The Vinyl Institute

NEWS

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FOR IMMEDIATE RELEASE

PVC PIPE SAVINGS DOCUMENTED

WAYNE, N.J., August 8, 1990 -- Plumbing contractors can save up to 44 cents on every dollar by switching to PVC (polyvinyl chloride, or vinyl) pipe when they install plumbing systems, a study performed by a leading independent research firm shows. The same study found that PVC used in drain-waste-vent (DWV) applications can cost up to 37 cents less per dollar than competitive materials.

The study, the first of its kind to include installation and labor costs in estimating the savings advantages of PVC pipe, was conducted by IFT Technical Services, Berkeley, California.

Estimates were based on actual building costs in Atlanta, Boston, Cleveland, Houston, San Francisco and Seattle. Plumbing and DWV systems for four types of structures were evaluated: a wood frame townhouse, strip shopping center, high-rise residential building and a high-rise office building.

On average, the study found that CPVC (chlorinated PVC) pipe systems cost between 23 to 44 percent less than copper in new hot and cold water installations, according to Joseph B. Zicherman, Ph.D., president, IFT Technical Services.

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(more)

When PVC DWV was compared to cast iron soil pipe in drain, waste and vent pipe installations, the savings varied from 16 to 37 percent, he said.

"That can mean a savings of between 23 and 44 cents on every dollar spent to install hot and cold water systems and 16 to 37 cents for a typical DWV system," Zicherman said.

"This study confirms that there are significant cost advantages to using PVC pipe," said Roy Gottesman, executive director of the Vinyl Institute, which funded the IFT study.

PVC piping has proven to be safe, dependable and capable of meeting existing building codes, he said. Now there is concrete evidence of its superior economic performance.

"Moreover, this study doesn't even examine the total lifetime costs of the various systems and the related replacement costs. When you consider that PVC can easily outlast competitive materials, the advantages of PVC become even more obvious," Gottesman said.

PVC pipe has found broad use in plumbing applications. Because of its cost advantages and long life, pipe commands approximately three-fourths of the plastic pipe market. It is expected to maintain a strong hold on the market well into the year 2000.

The Vinyl Institute is a national trade association representing the leading manufacturers of vinyl, vinyl feedstocks, additives, and film and sheet products. Headquartered in Wayne, New Jersey, it is a division of the Society of Plastics Industry, Inc.

Executive summaries of the study dealing with plumbing and DWV pipe are available by contacting the Vinyl Institute, 114 Mayfield Avenue, P.O. Box 3053, Edison, New Jersey 08818-3053.

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PVC DRAIN, WASTE AND VENT PIPE

VS.

CAST IRON SOIL PIPE

A Cost/Benefit Comparison

Issued July 1990

CTL029904

This summary presents key findings from a study conducted for the Vinyl Institute by IFT Technical Services, Berkeley, California in September 1989. The study, entitled "A Cost/Benefit Study: In-Place Costs and Technical and Regulatory Constraints to Use of PVC-Based Pipe, Tube and Conduit in Construction," reviewed the use of PVC DWV (drain-waste-vent) pipe, plumbing pipe and electrical nonmetallic tubing (conduit). The findings relevant to the use of PVC DWV pipe are discussed here.

For individuals seeking cost-effective ways to meet performance requirements in DWV systems, the study provides important economic data: when the cost to install comparable cast iron and PVC DWV systems in six major U.S. cities was calculated, the PVC systems cost up to 37 percent less than the competitive metallic system. Direct comparison data of this type — including installation and labor costs — have not previously been available. Details of the study follow.

PROJECT OVERVIEW

PVC (polyvinyl chloride, or vinyl) construction products are increasingly used as replacements for "traditional" products. Typically, they provide both direct advantages in performance and cost/benefit advantages to the construction industry.

Although specific information on installed costs has not been available, it long has been believed that the full, installed cost of PVC DWV is substantially less than that of competitive metallic products. This study was designed to compare the fully installed costs of these two competing classes of products, thereby helping system specifiers make more complete comparisons between the merits of the two systems.

PROJECT DESIGN

Specifically, estimates were prepared to compare the costs of installing cast iron soil pipe and PVC drain-waste-vent piping in four different types of installations:

- A noncombustible high-rise residential building
- A noncombustible business/commercial building
- A wood frame townhouse
- A strip shopping center

The specific buildings upon which the estimates were based are actual buildings that were constructed using cast iron soil pipe. Estimates for comparable PVC DWV systems were developed by a nationally recognized cost-estimating firm (Lee Saylor and Associates of Concord, California) according to Construction Specification Institute (CSI) formats.

In order to make sure that the estimates for the two systems reflected actual safe installation practices, firestopping detailing was included in the estimate prepared for each PVC DWV system, while the cast iron system was estimated with no application of firestopping since grout applied along with the installation of wallboard typically is the only type of firestopping used with cast iron. The additional costs for the firestopping were factored into the estimates for each PVC system.

In order to provide costs on the various types of PVC DWV systems that are available, four different installation scenarios were estimated:

- Replacement of cast iron soil pipe with PVC solid core DWV piping, using a proprietary firestop.
- Replacement of cast iron soil pipe with PVC solid core piping, using a generic firestop.
- Replacement of cast iron soil pipe with PVC cellular core piping, using a proprietary firestop.
- Replacement of cast iron soil pipe with PVC cellular core piping, using a generic firestop.

In order to provide comparisons representative of labor and material costs throughout the United States, supplier and installer costs in six major U.S. cities were examined:

- San Francisco
- Boston
- Cleveland
- Houston
- Seattle
- Atlanta

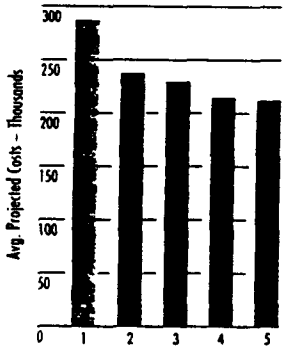
KEY FINDINGS

On average, the PVC DWV system cost between 16 and 37 percent less to install than the comparable cast iron system — even when the extra detailing required for firestopping the PVC system was included. (See cost summary table, next page.) Tables identifying the costs on a city-by-city basis, for each type of installation, follow.

Cost/B nefit Summary Tabl

CSI Section No.	Description	High-rise Residential Average	PVC Product Cost as % of Metal Pipe	High-rise Commercial Average	PVC Product Cost as % of Metal Pipe	Wood-frame Townhouse Average	PVC Product Cost as % of Metal Pipe	Strip Shopping Average	PVC Product Cost as % of Metal Pipe
15 1691	Cast iron pipe hubless mech, joint	$ 281,291		$ 62,708		$ 95,953		$ 27,445	
15 1692	PVC, Sch 40, in building, w/ftgs, supports and proprietary fire stopping	236,797	84	47,155	75	62,503	65	17,674	64
15 1693	PVC, cellular core, Sch 40 in building w/ftgs, supports, and proprietary fire stopping	231,755	82	46,347	74	62,865	66	17,394	63
15 1694	PVC, solid core, Sch. 40, in building w/ftgs, supports and generic fire stopping when possible	216,579	77	46,510	74	60,433	63	17,538	64
15 1695	PVC, cellular core, Sch 40 in building w/ftgs, supports, and generic fire stopping when possible	213,382	76	45,535	73	59,968	63	17,271	63

High-rise Residential In-Place DWV Costs (in Dollars)



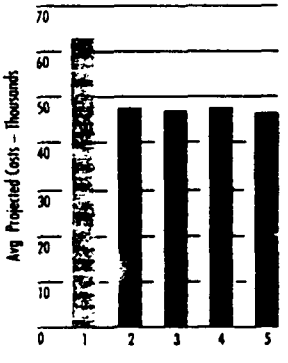
Legend: 1 – Cast Iron
2 – PVC Solid Core, Proprietary Fire
3 – PVC Cellular Core, Proprietary Fire
4 – PVC Solid Core Generic Fire
5 – PVC, Cellular Core Generic Fire

CSI Section No.	Description	San Francisco	Boston	Cleveland	Houston	Seattle	Atlanta	Project Cost Average	PVC Cost as o % of Iron
15.1691	Cast iron pipe hubless mech, joint	429,116	278,442	258,474	252,415	254,495	214,804	281,291	
15.1692	PVC, solid core Sch. 40, in building, w/ftgs, supports and proprietary fire stopping	361,764	238,745	203,975	219,261	220,125	176,914	236,797	84
15.1693	PVC, cellular core, Sch. 40 in building, w/ftgs, supports and proprietary fire stopping	349,421	234,709*	201,196	216,219	215,068	173,917	231,755	82
15 1694	PVC, solid core, Sch 40 in building, w/ftgs, supports and generic fire stopping when possible	339,838	218,583	184,499	199,547	199,065	157,943	216,579	77
15 1695	PVC, cellular core, Sch. 40 in building, w/ftgs, supports and generic fire stopping when possible	335,135	216,366*	181,713	196,532	195,540	155,007	213,382	76

**Manufacturer / Supplier would not reveal prices without an order Numbers based on estimate.*

These estimates were based on a Type-1, 30 story, noncombustible high-rise unit It was not a "spec" or "fast-track" project

High-rise Commercial In-Place DWV Costs (in Dollars)



Legend: 1 – Cast Iron
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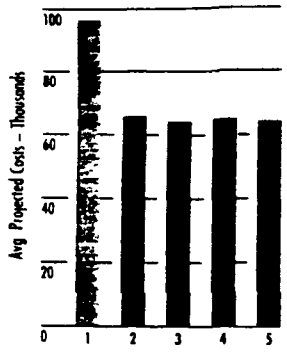
3 – PVC, Cellular Core, Proprietary Fire
4 – PVC Solid-Core Generic Fire
5 – PVC, Cellular Core, Generic Fire

CSI Section No.	Description	San Francisco	Boston	Cleveland	Houston	Seattle	Atlanta	Project Cost Average	PVC Cost as o % of Iron
15.1691	Cast iron pipe hubless mech, joint	96 045	62,112	57,108	56,377	56,741	47,867	62,708	
15.1692	PVC, solid core Sch. 40, in building, w/ftgs, supports and proprietary fire stopping	72,039	48,034	38,566	44,208	44,799	35,284	47,155	75
15.1693	PVC, cellular core, Sch. 40 in building, w/ftgs, supports and proprietary fire stopping	70 934	47 148	38,009	43,373	43,962	34,657	46,347	74
15.1694	PVC, solid core, Sch. 40 in building, w/ftgs, supports and generic fire stopping when possible	70 969	47 840	37,795	43,284	44,537	34,637	46,510	74
15.1695	PVC, cellular core, Sch. 40 in building, w/ftgs, supports and generic fire stopping when possible	69 867	46,984	37,239	42,439	42,727	33,952	45,535	73

These estimates were based on a high-rise, noncombustible, sprinklered building that included upper-story office occupancies and lower-story commercial space Because of the typical high-rise core design used, distribution of utilities was generally confined to the central building area.

Wood-frame T wnhouse In-Place DWV C sts (in-Dollars)

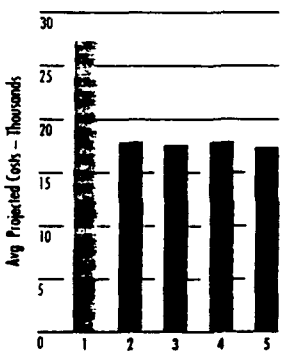


Legend: 1 – Cast Iron
2 – PVC, Solid Core, Proprietary Fire
3 – PVC, Cellular Core, Proprietary Fire
4 – PVC, Solid Core, Generic Fire
5 – PVC, Cellular Core, Generic Fire

CSI Section No.	Description	San Francisco	Boston	Cleveland	Houston	Seattle	Atlanta	Project Cost Average	PVC Cost as a % of Iron
15.1691	Cast iron pipe hubless mech, joint (w copper "M")	147,382	93,852	90,377	85,787	85,433	72,896	95,953	
15 1692	PVC, solid core Sch 40, in building, w/ftgs, supports and proprietary fire stopping	99,375	60,993	53,907	57,347	55,719	47,675	62,503	65
15.1693	PVC, cellular core, Sch. 40 in building, w/ftgs, supports and proprietary fire stopping	98,292	63,881	53,168	57,043	55,073	49,734	62,865	66
15.1694	PVC, solid core, Sch 40 in building, w/ftgs, supports and generic fire stopping when possible	96,396	59,164	52,243	55,762	53,645	45,388	60,433	63
15.1695	PVC, cellular core, Sch. 40 in building, w/ftgs, supports and generic fire stopping when possible	95,314	58,398	51,434	55,042	52,174	47,447	59,968	63

These estimates were based on a residential townhouse development, including common areas and limited commercial space. Estimates were for typical residential units only

Strip Shopping Center In-Place DWV Costs (in Dollars)



Legend: 1 – Cast Iron
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3 – PVC, Cellular Core, Proprietary Fire
4 – PVC, Solid Core, Generic Fire
5 – PVC, Cellular Core, Generic Fire

CSI Section No.	Description	San Francisco	Boston	Cleveland	Houston	Seattle	Atlanta	Project Cost Average	PVC Cost as a % of Iron
15.1691	Cast iron pipe hubless mech, joint	41,916	27,123	25,274	23,855	24,750	21,751	27,445	
15 1692	PVC, solid core Sch 40, in building, w/ftgs, supports and proprietary fire stopping	27,300	17,681	14,743	16,746	16,118	13,455	17,674	64
15.1693	PVC, cellular core, Sch. 40 in building, w/ftgs, supports and proprietary fire stopping	26,878	17,366	14,489	16,427	15,798	13,408	17,394	63
15 1694	PVC, solid core, Sch. 40 in building, w/ftgs, supports and generic fire stopping when possible	27,137	17,457	14,642	16,606	16,019	13,367	17,538	64
15.1695	PVC, cellular core, Sch 40 in building, w/ftgs, supports and generic fire stopping when possible	26,715	17,218	14,389	16,287	15,699	13,320	17,271	63

These estimates were based on a single-story project with individual units separated by fire walls as required by local codes

Addendum

DATA PREPARATION

In order to prepare the needed data, plans for each building were analyzed to determine the number of feet of pipe used, the number of fittings need and detailing such as firestop needed to use PVC. Those materials were then totaled for the given size pipe.

Next, the unit cost was determined by dividing the total cost of all materials by the total number of feet used. The result was the "material cost," which was the average per-foot cost.

Finally, labor costs associated with installing the number of feet of pipe, the fittings, firestopping and other detailing were totaled by pipe size. An average, again based on total feet of pipe of a particular size, was then computed to obtain an average labor cost. The sum of those two averages was used to determine the installed cost.

MATERIAL SPECIFICS

Pricing data included costs for pipe, fittings and firestopping, plus man-hours for installation of each component at local union rates, subcontractor overhead and profit, and tax. Schedule 40 PVC pipe in sizes ranging from ¾" to 8" was used for all four comparisons.

Two firestopping systems were used to prepare the estimates:

3M Fire Barrier (the proprietary system): Pipe wrapping, aluminum foil tape and caulking.

USG Thermafiber (the generic system): Batt insulation in walls, but applied around pipe then sealed with smoke sealant.

CODE APPROVALS

All three model building codes permit the use of PVC pipe, provided the appropriate plumbing code allows its use. Both the Standard (SBCCI) and National Building Code (BOCA) incorporate plumbing codes that do not restrict the use of PVC pipe. In areas where the IAPMO code is the adopted plumbing code, PVC pipe currently is restricted to use in combustible construction less than seven stories in height. Some large cities have their own plumbing codes, and permitted uses for PVC pipe may vary in these cases.

This information published by the Pipe Resource Organization of the Vinyl Institute, 155 Route 46 West, Wayne Interchange Plaza II, Wayne, NJ 07470

PVC

VS.

COPPER

DOMESTIC HOT & COLD WATER SYSTEMS

A Cost/Benefit Comparison

Issued July 1990

This summary presents key findings from a study conducted for the Vinyl Institute by IFT Technical Services, Berkeley, California in September, 1989. The study, entitled, "A Cost/Benefit Study: In-Place Costs and Technical and Regulatory Constraints to Use of PVC-Based Pipe, Tube and Conduit in Construction," reviewed the use of PVC DWV (drain-waste-vent) pipe, plumbing pipe and electrical nonmetallic tubing (conduit). The findings relevant to the use of PVC pipe in domestic hot and cold water plumbing systems (DHCW) are discussed here.

For individuals seeking cost-effective ways to meet performance requirements in DHCW systems, the study provides important economic data: when the cost to install comparable copper and PVC-based DHCW systems — specifically, CPVC — in six major U.S. cities was calculated, the CPVC systems cost up to 44 percent less than the competitive metallic system. Direct comparison data of this type — including installation and labor costs — have not previously been available. Details of the study follow.

PROJECT OVERVIEW

PVC (polyvinyl chloride, or vinyl) construction products are increasingly used as replacements for "traditional" products. Typically, they provide both direct advantages in performance and cost/benefit advantages to the construction industry. CPVC (chlorinated polyvinyl chloride) has found broad use in plumbing applications.

Although specific information on installed costs has not been available, it long has been believed that the full, installed cost of CPVC-based DHCW is substantially less than that of competitive metallic products. This study was designed to compare the fully installed costs of these two competing classes of products, thereby helping system specifiers make more complete comparisons between the merits of the two systems.

PROJECT DESIGN

Specifically, estimates were prepared to compare the costs of installing copper and CPVC-based domestic hot and cold water supply piping in four different types of installations:

- A noncombustible high-rise residential building
- A noncombustible business/commercial building
- A wood frame townhouse
- A strip shopping center

The specific buildings upon which the estimates were based are actual buildings that were constructed using copper DHCW. Estimates for comparable CPVC DHCW systems were developed by a nationally recognized cost-estimating firm (Lee Saylor and Associates of Concord, California) according to Construction Specification Institute (CSI) formats.

In order to make sure that the estimates for the two systems reflected actual safe installation practices, firestopping detailing was included in the estimate prepared for each CPVC DHCW system, while the copper system was estimated with no application of firestopping since grout applied along with the installation of wallboard typically is the only type of firestopping used with copper. The additional costs for the firestopping were factored into the estimates for each CPVC system.

In order to provide costs on the various types of CPVC DHCW systems that are available, two different installation scenarios were estimated:

- Replacement of copper DHCW piping with CPVC DHCW piping, using a proprietary firestop.
- Replacement of copper DHCW piping with CPVC DHCW piping, using a generic firestop.

In order to provide comparisons representative of labor and material costs throughout the United States, supplier and installer costs in six major U.S. cities were examined:

- San Francisco
- Cleveland
- Seattle
- Boston
- Houston
- Atlanta

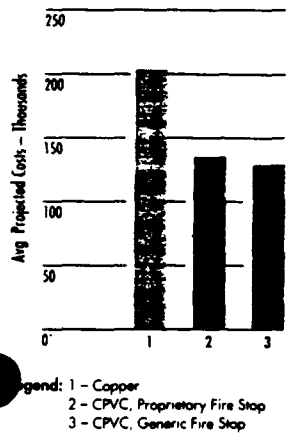
KEY FINDINGS

On average, the CPVC DHCW system cost between 23 and 44 percent less to install than the comparable copper system — even when the extra detailing required for firestopping the CPVC system was included. (See cost summary table, next page.) Tables identifying the costs on a city-by-city basis, for each type of installation, follow.

Cost/B n fit Summary Table

CSI Section No	Description	High-rise Residential Average	PVC Product Cost as % of Metal Pipe	High-rise Commercial Average	PVC Product Cost as % of Metal Pipe	Wood-frame Townhouse Average	PVC Product Cost as % of Metal Pipe	Strip Shopping Average	PVC Product Cost as % of Metal Pipe
15 1696	Copper pipe "L" in building, w/fitgs and supports	$ 205,937		$ 57,564		$ 75,605		$ 16,477	
15 1697	CPVC, supply pipe w/fitgs, supports and proprietary fire stopping	134,681	65	37,551	65	58,168	77	9,380	57
15 1698	CPVC, supply pipe w/fitgs, supports and generic fire stopping when possible	128,938	63	37,570	65	55,859	74	9,255	56

High-rise Residential In-Place DHCW Costs (in Dollars)

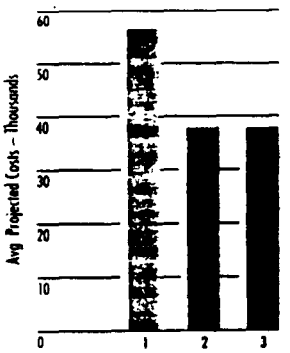


Legend: 1 – Copper
2 – CPVC, Proprietary Fire Stop
3 – CPVC, Generic Fire Stop

CSI Section No.	Description	San Francisco	Boston	Cleveland	Houston	Seattle	Atlanta	Project Cost Average	PVC Cost as a % of Copper
15 1696	Copper pipe "L" in building, w/fitgs and supports	303,133	205,335	193,773	183,393	188,788	161,201	205,937	
15.1697	CPVC, supply pipe w/fitgs, supports and proprietary fire stopping	202,697	132,496	123,196	122,910	122,911	103,874	134,681	65
15 1698	CPVC, supply pipe w/fitgs, supports and generic fire stopping when possible	200,227	127,101	116,457	116,337	115,966	97,539	128,938	63

These estimates were based on a Type-1, 30 story, noncombustible high-rise unit It was not a "spec" or "fast-track" project

High-rise Commercial In-Place DHCW Costs (in Dollars)

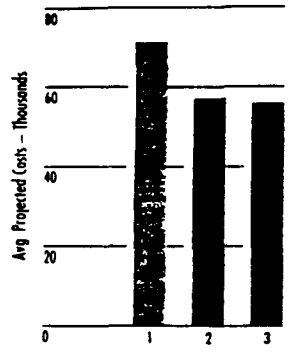


Legend: 1 – Copper
2 – CPVC, Proprietary Fire Stop
3 – CPVC, Generic Fire Stop

CSI Section No.	Description	San Francisco	Boston	Cleveland	Houston	Seattle	Atlanta	Project Cost Average	PVC Cost as a % of Copper
15 1696	Copper pipe "L" in building, w/fitgs and supports	87,940	57,497	53,467	48,546	52,850	45 082	57,564	
15.1697	CPVC, supply pipe w/fitgs, supports and proprietary fire stopping	55 811	37 489	35,208	31,992	34,914	29 892	37,551	65
15 1698	CPVC, supply pipe w/fitgs, supports and generic fire stopping when possible	55,085	37,775	35 466	31,915	35,073	30,108	37 570	65

These estimates were based on a high-rise, noncombustible sprinklered building that included upper-story office occupancies and lower-story commercial space Because of the typical high-rise core design used distribution of utilities was generally confined to the central building area

Wood-frame Townhouse In-Plac DHCW Costs (in-Dollars)



Legend: 1 – Copper
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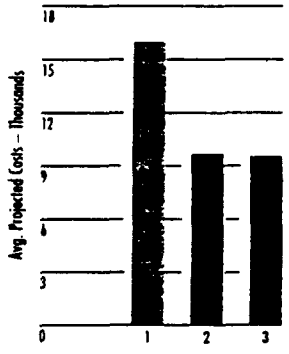
3 – CPVC, Generic Fire Stop

CSI Section No.	Description	San Francisco	Boston	Cleveland	Houston	Seattle	Atlanta	Project Cost Average	PVC Cost as a % of Copper
15 1696	Copper pipe "M" in building, w/ftgs and supports	114,409	75,671	67,894	64,470	67,626	63,559	75,605	
15.1697	CPVC, supply pipe w/ftgs, supports and proprietary fire stopping	95,648	57,540	51,711	47,309	52,782	44,016	58,168	77
15.1698	CPVC, supply pipe w/ftgs, supports and generic fire stopping when possible	88,620	56,112	50,339	46,071	51,263	42,750	55,859	74

These estimates were based on a residential townhouse development, including common areas and limited commercial space. Estimates were for typical residential units only.

Strip Shopping Center In-Place DHCW Costs (in Dollars)



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CSI Section No.	Description	San Francisco	Boston	Cleveland	Houston	Seattle	Atlanta	Project Cost Average	PVC Cost as a % of Copper
15 1696	Copper pipe "M" in building, w/ftgs and supports	24,552	16,421	15,252	14,687	15,084	12,865	16,477	
15 1697	CPVC, supply pipe w/ftgs, supports and proprietary fire stopping	14,716	9,203	8,472	8,407	8,397	7,084	9,380	57
15 1698	CPVC, supply pipe w/ftgs, supports and generic fire stopping when possible	14,588	9,095	8,292	8,273	8,295	6,985	9,255	56

These estimates were based on a single-story project with individual units separated by fire walls as required by local codes.

Addendum

DATA PREPARATION

In order to prepare the needed data, plans for each building were analyzed to determine the number of feet of pipe used, the number of fittings needed and detailing such as firestops needed to use CPVC. Those materials were then totaled for the given size pipe.

Next, the unit cost was determined by dividing the total cost of all materials by the total number of feet used. The result was the "material cost," which was the average per-foot cost.

Finally, labor costs associated with installing the number of feet of pipe, the fittings, firestopping and other detailing were totaled by pipe size. An average labor cost was then obtained, again based on total feet of pipe of a particular size. The sum of those two averages was used to determine the installed cost.

MATERIAL SPECIFICS

Pricing data included costs for pipe, fittings and firestopping, plus man-hours for installation of each component at local union rates, subcontractor overhead and profit, and tax. CPVC pipe ranging from ½" through 6" was used for the comparisons.

Two firestopping systems were used to prepare the estimates:

3M Fire Barrier (the proprietary system): Pipe wrapping, aluminum foil tape and caulking.

USG Thermafiber (the generic system): Batt insulation in walls, but applied around pipe then sealed with smoke sealant.

CODE APPROVALS

All three model building codes permit the use of CPVC pipe, provided the appropriate plumbing code allows its use. Both the Standard (SBCCI) and National Building Code (BOCA) incorporate plumbing codes that do not restrict the use of CPVC pipe. In areas where the IAPMO code is the adopted plumbing code, CPVC pipe currently is permitted on an exception basis only. Some large cities have their own plumbing codes, and permitted uses for CPVC pipe may vary in these cases.

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