



Special Research Study

**Comparison of Water Pipe Installation Lengths and Costs in
Michigan: Port Huron, Grand Rapids, Monroe, and Livonia**

Client: American Chemistry Council

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EXECUTIVE SUMMARY

The American Chemistry Council (ACC) retained BCC Research to investigate and compare municipal water supply pipe (i.e., pressure mains) costs in four communities in Michigan. These included the cities of Monroe and Livonia, that permit open competition for pipe materials, and Port Huron and Grand Rapids, that use a closed competition for pipe and pipeline projects. BCC Research collected pipe installation, pipe cost, and pipe material data in each of these communities to compare cost and cost differential among the communities.

BCC Research collected publicly available data from bid documentation, city data, council meeting minutes, contracts, and other data sources. Primary data collection methods, including phone and/or email interviews, were used as needed to fill gaps or to verify and benchmark available data.

Key project findings indicate that communities with open competition enjoy lower pipe cost, on average, for water main installation or replacement projects, reaching average savings of 27% for 8-inch pipe and 34% for 12-inch pipe, in comparison to municipalities employing closed competition practices. Based on these data, for a hypothetical one-mile installation of 12-inch water main pipe, a municipality using a closed competition pipe material selection process would pay approximately \$445,206 (for pipe only; does not consider installation costs). In contrast, a municipality using an open competition pipe material selection process would pay approximately \$331,080, for a cost savings of \$114,126 per mile of 12-inch water main purchased. Figure A summarizes the closed and open competition pipe cost results shown in Table A.

Furthermore, ductile iron pipe of the same diameter was found to be less costly in open bid cities than in closed bid cities: 8-inch ductile iron pipe cost, on average, \$71.69 per foot in Port Huron (closed) and \$62.39 in Grand Rapids (closed), in comparison to \$58.60 in Livonia (open) and 55.64 in Monroe (open). Therefore, even when ductile iron is considered by itself, 8-inch pipe costs in closed bid cities were up to \$16.05 higher than in open bid cities, equivalent to a pipe cost inflation of up to 29%.

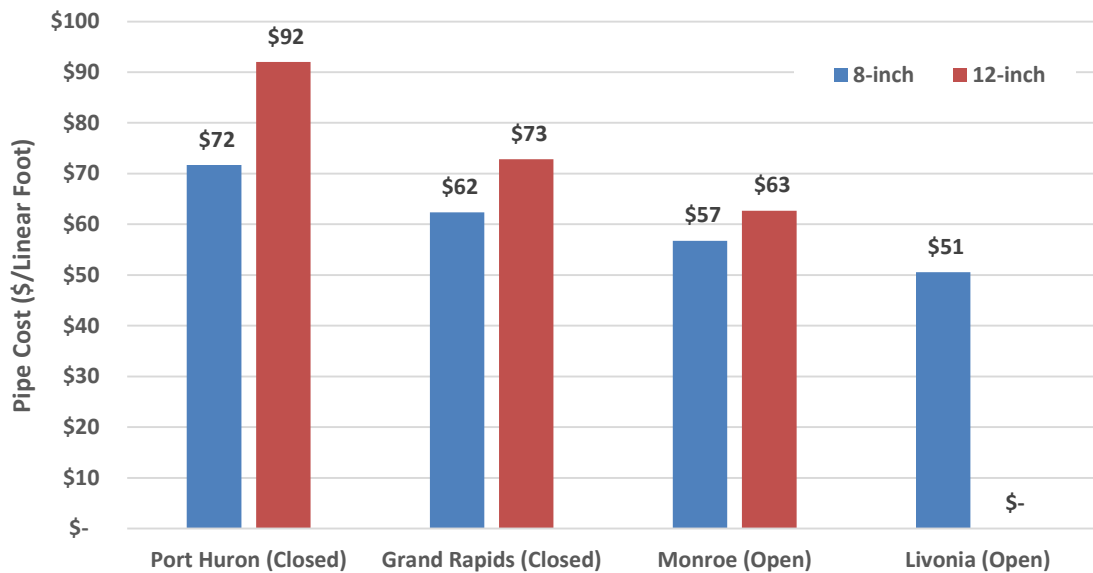


Figure A: Average Pipe Capital Cost (\$/Foot) by Pipe Diameter (8-inch and 12-inch), for Closed Competition (Port Huron and Grand Rapids) and Open Competition (Monroe and Livonia) Municipalities, 2013 to 2015; Composite of All Pipe Materials.

Table A: Average Pipe Capital Cost (\$/Foot) by Pipe Diameter for Closed (Port Huron and Grand Rapids) and Open Competition (Monroe and Livonia), and Percent Savings Identified for Open Over Closed Competition, 2013 to 2015.

Pipe diameter (inches)	Closed Competition	Open Competition	Percent Savings from Open Competition
8	\$67.97	\$53.65	27%
12	\$84.32	\$62.70	34%

Source: BCC Research.

INTRODUCTION

PURPOSE

The primary objective of this study was to provide a comparison of municipal water (pressurized) pipe installation and costs in four communities in Michigan. Two permit open competition for pipe materials (Monroe and Livonia), while two use a closed competition process for pipe purchase and pipeline projects (Port Huron and Grand Rapids). Data were gathered in order to highlight differences between these two types of bidding options for the following:

- How much pipe is installed each year
- Pipe sizing
- Pipe material, where data are available
- Compare cost and cost differential in the selected communities that follow different options for bidding

METHODOLOGY

Information collected in support of this study was collected through a combination of primary and secondary research methods. For these cities, secondary research methods, include city data, bid documentation, council meeting minutes, contracts, planning documents, water master plans, capital improvement plants, and other available data proved effective as reliable data sources. Primary data sources (phone and/or email based interviews with City staff) were used as needed to fill gaps or verify/benchmark pipe data. .

Public data were collected that included pipe lengths, materials, diameter and published costs. However, some data sources also included extraneous information and costs, beyond simple pipe cost. For example, some pipeline projects are bid out as a cost for construction and completion of the entire project, including pipe as well as appurtenances (vaults, manholes, etc.) and sometimes roadwork and earthwork (pavement, fill, sidewalks, etc.), without breaking out pipe costs explicitly. Data collected for these cities were of high quality. Nonetheless, in some instances, pipe costs were not available. In these cases, average cost per foot was estimated based on average cost for the same diameter pipe in that city during the same year.

Pipe cost, length, and diameter data were available for at least 75% of the data points used and summarized for this study. No complete or otherwise usable data were excluded. In total, 247 individual pipe installations were considered, from 2013 through 2015, in support of the project.

CITY OF LIVONIA (OPEN COMPETITION) PIPE INSTALLATION AND COST DATA

Livonia, Michigan allows open competition for water pipeline projects. Based on data collected in support of this study, the City currently installs considerably more plastic pipe - primarily high density polyethylene (HDPE) - than ductile iron, although the City does have both within its existing installed water distribution system. For example, in 2013, 100% of Livonia's installed water pipe (based on pipe length) was plastic. In 2014, 76% was plastic, and in 2015 94% was plastic, with the remainder being ductile iron during both years. Most of the City's in-ground water mains are actually ductile iron – as of 2015, 466 of approximately 500 miles of existing in-ground water mains were ductile iron. The City repairs approximately 165 breaks in its water distribution system each year.

Data for the City were collected primarily based on filed bid responses and awarded contracts for City pipeline projects, which were publicly available through City Council meeting documentation, contract documentation, bid documentation, and as data made available to BCC Research. Data collected were benchmarked against city municipal water system data, including total length of in-ground pipe each year. Pipe diameter, length and cost data were available for Livonia for all identified projects. During the Study period, the City installed only 8-inch and 16-inch (data not shown) diameter pipe. No data were available that identified installation of 12-inch diameter pipe.

Table 1 summarizes the length and diameter of pipe installed in Livonia during 2013, 2014, and 2015. Similarly, Table 2 summarizes total pipe costs by diameter and year, while Table 3 summarizes pipe cost per foot, and Table 4 summarizes pipe *materials* by length of pipe installed. Finally, we summarized average pipe costs for Livonia over the study period by diameter. These are shown in Table 5.

Table 1: Livonia: Linear Feet of Pipe Installed, 2013-2015

Pipe Diameter (inches)	Pipe Length (feet)		
	2013	2014	2015
8	1,200	19,642	26,000
12	0	0	0
TOTAL	1,200	19,642	26,000

Source: BCC Research.

Table 2: Livonia: Pipe Cost, 2013-2015

Pipe Diameter (inches)	Pipe Cost (\$/Year)		
	2013	2014	2015
8	\$ 46,250	\$ 1,095,731	\$ 1,491,620
12	N/A	N/A	N/A
TOTAL	\$ 46,250	\$ 1,095,731	\$ 1,491,620

Source: BCC Research.

Table 3: Livonia: Pipe Cost per Foot

Pipe Diameter (inches)	Pipe Cost (\$/Foot)		
	2013	2014	2015
8	\$ 38.54	\$ 55.79	\$ 57.37
12	N/A	N/A	N/A

Source: BCC Research.

Table 4: Livonia: Pipe Materials (Percent of Annual Total)

Pipe Materials	Percent of Total Annual Pipe Length Installed		
	2013	2014	2015
Ductile Iron	0%	24%	6%
Plastic	100%	76%	94%
Total	100%	100%	100%

Source: BCC Research.

Table 5: Livonia: Average Pipe Cost, by Pipe Diameter, All Materials Combined

Pipe Diameter (inches)	Average Pipe Cost (\$/ft), 2013-2015
8	\$ 50.57
12	N/A

Source: BCC Research.

CITY OF MONROE (OPEN COMPETITION) PIPE INSTALLATION AND COST DATA

Monroe, Michigan allows open competition for water pipeline projects. Based on data collected in support of this study, the City currently installs considerably more plastic pipe – almost exclusively polyvinyl chloride (PVC) pipe - than ductile iron, although the City does have both within its existing installed water distribution system. For example, in 2013, 84% of Monroe’s installed water pipe (based on pipe length) during that year was plastic. In 2014, 83% was plastic, and in 2015, 56% was plastic, with the remainder being ductile iron during both years. Most of the City’s 306 miles of water lines (as of 2015) are ductile iron. The City maintains an active water main replacement program, which was active during the time period covered by this Study.

Data for the City were collected primarily based on filed bid responses and awarded contracts for City pipeline projects, which were publicly available through City Council meeting documentation, contract documentation, bid documentation, and as data made available to BCC Research. Data collected were benchmarked against city municipal water system data, including total length of in-ground pipe each year. Pipe diameter, length and cost data were available for Monroe for all identified projects. During the Study period, the City installed pipe of various sizes; however, 8-inch and 12-inch pipe were the most commonly installed diameters.

Table 6 summarizes the length and diameter of pipe installed in Monroe during 2013, 2014, and 2015. Similarly, Table 7 summarizes total pipe costs by diameter and year, while Table 8 summarizes pipe cost per foot, and Table 9 summarizes pipe *materials* by length of pipe installed. Finally, we summarized average pipe costs for Monroe over the study period by diameter. These are shown in Table 10.

Table 6: Monroe: Linear Feet of Pipe Installed, 2013-2015

Pipe Diameter (inches)	Pipe Length (feet)		
	2013	2014	2015
8	2,371	3,345	8,675
12	11,426	1,360	3,971
TOTAL	13,797	4,705	12,646

Source: BCC Research.

Table 7: Monroe: Pipe Cost, 2013-2015

Pipe Diameter (inches)	Pipe Cost (\$/Year)		
	2013	2014	2015
8	\$ 144,031	\$ 185,556	\$ 468,108
12	\$ 711,315	\$ 84,320	\$ 253,556
TOTAL	\$ 855,346	\$ 269,876	\$ 721,665

Source: BCC Research.

Table 8: Monroe: Pipe Cost per Foot

Pipe Diameter (inches)	Pipe Cost (\$/Foot)		
	2013	2014	2015
8	\$ 60.76	\$ 55.47	\$ 53.96
12	\$ 62.25	\$ 62.00	\$ 63.86

Source: BCC Research.

Table 9: Monroe: Pipe Materials (Percent of Annual Total)

Pipe Materials	Percent of Total Annual Pipe Length Installed		
	2013	2014	2015
Ductile Iron	16%	17%	44%
Plastic	84%	83%	56%
Total	100%	100%	100%

Source: BCC Research.

Table 10: Monroe: Average Pipe Cost, by Pipe Diameter, All Materials Combined

Pipe Diameter (inches)	Average Pipe Cost (\$/ft), 2013-2015
8	\$ 56.73
12	\$ 62.70

Source: BCC Research.

CITY OF GRAND RAPIDS (CLOSED COMPETITION) PIPE INSTALLATION AND COST DATA

Grand Rapids, Michigan follows a closed competition process for water pipeline projects. Pipe material data were available for about two-thirds of all pipe installed during the study period. These data indicate that all pipe installed in 2013 and 2015 was ductile iron. Note that no pipe installation data were available during 2014, for 8-inch or 12-inch pipe.

Data for the City were collected primarily based on filed bid responses and awarded contracts for City pipeline projects, which were publicly available through City Council meeting documentation, contract documentation, bid documentation, and as data made available to BCC Research. Data collected were benchmarked against city municipal water system data, including total length of in-ground pipe each year. Pipe diameter, length and cost data were available for Grand Rapids for all identified projects. During the Study period, the City installed pipe of various sizes; however, 8-inch and 12-inch pipe were the most commonly installed diameters.

Table 11 summarizes the length and diameter of pipe installed in Grand Rapids during 2013, 2014, and 2015. Similarly, Table 12 summarizes total pipe costs by diameter and year, while Table 13 summarizes pipe cost per foot, and Table 14 summarizes pipe *materials* by length of pipe installed. Finally, we summarized average pipe costs for Grand Rapids over the study period by diameter. These are shown in Table 15.

Table 11: Grand Rapids: Linear Feet of Pipe Installed, 2013-2015

Pipe Diameter (inches)	Pipe Length (feet)		
	2013	2014	2015
8	4,537	-	9,516
12	1,431	-	263
TOTAL	5,968	-	9,779

Source: BCC Research.

Table 12: Grand Rapids: Pipe Cost, 2013-2015

Pipe Diameter (inches)	Pipe Cost (\$/Year)		
	2013	2014	2015
8	\$ 244,533	N/A	\$ 674,538
12	\$ 101,931	N/A	\$ 19,565
TOTAL	\$ 346,464	N/A	\$ 694,103

Source: BCC Research.

Table 13: Grand Rapids: Pipe Cost per Foot

Pipe Diameter (inches)	Pipe Cost (\$/Foot)		
	2013	2014	2015
8	\$ 53.90	N/A	\$ 70.88
12	\$ 71.23	N/A	\$ 74.39

Source: BCC Research.

Table 14: Grand Rapids: Pipe Materials (Percent of Annual Total)

Pipe Materials	Percent of Total Annual Pipe Length Installed		
	2013	2014	2015
Ductile Iron	100%	N/A	100%
Plastic	0%	N/A	0%
Total	100%	N/A	100%

Source: BCC Research.

Table 15: Grand Rapids: Average Pipe Cost, by Pipe Diameter

Pipe Diameter (inches)	Average Pipe Cost (\$/ft), 2013-2015
8	\$ 62.39
12	\$ 72.81

Source: BCC Research.

CITY OF PORT HURON (CLOSED COMPETITION) PIPE INSTALLATION AND COST DATA

Port Huron, Michigan follows a closed competition process for water pipeline projects. Pipe material data were available for all identified projects during 2013 and 2014, but pipe material data were available for only about one quarter of the projects during 2015. These data indicate a strong preference toward ductile iron, with all installations in 2013 through 2015 as ductile iron.

Data for the City were collected primarily based on filed bid responses and awarded contracts for City pipeline projects, which were publicly available through City Council meeting documentation, contract documentation, bid documentation, and as data made available to BCC Research. Data collected were benchmarked against city municipal water system data, including total length of in-ground pipe each year. Pipe diameter, length and cost data were available for Port Huron for all identified projects. During the Study period, the City installed pipe of various sizes; however, 8-inch and 12-inch pipe were the most commonly installed diameters.

Table 16 summarizes the length and diameter of pipe installed in Port Huron during 2013, 2014, and 2015. Similarly, Table 17 summarizes total pipe costs by diameter and year, while Table 18 summarizes pipe cost per foot, and Table 19 summarizes pipe *materials* by length of pipe installed. Finally, we summarized average pipe costs for Port Huron over the study period by diameter. These are shown in Table 20.

Table 16: Port Huron: Linear Feet of Pipe Installed, 2013-2015

Pipe Diameter (inches)	Pipe Length (feet)		
	2013	2014	2015
8	500	7,047	22,797
12	1,865	3,900	4,278
TOTAL	2,365	10,947	27,075

Source: BCC Research.

Table 17: Port Huron: Pipe Cost, 2013-2015

Pipe Diameter (inches)	Pipe Cost (\$/Year)		
	2013	2014	2015
8	\$ 25,543	\$ 420,275	\$ 2,378,469
12	\$ 183,200	\$ 273,000	\$ 460,929
TOTAL	\$ 208,743	\$ 693,275	\$ 2,839,398

Source: BCC Research.

Table 18: Port Huron: Pipe Cost per Foot

Pipe Diameter (inches)	Pipe Cost (\$/Foot)		
	2013	2014	2015
8	\$ 51.09	\$ 59.64	\$ 104.33
12	\$ 98.23	\$ 70.00	\$ 107.74

Source: BCC Research.

Table 19: Port Huron: Pipe Materials (Percent of Annual Total)

Pipe Materials	Percent of Total Annual Pipe Length Installed		
	2013	2014	2015
Ductile Iron	100%	100%	100%
Plastic	0%	0%	0%
Total	100%	100%	100%

Source: BCC Research.

Table 20: Port Huron: Average Pipe Cost, by Pipe Diameter

Pipe Diameter (inches)	Average Pipe Cost (\$/ft), 2013-2015
8	\$ 71.69
12	\$ 91.99

Source: BCC Research.

SUMMARY FINDINGS AND CONCLUSIONS

Key findings of this project indicate that municipalities employing open competition practices for the selection of municipal water pipe (force main) materials enjoy lower pipe cost on average for water main projects. As shown in Table 21, open competition resulted in a pipe cost savings for both 8-inch and 12-inch pipe diameters, with average savings of 34% for 12-inch pipe. Based on these data, for a hypothetical one-mile installation of 12-inch municipal water force main pipe, a municipality utilizing a closed competition pipe material selection process would pay approximately \$445,206 in pipe capital costs. In contrast, a municipality utilizing an open competition pipe material selection process would pay approximately \$331,080, for a cost savings of \$114,126 per mile of 12-inch water pipe purchased. Figure 1 visually summarizes the closed and open competition pipe cost results shown in Table 21.

Cities with an open bid process realized better prices, even when considering only the cost of ductile iron pipe (i.e., excluding plastic pipe costs from the analysis). For example, 8-inch ductile iron pipe cost, on average, \$71.69 per foot in Port Huron (closed) and \$62.39 in Grand Rapids (closed), in comparison to \$58.60 in Livonia (open) and 55.64 in Monroe (open). Even for ductile iron alone, 8-inch pipe costs in closed bid cities were consistently higher - up to \$16.05 higher per foot - than in open bid cities. Thus, cities with an open bid process saved up to 22% on ductile iron pipe costs *of the same diameter*.

Table 21: Average Pipe Capital Cost (\$/Foot) by Pipe Diameter (8-inch and 12-inch), for Closed Competition (Port Huron and Grand Rapids) and Open Competition (Monroe and Livonia) Municipalities, 2012 to 2015

Pipe diameter (inches)	Closed Competition	Open Competition	Percent Savings from Open Competition
8	\$ 67.97	\$ 53.65	27%
12	\$ 84.32	\$ 62.70	34%

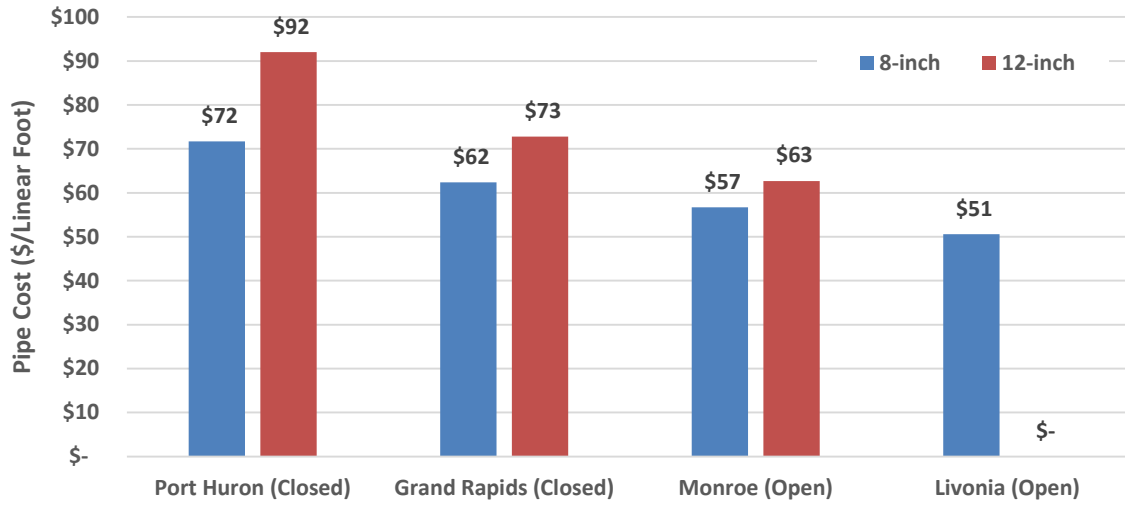


Figure 1: Average Pipe Capital Cost (\$/Foot) by Pipe Diameter for Closed (Port Huron and Grand Rapids) and Open Competition (Monroe and Livonia), and Percent Savings Identified for Open Over Closed Competition, 2013 to 2015