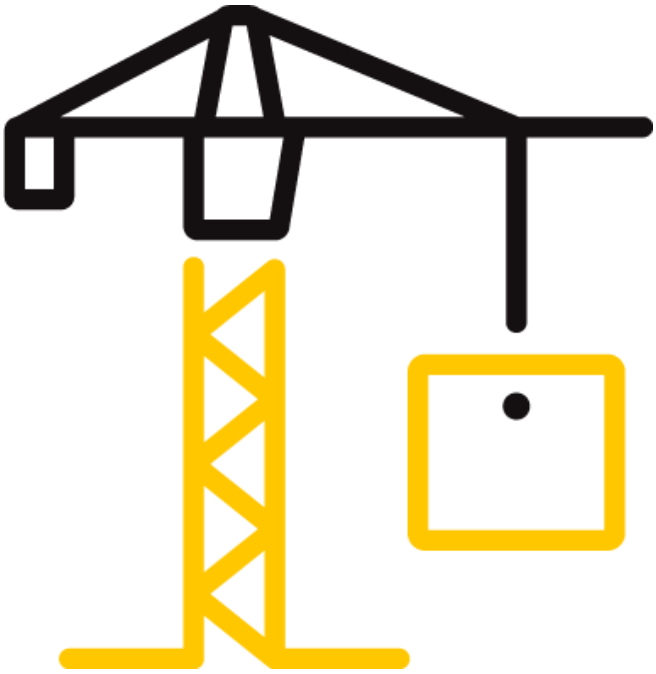
REPORT NUMBER
106011396COQ-001 R1

TEST DATE(S)
03/19/25 - 03/19/25

ISSUE DATE **REVISION DATE**
03/27/25 04/07/25

PAGES
16

DOCUMENT CONTROL NUMBER
GFT-OP-10c (09/29/20)



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TEST REPORT FOR WESTLAKE PIPE & FITTINGS CORPORATION

Report No.: 106011396COQ-001 R1
Date: 03/27/25

REPORT ISSUED TO

WESTLAKE PIPE & FITTINGS CORPORATION
2801 POST OAK BLVD
HOUSTON, TX 77056 USA

SECTION 1

SCOPE

Intertek Building & Construction (B&C) was contracted by Westlake Pipe & Fittings Corporation 2801 Post Oak Blvd Houston, TX 77056 USA. to perform testing in accordance with CAN/ULC S102.2-18 Standard Method of Test for Surface Burning Characteristics of Flooring, Floor Covering, and Miscellaneous Materials and Assemblies., on their 1 ½ in. id Schedule 40 ABS Cellular Core Pipe. Results obtained are tested values and were secured by using the designated test method(s). Testing was conducted at Intertek Testing Services NA Ltd. (Intertek) test facility at 1500 Brigantine Drive Coquitlam, BC Canada.

Unless differently required, Intertek reports apply the "Simple Acceptance" rule also called “Shared Risk approach,” of ILAC-G8:09/2019, Guidelines on Decision Rules and Statements of Conformity.

Intertek B&C will service this report for the entire test record retention period. The test record retention period ends four years after the test date. Test records, such as detailed drawings, datasheets, representative samples of test specimens (where required by Certification or Accreditation bodies), or other pertinent project documentation, will be retained for the entire test record retention period.

1500 Brigantine Drive
Coquitlam, BC V3K 7C1

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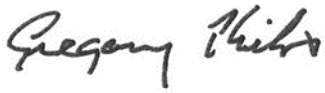
TEST REPORT FOR WESTLAKE PIPE & FITTINGS CORPORATION
Report No.: 106011396COQ-001 R1
Date: 03/27/25

SECTION 2
SUMMARY OF TEST RESULTS

The samples of 1 ½ in. id Schedule 40 ABS Cellular Core Pipe submitted by Westlake Pipe & Fittings Corporation were tested in accordance with CAN/ULC S102.2-18 Standard Method of Test for Surface Burning Characteristics of Flooring, Floor Covering, and Miscellaneous Materials and Assemblies.

The product test results are presented in Section 10 of this report.

For INTERTEK B&C:

COMPLETED BY:	Sean Fewer	**REVIEWED BY:**	Greg Philp
TITLE:	Technician B&C	**TITLE:**	Reviewer- B&C
SIGNATURE:		**SIGNATURE:**	
DATE:	04/07/25	**DATE:**	04/07/25

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TEST REPORT FOR WESTLAKE PIPE & FITTINGS CORPORATION
Report No.: 106011396COQ-001 R1
Date: 03/27/25

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SECTION 6
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NAME	COMPANY
Sean Fewer	Intertek B&C

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TEST REPORT FOR WESTLAKE PIPE & FITTINGS CORPORATION
Report No.: 106011396COQ-001 R1
Date: 03/27/25

SECTION 7
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(A) Flame Spread Rating:

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A photocell is used to measure the amount of light, which is obscured by the smoke passing down the tunnel duct. When the smoke from a burning sample obscures the light beam, the output from the photocell decreases. This decrease with time is recorded and compared to the results obtained for red oak, which is defined to be 100.

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The sample material was identified as " 1 ½ in. id Schedule 40 ABS Cellular Core Pipe".

For each trial run, two single 7315mm. lengths of pipe were placed on the floor of the tunnel directly under each burner port. A layer of 6 mm. reinforced cement board was then placed on the upper ledges of the tunnel, the tunnel lid was lowered into place, and the samples were then tested in accordance with CAN/ULC S102.2-18 at a room temperature of 20 °C and 53% humidity.

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Coquitlam, BC V3K 7C1

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TEST REPORT FOR WESTLAKE PIPE & FITTINGS CORPORATION
Report No.: 106011396COQ-001 R1
Date: 03/27/25

SECTION 9
TEST RESULTS

(A) Flame Spread

The resultant flame spread ratings are as follows:
(Rating rounded to nearest 5)

1 ½ in. ABS Cellular Core Pipe	Flame Spread	Flame Spread Rating
Run 1	302	270
Run 2	246	
Run 3	265	

(B) Smoke Developed

The areas beneath the smoke developed curve and the related classifications are as follows:
(Classification rounded to nearest 5)

1 ½ in. ABS Cellular Core Pipe	Smoke Developed	Smoked Developed Classification
Run 1	491	485
Run 2	500	
Run 3	459	

Observations

During the test runs, surface ignition occurred between 25 and 36 seconds. The flame then began to progress along the sample length until it reached the maximum flame spread. This was the case for all three test runs.

Westlake
Pipe & Fittings

APPENDIX III: NSF Certification of Product to ASTM F3128

Westlake
Pipe & Fittings

Profile-Wall Polyethylene (PE) Pipe and Fittings for Non-Pressure Gravity-Flow Storm Sewer and Subsurface Drainage Applications [5]

ASTM F2389-23, *Standard Specification for Pressure-rated Polypropylene (PP) Piping Systems* [5]

ASTM F2390-21, *Standard Specifications for Poly(Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent (DWV) Pipe and Fittings Having Post-Industrial Recycle Content* [5]

ASTM F2434-19, *Standard Specification for Metal Insert Fittings Utilizing a Copper Crimp Ring for SDR9 Cross-linked Polyethylene (PEX) Tubing and SDR9 Cross-linked Polyethylene/Aluminum/Cross-linked Polyethylene (PEX-AL-PEX) Tubing* [5]

ASTM F2599-22, *Standard Practice for Sectional Repair of Damaged Pipe by Means of an Inverted Cured-In-Place Liner* [5]

ASTM F2561-20, *Standard Practice for Rehabilitation of a Sewer Service Lateral and Its Connection to the Main Using a One Piece Main and Lateral Cured-in-Place Liner* [5]

ASTM F2618-21, *Standard Specification for Chlorinated Poly(Vinyl Chloride) (CPVC) Pipe and Fittings for Chemical Waste Drainage Systems* [5]

ASTM F2619-20/F2619M-20, *Standard Specification for High-Density Polyethylene (PE) Line Pipe* [5]

ASTM F2623-24e1, *Standard Specification for Polyethylene of Raised Temperature (PE-RT) Systems for Non-Potable Water Applications* [5]

ASTM F2648/F2648M-23, *Standard Specification for 50 mm to 1500 mm [2 in. to 60 in.] Annular Corrugated Profile Wall Polyethylene (PE) Pipe and Fittings for Land Drainage Applications* [5]

ASTM F2764/F2764M-23, *Standard Specification for 6 to 60 in [150 to 1500 mm] Polypropylene (PP) Corrugated Double and Triple Wall Pipe and Fittings for Non-Pressure Sanitary Sewer Applications* [5]

ASTM F2769-24, *Standard Specification for Polyethylene of Raised Temperature (PE-RT) Plastic Hot and Cold-Water Tubing and Distribution Systems* [5]

ASTM F2788/F2788M-21, *Standard Specification for Metric and Inch-sized Crosslinked Polyethylene (PEX) Pipe* [5]

ASTM F2806-23, *Standard Specification for Acrylonitrile Butadiene Styrene (ABS) Plastic Pipe (Metric SDR PR)* [5]

ASTM F2855-19 (2024), *Standard Specification for Chlorinated Poly(Vinyl Chloride)/Aluminum Chlorinated Poly(Vinyl Chloride) (CPVC-AL-CPVC) Composite Pressure Tubing* [5]

ASTM F2881/F2881M-21e1, *Standard Specification for 12 to 60 in [300 to 1500 mm] Polypropylene (PP) Dual Wall Pipe and Fittings for Non-Pressure Storm Sewer Applications* [5]

ASTM F2929-17 (2021), *Standard Specification for Crosslinked Polyethylene (PEX) Tubing of 0.070 in. Wall and Fittings for Radiant Heating Systems up to 75 psig* [5]

ASTM F2969-12 (2020), *Standard Specification for Acrylonitrile Butadiene Styrene (ABS) IPS Dimensioned Pressure Pipe* [5]

ASTM F3128-23, *Standard Specification for Poly(Vinyl Chloride) (PVC) Schedule 40 Drain, Waste, and Vent Pipe with a Cellular Core* [5]

Westlake
Pipe & Fittings

Table 9.13
PVC pipe test frequency

Test	Potable water [a]	DWV	DWV (3.25" OD)	DWV cellular core	Sewer	Well casing
acetone	annually	—	annually	annually	annually	—
bond	—	—	—	weekly	—	—
burst pressure	24 h [a,b]	—	—	—	—	—
deflection load and crush	—	annually	annually	—	—	annually
cellular structure	—	—	—	annually	—	—
dimensions						
pipe outside diameter	2 h	2 h	2 h	2 h	2 h	2 h
pipe wall thickness	2 h	2 h	2 h	2 h	2 h	2 h
pipe out-of-roundness	2 h	2 h	2 h	2 h	2 h	2 h
flattening resistance	annually	—	annually	annually	annually	—
impact resistance at 0 °C (32 °F) [b]	24 h [c]	—	—	—	—	24 h [d]
impact at 22.8 °C (73 °F) [b]	24 h [c,e]	24 h	24 h	24 h	24 h	—
joint tightness	—	—	—	—	annually	—
stiffness	—	annually	annually	annually	annually	annually
sustained pressure	annually	—	—	—	—	—
tup puncture resistance	—	—	—	—	—	annually
product standard(s)	ASTM D1785 ASTM D2241 CSA B137.3	ASTM D2665	ASTM D2949	ASTM F891 ASTM F3128	ASTM D2729 ASTM D3034	ASTM F480

[a] Test does not apply to CSA B137.3 products.
[b] If one material is continuously used in several machines or sizes, then when a steady-state operation is obtained on each machine, sample selection shall be from a different extruder each day and rotated in sequence among all machines or sizes.
[c] Test only applies to CSA B137.3 products.
[d] Impact testing shall be in accordance with ASTM F480 as referenced in Section 2 of this standard and the specified impact classification of IC-1, IC-2, or IC-3.
[e] 23 °C (73 °F) impact applies only to products produced under ASTM D2241 as referenced in Section 2 of this standard.

Product Listing Details

Current as of Monday, Apr 27, 2026 at 12:04 AM Eastern Time.
Always confirm this information by clicking here or scan the QR code for the most accurate, up-to-date information.

Scan QR Code

Product Listing Details

Trade Name	**Westlake Pipe & Fittings**
Product	**1 1/4" - 6"**
Product Type	**Pipe**
Material Type	**PVC**
Standard/Program	**NSF/ANSI 14 - Plastics Piping System Components and Related Materials**
End Use	**Drain, Waste, and Vent - Pipe and Fittings**
Company	**Westlake Pipe & Fittings Corporation** **The Westlake Center** **2801 Post Oak Boulevard, Suite 650** **Houston, Texas, 77056** **United States**
Contact	**713-585-2621** **800-999-7473**

Listing Details by Facility

Model/Size	Facility	Product Standard	Related Footnotes
-	Janesville, WI	ASTM F3128	NOTE: Only products bearing the NSF Mark on the product,product packaging, and/or documentation shipped with the product are Certified. [1] Product may also be marked with trade designation Westlake Canada, Inc. DBA Westlake Pipe & Fittings. ¢ Product is authorized to bear the cNSF and/or the cNSFus Mark.
-	Leola, PA	ASTM F3128	NOTE: Only products bearing the NSF Mark on the product, product packaging, and/or documentation shipped with the product are Certified. [1] Product may also be marked with trade designation Westlake Canada, Inc. DBA Westlake Pipe & Fittings. ¢ Product is authorized to bear the cNSF and/or the cNSFus Mark.