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July 6, 2006

Report Number: 06A0706E1

- Engineering Report - Cost Analysis of High-Rise Plumbing Piping System

Client: American Plastics Council
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Albany, NY 12207

Contact: Stephen M. Rosario
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Purpose: JB Engineering and Code Consulting, P.C. was requested to prepare a cost comparison of the difference between using metallic piping and plastic piping for the plumbing piping systems in a 12-story residential high-rise structure.

Abstract: The ICC International Plumbing Code permits all viable piping materials to be installed in plumbing piping systems. There are no arbitrary limitations based on the type of building or the size of building. Any structure can use any approved piping material.

Based on the ICC International Plumbing Code for the drainage, waste, and vent piping system, as well as, storm drainage systems, the common materials used are: ABS plastic pipe, cast iron soil pipe, Type DWV copper tubing, galvanized steel pipe, and PVC plastic pipe. For a water piping system, the common materials used are: CPVC plastic pipe, copper tubing, galvanized steel pipe, and PEX tubing.

The City of New York Building Code has a limitation on the use of plastic pipe. Plastic pipe is restricted to residential buildings of a given height. A 12-story residential high-rise building would not be permitted to be constructed with plastic plumbing piping material in New York City.

When a plumbing engineer analyzes the material to specify for a given project, part of the analysis includes the cost of the material and the cost of installation. Plastic piping

systems have traditionally had lower material costs and lower installation costs when compared to metallic piping systems, without any sacrifice of piping performance.

**Residential
Project:**

The building selected for analyzing the cost of the piping system is a 12-story residential high-rise building. There are a number of towers for the building, however, only one tower is being evaluated since all of the towers are identical. The cost of the piping installation would be the same for each tower.

The 12-story tower has 30 dwelling units: 12 three bedroom dwelling units, 12 four bedroom dwelling units, and 6 two bedroom dwelling units. The two bedroom dwelling units occupy two stories. The total floor area of each floor is 4,800 square feet. The three bedroom units have 3-1/2 baths, with a whirlpool tub and shower in the master bathroom. The four bedroom units have 4-1/2 baths, with a whirlpool tub and shower in the master bathroom. The two bedroom units have 2 baths. Each unit also has a kitchen sink. The three and four bedroom units have an automatic clothes washer standpipe.

There are multiple 2 hour fireresistance rated shafts in each tower for the plumbing piping installation. When the piping penetrates the fireresistance rated shafts, through penetration protection must be provided. Since this protection is required for both metallic and plastic piping, the cost of the through penetration protection is not included in this report.

**Technical
Information:**

Drainage, Waste, and Vent System: The metallic piping material selected for the drainage, waste, and vent system was no-hub cast iron soil pipe. This material is the lowest cost and fastest piping material to install. No-hub cast iron soil pipe is a common piping material installed in high-rise construction.

The plastic piping materials selected were ABS and PVC plastic pipe. Both ABS and PVC plastic pipe are also common piping materials used in high-rise construction. The plastic pipe is joined by solvent cement.

Storm Drainage System: Each tower only requires a single downspout. The material selected was the same as the drainage, waste, and vent piping material.

Water Piping System: In high-rise construction, the plumbing engineer will typically select a piping material for the main risers that can withstand higher pressures. The pressure on each floor would need to be lowered to an acceptable pressure of 80 psi, or less, by use of pressure reducing valves.

When using a metallic piping system, the most common material to use would be copper tubing. The first joining method selected was soldered connections with T-Drill connections used on the risers to the dwelling units. The T-Drill connections must be

brazed when joined. The other copper tubing system selected was a press connect joining method. Press connect fittings are joined with a special pressing tool which takes less labor to install the piping system. The press connect fittings typically cost more than solder fittings. The savings for a press connect fitting installation is in the labor savings.

A cost analysis of a galvanized steel pipe water piping system was also performed. The joining method for the steel pipe system was threaded joints.

For comparison purposes, the plastic pipe selected was Schedule 80 CPVC plastic pipe for the riser piping since it has a higher pressure rating. For the piping within the dwelling units, both CPVC (CTS) pipe and PEX tubing were selected for evaluation. The joining method selected for the CPVC was one step solvent cement. The PEX system was a manifold piping system. The manifold system requires more piping, however, there is a labor savings regarding the installation and elimination of fittings other than the manifold.

**Engineering
Design:**

The drainage, waste, and vent (DWV) system used the most economical design as permitted by the ICC International Plumbing Code, without the use of air admittance valves. There are seven riser combinations for the DWV system. The bathroom groups were wet vented when possible based on the layout within the room. For one riser, the kitchen sinks and showers were vented by a waste stack piping system.

The DWV riser diagrams for the building appear in Appendix A. The top floors of the DWV design are shown. This design is repeated for each floor of the residential high-rise building.

The storm drainage system was a single 4 inch downspout connected to the roof drain. The secondary drainage for the storm drainage system was provided by scuppers in the parapet on the roof.

Four risers were provided for the water piping system; two for cold water and two for the hot water. The water piping diagrams for each unit are shown in Appendix B. The manifold type installation is not shown in the drawing. For a manifold system, a separate cold and hot PEX tubing runs from the manifold to each fixture.

**Cost
Evaluation:**

The cost of the plumbing piping system was subdivided into drainage, waste, and vent, and storm drainage in one set of tables, and water piping in the other set of tables. Each table identifies the piping material and fittings required for the piping system. The material prices were extracted from *The Bradford Price Book*. This is a common price book used by plumbing contractors. The material prices used from *The Bradford Price Book* are either the list price or the sell price identified for each material, based on July 2006 prices. In addition, the labor, in man hours, is listed.

Two documents were referenced for the labor rates, the *National Plumbing Estimator* and the *PHCC-NA Labor Calculator III*. These documents establish labor rates for installing pipe and fittings. It should be noted that the labor associated with the installation of the pipe includes the labor required to cut the pipe, prepare the pipe, drill the holes, and hang the pipe. The fitting labor rate includes the preparation and joining of the fitting.

Drainage costs: The detailed cost tables for the drainage, waste, and piping system and storm drainage system appear in Appendix C. Table C-1 lists the cost for ABS plastic piping. Table C-2 lists the cost for PVC plastic piping. Table C-3 lists the costs for cast iron soil pipe with copper tubular traps.

Water costs: The detailed cost tables for the water piping system appear in Appendix D. Table D-1 lists the cost for CPVC plastic piping. Table D-2 lists the costs for CPVC plastic piping with PEX manifold system in the units. Table D-3 lists the costs for copper piping using T-Drill and solder fittings. Table D-4 lists the costs for copper piping using press connect fittings. Table D-5 lists the costs for galvanized steel pipe.

Cost Analysis: **Drainage systems:** Table 1 lists the total material and total labor costs for installing the drainage, waste, and vent piping system and the storm drainage piping system. These values are extracted from the tables in Appendix C.

Table 1 identifies the material cost based on list price (or sell price). The difference in labor between an ABS and PVC installation is a result of certain combination fittings not being available in 6 inch diameter in ABS. As a result, multiple fittings must be installed requiring additional time to join the fittings.

**Table 1
 Total Labor and Cost for DWV and Storm Drainage Piping Installation**

Item	Total Material Cost	Total Labor (hours)
ABS Plastic Pipe Installation	\$66,660.43	2008.87
PVC Plastic Pipe Installation	\$65,122.01	2003.35
Cast Iron Soil Pipe Installation	\$186,488.57	2736.88

Plumbing contractors receive a discount on material costs based on the type of material and the volume of sales. A typical discount for a plumbing contractor would be 45 percent for cast iron and 70 percent for ABS or PVC. Using these discounts, Table 2 identifies the discounted costs of installation.

The cost comparison and labor comparison is identified between PVC plastic pipe and cast iron. These two values are the lowest cost and highest cost for installation of the DWV and storm drainage system.

Table 2
Labor and Discounted Cost for DWV and Storm Drainage Piping Installation

Item	Total Material Cost	Total Labor (hours)
ABS Plastic Pipe Installation	\$19,998.13	2008.87
PVC Plastic Pipe Installation	\$19,536.60	2003.35
Cast Iron Soil Pipe Installation	\$121,217.57	2736.88
Difference Between PVC and Cast Iron	\$101,680.97	733.53
Percent Savings Using Plastic Pipe	83.88%	26.80%

Water System: Table 3 identifies the total list price of material cost and total labor required for installing the water piping.

Table 3
Total Labor and Cost for Water Piping Installation

Item	Total Material Cost	Total Labor (hours)
CPVC Pipe	\$25,321.87	1835.14
CPVC Pipe and PEX Tubing	\$56,906.70	525.22
Copper Tubing, T-Drill and Solder Fittings	\$63,114.30	1811.42
Copper Tubing, Press Connect Fittings	\$66,367.56	1402.04
Galvanized Steel Pipe	\$76,529.86	2361.65

The lowest labor rate is for a system using CPVC for the risers and PEX tubing with a manifold system in the units. The significant difference in the labor rate can be attributed

to the manifold piping installation. However, the material costs for the CPVC and PEX installation are higher because of the piping required for a manifold installation.

The labor requirements for CPVC plastic pipe are higher than for copper tubing with T-Drill and solder connection. This difference in installation time can be attributed to the use of T-Drill connections on the copper tubing risers. The T-Drill installation reduces the overall time required to install copper tubing. The copper tubing installation with press connect fittings has a lower labor rate than the CPVC and copper tubing using T-Drill and solder fittings. However, the copper press fitting installation has the higher material costs.

The tables in Appendix D identifies the difference between using Schedule 80 CPVC plastic pipe and CPVC (CTS) plastic pipe since there is a difference in the plumbing contractor discount between the two materials. Similarly, there is a difference in the discount between copper tubing and copper fittings.

A typical discount for Schedule 80 CPVC plastic pipe and fittings is 45 percent. A typical discount for CPVC (CTS) plastic pipe and fittings is 70 percent. A typical discount for copper tubing is 60 percent. A typical discount for copper fittings is 25 percent. A typical discount for galvanized steel pipe and fittings is 25 percent. Table 4 identifies the discounted material costs.

Table 4
Labor and Discounted Cost for Water Piping Installation

Item	Total Material Cost	Total Labor (hours)
CPVC Plastic Pipe Installation	\$9,830.27	1835.14
CPVC Plastic Pipe and PEX Tubing Installation	\$19,305.68	525.22
Copper Tubing with Solder Fitting Installation	\$28,397.52	1811.42
Copper Tubing with Press Connect Installation	\$30,837.46	1402.04
Galvanized Steel Pipe Installation	\$57,397.40	2361.65

The lowest plastic water piping installation (assuming a labor rate higher than \$7.25 per hour) would be a CPVC pipe and PEX tubing installation. The lowest metallic water piping installation (assuming a labor rate higher than \$6 per hour) would be a copper tubing with press connect fittings.

Plumbing Piping Systems: The total cost of all the plumbing piping systems is shown in Table 5. The material costs are the discounted costs of material.

Table 5
Comparison of Discounted Material Cost and Labor
For Plastic Piping Versus Metallic Piping

Riser and Main Material	Material Cost	Labor
Plastic Pipe Installation	\$38,842.28	2528.57
Metallic Pipe Installation	\$152,055.03	4138.92
Difference Between Plastic and Metallic	\$113,212.75	1610.35
Percent Savings with Plastic	74.46%	38.91%

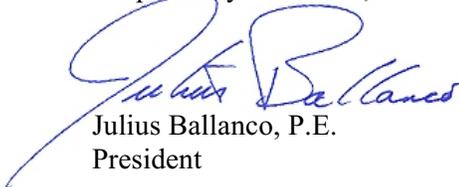
Conclusions: The lowest installed cost for the plumbing piping systems in a 12-story residential tower of a high-rise building would be plastic piping. Plastic piping, using PVC, CPVC, and PEX cost significantly less to install than metallic piping using cast iron soil pipe and copper tubing. The material cost savings for the installation is 74 percent when using plastic pipe. The labor savings is 38 percent.

Based on discounted prices, the plastic piping material cost would be \$38,842. The metallic piping material cost would be \$152,055.

The labor requirements to install plastic piping would be 2528 hours. The labor requirements to install metallic piping would be 4138 hours.

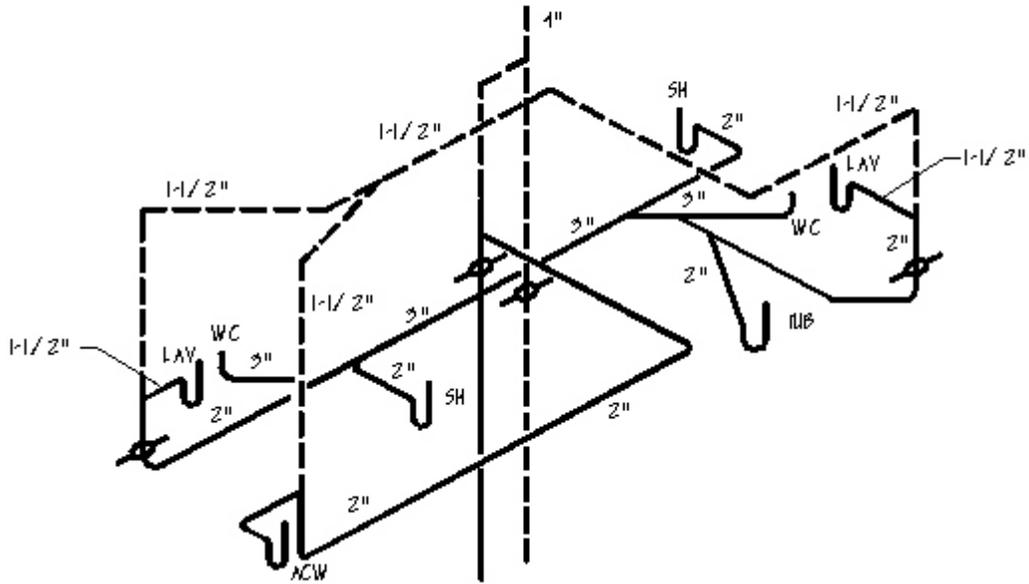
Certification: This report was prepared by Julius Ballanco, P.E., President, JB Engineering and Code Consulting, P.C., registered as a Professional Engineer in the State of New York, license number 070827. JB Engineering and Code Consulting, P.C. is a registered Engineering Professional Corporation in the State of Indiana, license number PC50910000.

Respectfully submitted,

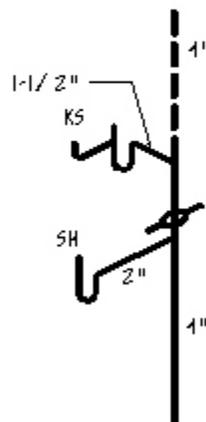

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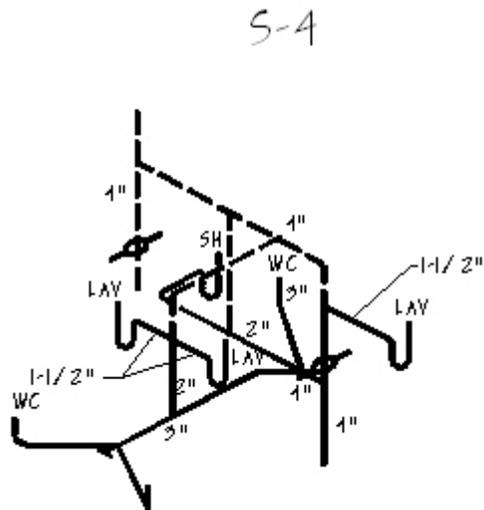
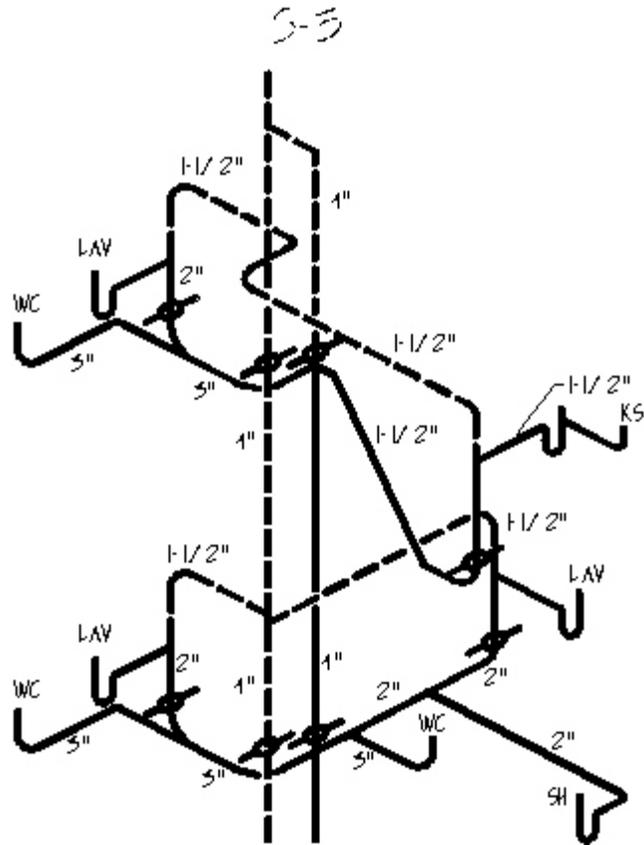
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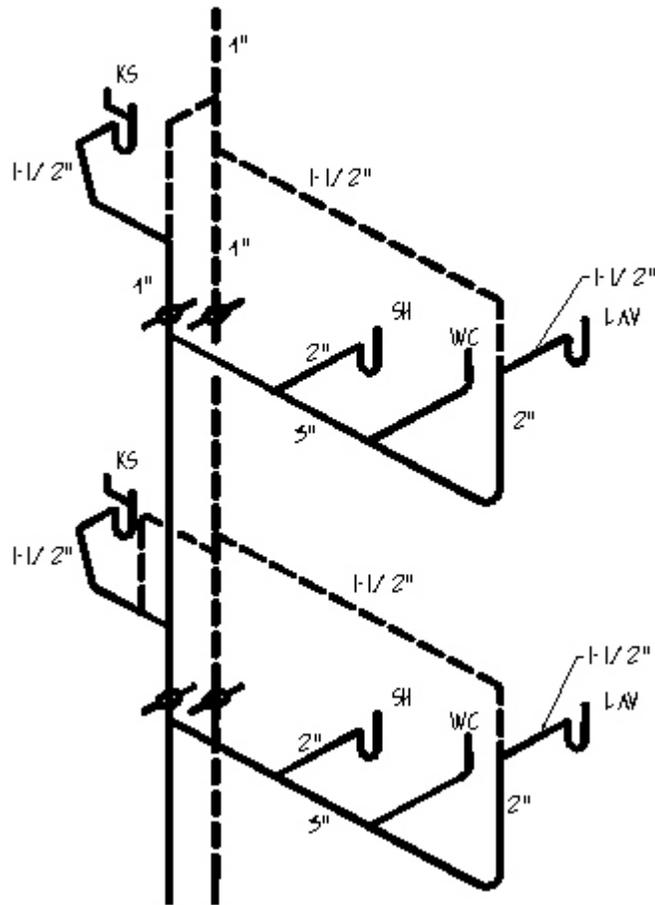


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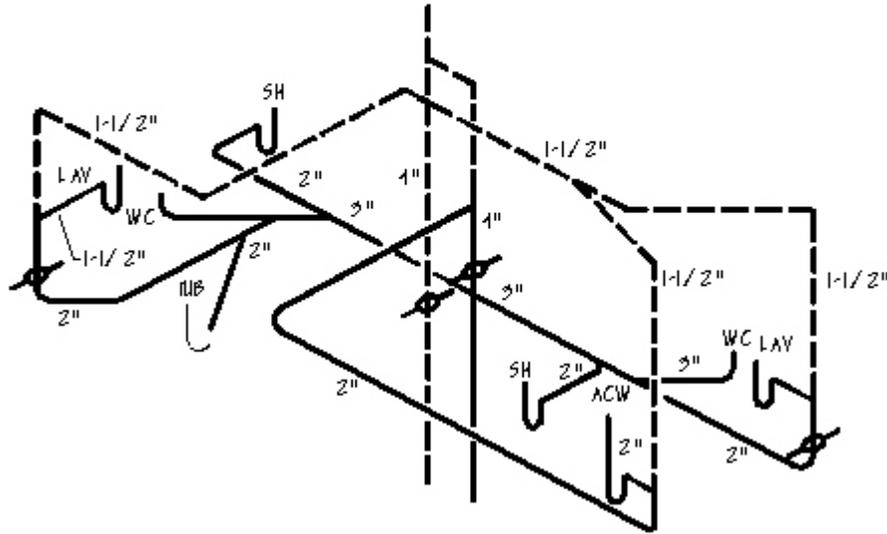


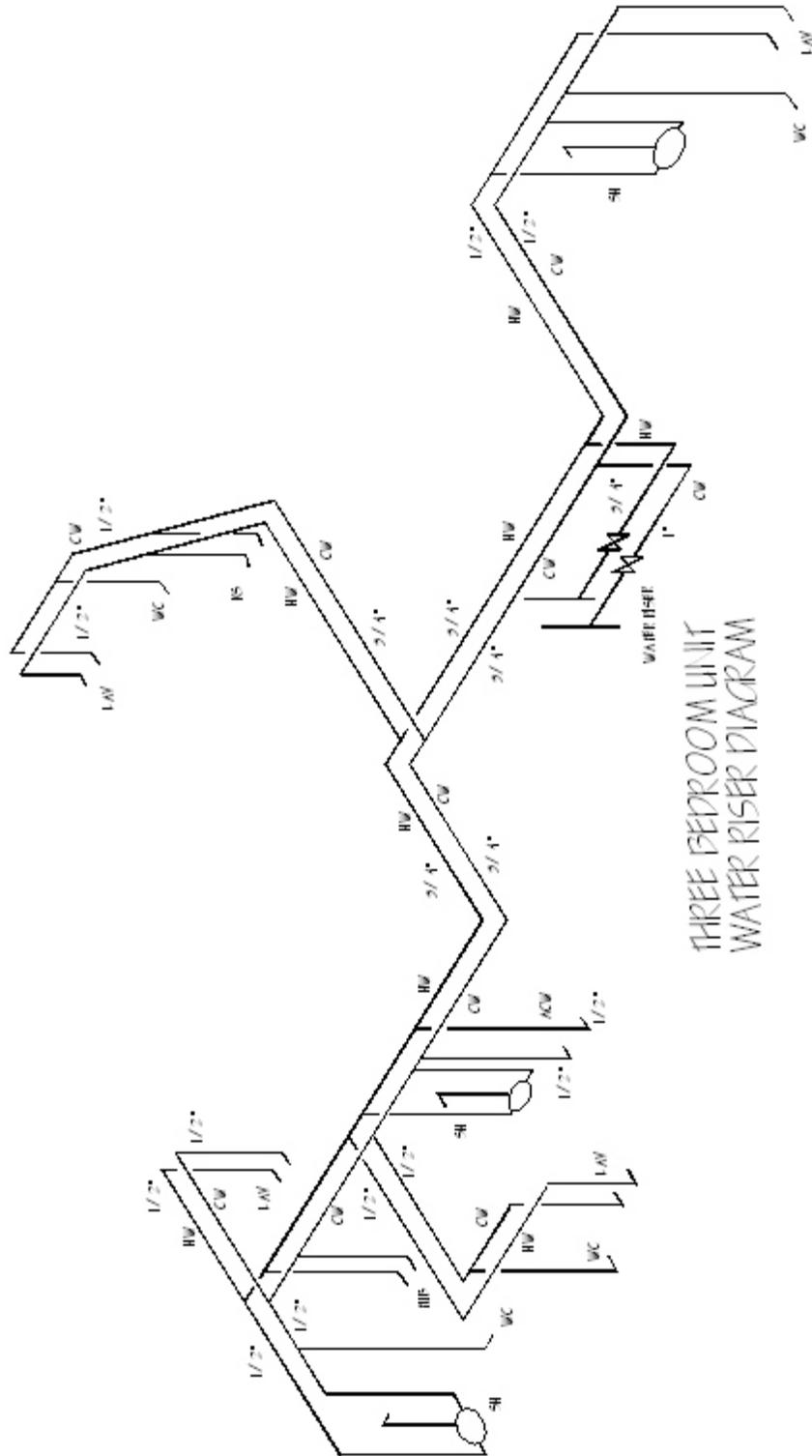


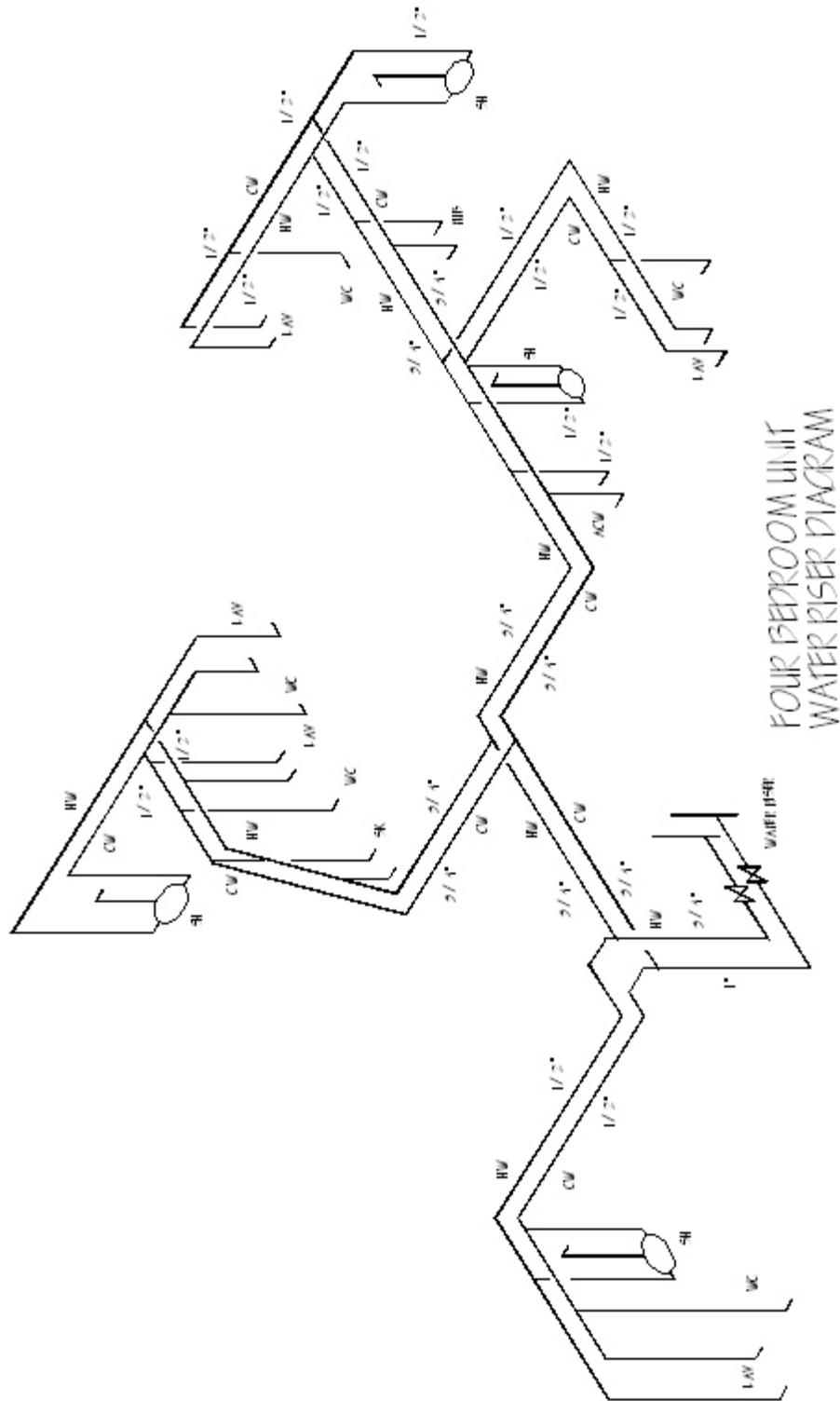
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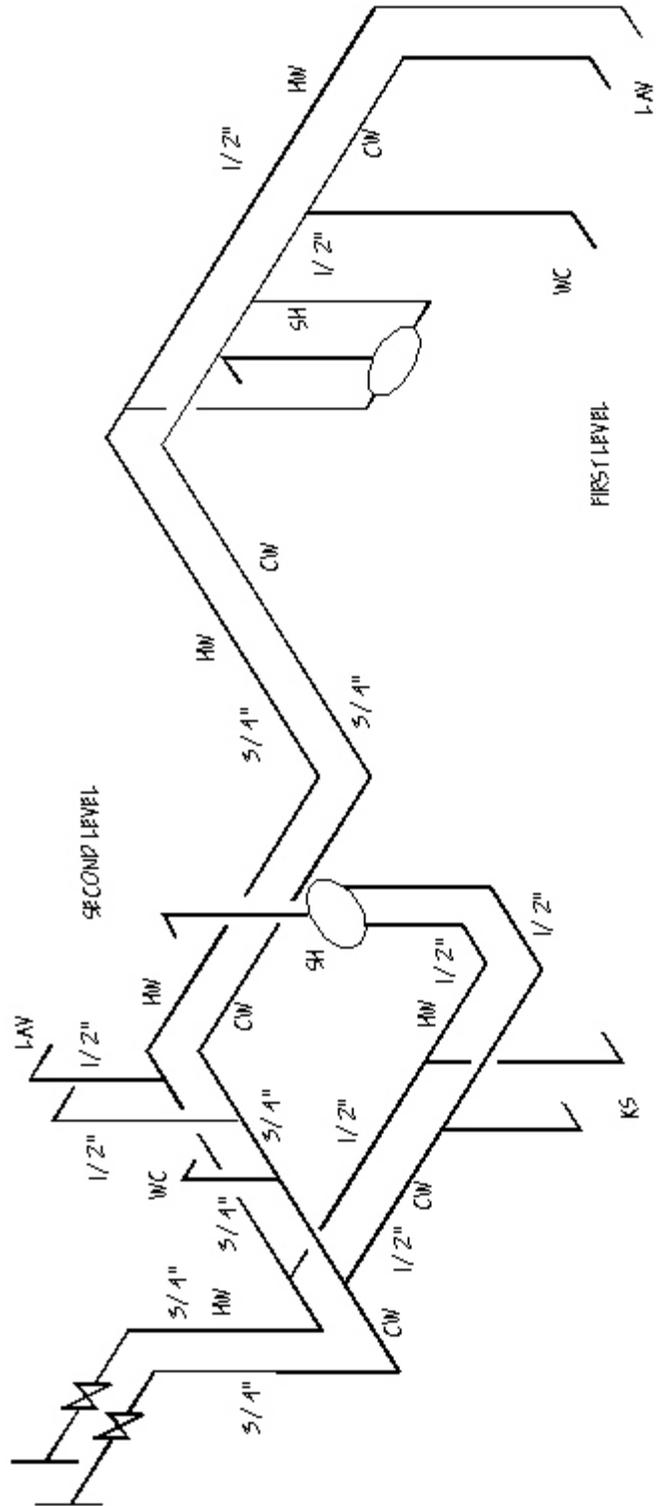


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TWO BEDROOM UNIT
WATER RISER DIAGRAM

Table C-1 ABS Pipe Material List

Qty	ABS Pipe Material List	Unit Cost	Total Cost	Unit Labor	Total Labor
30	6" ABS Schedule 40 Plastic Pipe	\$9.15	\$274.50	0.18	5.40
2188	4" ABS Schedule 40 Plastic Pipe	\$4.49	\$9,824.12	0.10	218.80
1167	3" ABS Schedule 40 Plastic Pipe	\$3.14	\$3,664.38	0.09	105.03
4555	2" ABS Schedule 40 Plastic Pipe	\$1.52	\$6,923.60	0.06	273.30
171	1-1/2" ABS Schedule 40 Plastic Pipe	\$1.13	\$193.23	0.05	8.55
302	Solvent Cement	\$23.18	\$7,000.36	0.00	0.00
2	6" ABS Plastic Wye	\$125.59	\$251.18	1.95	3.90
2	6" PVC Plastic Cleanout	\$55.06	\$110.12	0.65	1.30
2	6" ABS Plastic Eighth Bend	\$85.46	\$170.92	1.30	2.60
6	6" x 4" ABS Plastic Wye	\$103.76	\$622.56	1.76	10.56
2	6" x 4" ABS Plastic Bushing	\$54.04	\$108.08	1.30	2.60
129	4" ABS Plastic Closet Flange	\$10.22	\$1,318.38	0.36	46.44
14	4" ABS Plastic Coupling	\$11.26	\$157.64	0.72	10.08
5	4" ABS Plastic 90° Long Sweep	\$31.06	\$155.30	0.72	3.60
11	4" ABS Plastic 90° Short Sweep	\$25.07	\$275.77	0.72	7.92
12	4" ABS Plastic Eighth Bend	\$20.77	\$249.24	0.72	8.64
6	4" ABS Plastic Wye	\$48.28	\$289.68	1.08	6.48
7	4" ABS Plastic Combination Wye and Eighth Bend	\$58.34	\$408.38	1.08	7.56
16	4" ABS Plastic Sanitary Tee	\$356.94	\$5,711.04	1.08	17.28
1	4" ABS Plastic Cleanout Tee	\$56.69	\$56.69	0.72	0.72
4	4" ABS Plastic Cleanout	\$29.45	\$117.80	0.36	1.44
1	4" x 3" ABS Plastic Combination Wye and Eighth Bend	\$47.00	\$47.00	1.02	1.02
5	4" x 3" ABS Plastic Reducer	\$21.47	\$107.35	0.72	3.60
24	4" x 3" ABS Plastic Double Wye	\$78.93	\$1,894.32	1.42	34.08

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Qty	ABS Pipe Material List	Unit Cost	Total Cost	Unit Labor	Total Labor
2	4" x 3" ABS Plastic Wye	\$37.23	\$74.46	1.02	2.04
36	4" x 3" ABS Plastic Sanitary Tee	\$29.75	\$1,071.00	1.02	36.72
129	4" x 3" ABS Plastic Closet Bend	\$17.17	\$2,214.93	0.72	92.88
4	4" x 2" ABS Plastic Combination Wye and Eighth Bend	\$38.54	\$154.16	1.02	4.08
56	4" x 2" ABS Plastic Double Sanitary Tee	\$55.93	\$3,132.08	1.38	77.28
145	4" x 2" ABS Plastic Sanitary Tee	\$34.22	\$4,961.90	1.02	147.90
1	4" x 2" ABS Plastic Wye	\$26.60	\$26.60	1.02	1.02
2	4" x 2" ABS Plastic Reducer	\$20.39	\$40.78	0.72	1.44
5	3" ABS Plastic Eighth Bend	\$12.29	\$61.45	0.60	3.00
49	3" ABS Plastic Wye	\$22.44	\$1,099.56	0.90	44.10
12	3" ABS Plastic Double Wye	\$49.21	\$590.52	1.20	14.40
38	3" ABS Plastic Combination Wye and Eighth Bend	\$29.06	\$1,104.28	0.90	34.20
1	3" ABS Plastic Cleanout	\$11.11	\$11.11	0.30	0.30
12	3" ABS Plastic Plug	\$4.10	\$49.20	0.30	3.60
74	3" x 2" ABS Plastic Combination Wye and Eighth Bend	\$19.52	\$1,444.48	0.85	62.90
27	3" x 2" ABS Plastic Wye	\$16.59	\$447.93	0.85	22.95
86	3" x 2" ABS Plastic Reducer	\$10.41	\$895.26	0.60	51.60
9	2" ABS Plastic Combination Wye and Eighth Bend	\$13.48	\$121.32	0.60	5.40
129	2" ABS Plastic Trap	\$14.69	\$1,895.01	0.60	77.40
471	2" ABS Plastic 90° Short Sweep	\$5.70	\$2,684.70	0.40	188.40
150	2" ABS Plastic Eighth Bend	\$5.06	\$759.00	0.40	60.00
50	2" ABS Plastic Wye	\$9.82	\$491.00	0.60	30.00
132	2" ABS Plastic Sanitary Tee	\$7.35	\$970.20	0.60	79.20
68	2" x 1-1/2" ABS Plastic Reducer	\$4.36	\$296.48	0.40	27.20

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Qty	ABS Pipe Material List	Unit Cost	Total Cost	Unit Labor	Total Labor
25	2" x 1-1/2" ABS Plastic Double Sanitary Tee	\$11.89	\$297.25	0.54	13.50
90	2" x 1-1/2" ABS Plastic Sanitary Tee	\$6.41	\$576.90	0.54	48.60
177	1-1/2" Plastic Tubular P-Trap	\$3.23	\$571.71	0.42	74.34
30	1-1/2" Plastic Direct Connect E.O. Waste	\$5.89	\$176.70	0.42	12.60
26	1-1/2" Plastic Tub Trap and Overflow	\$19.57	\$508.82	0.42	10.92
Total for ABS Schedule 40 Plastic Pipe and Fittings			\$66,660.43		2008.87

Table C-2 PVC Pipe Material List

Qty	PVC Pipe Material List	Unit Cost	Total Cost	Unit Labor	Total Labor
30	6" PVC Schedule 40 Plastic Pipe	\$8.16	\$244.80	0.18	5.40
2188	4" PVC Schedule 40 Plastic Pipe	\$4.60	\$10,064.80	0.10	218.80
1167	3" PVC Schedule 40 Plastic Pipe	\$3.26	\$3,804.42	0.09	105.03
4555	2" PVC Schedule 40 Plastic Pipe	\$1.62	\$7,379.10	0.06	273.30
171	1-1/2" PVC Schedule 40 Plastic Pipe	\$1.24	\$212.04	0.05	8.55
302	Solvent Cement	\$23.61	\$7,130.22	0.00	0.00
302	Primer	\$22.67	\$6,846.34	0.00	0.00
2	6" PVC Plastic Wye	\$110.54	\$221.08	1.95	3.90
2	6" PVC Plastic Cleanout	\$55.06	\$110.12	0.65	1.30
2	6" PVC Plastic Eighth Bend	\$69.77	\$139.54	1.30	2.60
4	6" x 4" PVC Plastic Combination Wye and Eighth Bend	\$220.23	\$880.92	1.76	7.04
2	6" x 4" PVC Plastic Bushing	\$44.79	\$89.58	1.30	2.60
2	6" x 3" PVC Plastic Combination Wye and Eighth Bend	\$220.23	\$440.46	1.76	3.52
129	4" PVC Plastic Closet Flange	\$10.98	\$1,416.42	0.36	46.44
14	4" PVC Plastic Coupling	\$9.38	\$131.32	0.72	10.08
5	4" PVC Plastic 90° Long Sweep	\$26.97	\$134.85	0.72	3.60
11	4" PVC Plastic 90° Short Sweep	\$20.75	\$228.25	0.72	7.92
8	4" PVC Plastic Eighth Bend	\$16.53	\$132.24	0.72	5.76
6	4" PVC Plastic Wye	\$36.75	\$220.50	1.08	6.48
7	4" PVC Plastic Combination Wye and Eighth Bend	\$47.86	\$335.02	1.08	7.56
16	4" PVC Plastic Sanitary Tee	\$28.16	\$450.56	1.08	17.28
1	4" PVC Plastic Cleanout Tee	\$37.68	\$37.68	0.72	0.72
4	4" PVC Plastic Cleanout	\$19.11	\$76.44	0.36	1.44

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Qty	PVC Pipe Material List	Unit Cost	Total Cost	Unit Labor	Total Labor
1	4" x 3" PVC Plastic Combination Wye and Eighth Bend	\$36.17	\$36.17	1.02	1.02
3	4" x 3" PVC Plastic Reducer	\$16.85	\$50.55	0.72	2.16
24	4" x 3" PVC Plastic Double Wye	\$66.16	\$1,587.84	1.42	34.08
2	4" x 3" PVC Plastic Wye	\$29.21	\$58.42	1.02	2.04
36	4" x 3" PVC Plastic Sanitary Tee	\$35.82	\$1,289.52	1.02	36.72
129	4" x 3" PVC Plastic Closet Bend	\$17.81	\$2,297.49	0.72	92.88
4	4" x 2" PVC Plastic Combination Wye and Eighth Bend	\$29.70	\$118.80	1.02	4.08
56	4" x 2" PVC Plastic Double Sanitary Tee	\$47.93	\$2,684.08	1.38	77.28
145	4" x 2" PVC Plastic Sanitary Tee	\$26.36	\$3,822.20	1.02	147.90
1	4" x 2" PVC Plastic Wye	\$20.52	\$20.52	1.02	1.02
2	4" x 2" PVC Plastic Reducer	\$15.84	\$31.68	0.72	1.44
3	3" PVC Plastic Eighth Bend	\$10.13	\$30.39	0.60	1.80
49	3" PVC Plastic Wye	\$19.85	\$972.65	0.90	44.10
12	3" PVC Plastic Double Wye	\$41.20	\$494.40	1.20	14.40
38	3" PVC Plastic Combination Wye and Eighth Bend	\$26.91	\$1,022.58	0.90	34.20
1	3" PVC Plastic Cleanout	\$10.55	\$10.55	0.30	0.30
12	3" PVC Plastic Plug	\$4.13	\$49.56	0.30	3.60
74	3" x 2" PVC Plastic Combination Wye and Eighth Bend	\$17.79	\$1,316.46	0.85	62.90
27	3" x 2" PVC Plastic Wye	\$14.99	\$404.73	0.85	22.95
86	3" x 2" PVC Plastic Reducer	\$7.99	\$687.14	0.60	51.60
9	2" PVC Plastic Combination Wye and Eighth Bend	\$11.10	\$99.90	0.60	5.40
129	2" PVC Plastic Trap	\$10.83	\$1,397.07	0.60	77.40
471	2" PVC Plastic 90° Short Sweep	\$3.85	\$1,813.35	0.40	188.40
150	2" PVC Plastic Eighth Bend	\$3.71	\$556.50	0.40	60.00

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Qty	PVC Pipe Material List	Unit Cost	Total Cost	Unit Labor	Total Labor
50	2" PVC Plastic Wye	\$7.69	\$384.50	0.60	30.00
132	2" PVC Plastic Sanitary Tee	\$6.31	\$832.92	0.60	79.20
68	2" x 1-1/2" PVC Plastic Reducer	\$3.27	\$222.36	0.40	27.20
25	2" x 1-1/2" PVC Plastic Double Sanitary Tee	\$9.71	\$242.75	0.54	13.50
90	2" x 1-1/2" PVC Plastic Sanitary Tee	\$6.70	\$603.00	0.54	48.60
177	1-1/2" Plastic Tubular P-Trap	\$3.23	\$571.71	0.42	74.34
30	1-1/2" Plastic Direct Connect E.O. Waste	\$5.89	\$176.70	0.42	12.60
26	1-1/2" Plastic Tub Trap and Overflow	\$19.57	\$508.82	0.42	10.92
Total for PVC Schedule 40 Plastic Pipe and Fittings			\$65,122.01		2003.35

Table C-3 Cast Iron No-Hub Material List

Qty	Cast Iron No-Hub Pipe Material List	Unit Cost	Total Cost	Unit Labor	Total Labor
30	6" Cast Iron No-Hub Pipe	\$23.33	\$699.90	0.25	7.50
2188	4" Cast Iron No-Hub Pipe	\$13.57	\$29,691.16	0.17	371.96
1167	3" Cast Iron No-Hub Pipe	\$10.45	\$12,195.15	0.13	151.71
4555	2" Cast Iron No-Hub Pipe	\$7.57	\$34,481.35	0.09	409.95
171	1-1/2" Cast Iron No-Hub Pipe	\$7.38	\$1,261.98	0.06	10.26
26	6" Cast Iron No-Hub Coupling	\$41.15	\$1,069.90	0.00	0.00
695	4" Cast Iron No-Hub Coupling	\$16.20	\$11,259.00	0.00	0.00
985	3" Cast Iron No-Hub Coupling	\$13.70	\$13,494.50	0.00	0.00
2822	2" Cast Iron No-Hub Coupling	\$11.50	\$32,453.00	0.00	0.00
50	2" x 1-1/2" Cast Iron No-Hub Coupling	\$13.40	\$670.00	0.00	0.00
158	1-1/2" Cast Iron No-Hub Coupling	\$11.50	\$1,817.00	0.00	0.00
2	6" Cast Iron No-Hub Wye	\$88.29	\$176.58	1.50	3.00
2	6" Cast Iron No-Hub Cleanout	\$73.60	\$147.20	0.50	1.00
2	6" Cast Iron No-Hub Eighth Bend	\$37.46	\$74.92	1.00	2.00
2	6" x 4" Cast Iron No-Hub Combination Wye and Eighth Bend	\$79.49	\$158.98	1.50	3.00
2	6" x 3" Cast Iron No-Hub Reducer	\$31.90	\$63.80	0.90	1.80
2	6" x 3" Cast Iron No-Hub Combination Wye and Eighth Bend	\$76.86	\$153.72	1.50	3.00
2	6" x 2" Cast Iron No-Hub Combination Wye and Eighth Bend	\$60.86	\$121.72	1.50	3.00
129	4" x 3" Cast Iron No-Hub Closet Flange	\$20.40	\$2,631.60	0.50	64.50
5	4" Cast Iron No-Hub 90° Long Sweep	\$45.16	\$225.80	0.80	4.00
11	4" Cast Iron No-Hub 90° Short Sweep	\$30.58	\$336.38	0.80	8.80
8	4" Cast Iron No-Hub Eighth Bend	\$16.20	\$129.60	0.80	6.40

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Qty	Cast Iron No-Hub Pipe Material List	Unit Cost	Total Cost	Unit Labor	Total Labor
6	4" Cast Iron No-Hub Wye	\$33.12	\$198.72	1.20	7.20
7	4" Cast Iron No-Hub Combination Wye and Eighth Bend	\$45.06	\$315.42	1.20	8.40
16	4" Cast Iron No-Hub Sanitary Tee	\$28.86	\$461.76	1.20	19.20
1	4" Cast Iron No-Hub Cleanout Tee	\$59.60	\$59.60	0.80	0.80
4	4" Cast Iron No-Hub Cleanout	\$33.90	\$135.60	0.40	1.60
1	4" x 3" Cast Iron No-Hub Combination Wye and Eighth Bend	\$32.81	\$32.81	1.20	1.20
1	4" x 3" Cast Iron No-Hub Reducer	\$12.39	\$12.39	0.75	0.75
24	4" x 3" Cast Iron No-Hub Double Wye	\$52.04	\$1,248.96	1.50	36.00
2	4" x 3" Cast Iron No-Hub Wye	\$28.86	\$57.72	1.20	2.40
36	4" x 3" Cast Iron No-Hub Sanitary Tee	\$26.53	\$955.08	1.20	43.20
4	4" x 2" Cast Iron No-Hub Combination Wye and Eighth Bend	\$25.52	\$102.08	1.20	4.80
56	4" x 2" Cast Iron No-Hub Double Sanitary Tee	\$50.42	\$2,823.52	1.50	84.00
145	4" x 2" Cast Iron No-Hub Sanitary Tee	\$22.07	\$3,200.15	1.20	174.00
1	4" x 2" Cast Iron No-Hub Wye	\$21.26	\$21.26	1.20	1.20
129	3" x 12" Cast Iron No-Hub Closet Bend	\$43.60	\$5,624.40	0.70	90.30
3	3" Cast Iron No-Hub Eighth Bend	\$13.23	\$39.69	0.70	2.10
49	3" Cast Iron No-Hub Wye	\$20.25	\$992.25	1.05	51.45
12	3" Cast Iron No-Hub Double Wye	\$40.70	\$488.40	1.40	16.80
38	3" Cast Iron No-Hub Combination Wye and Eighth Bend	\$24.50	\$931.00	1.05	39.90
1	3" Cast Iron No-Hub Cleanout	\$22.90	\$22.90	0.35	0.35
12	3" Cast Iron No-Hub Plug	\$8.19	\$98.28	0.35	4.20
74	3" x 2" Cast Iron No-Hub Combination Wye and Eighth Bend	\$19.14	\$1,416.36	1.05	77.70
27	3" x 2" Cast Iron No-Hub Wye	\$15.30	\$413.10	1.05	28.35

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86	3" x 2" Cast Iron No-Hub Reducer	\$7.98	\$686.28	0.70	60.20
9	2" Cast Iron No-Hub Combination Wye and Eighth Bend	\$16.20	\$145.80	0.90	8.10
129	2" Cast Iron No-Hub Trap	\$16.20	\$2,089.80	0.90	116.10
471	2" Cast Iron No-Hub 90° Short Sweep	\$15.39	\$7,248.69	0.60	282.60
150	2" Cast Iron No-Hub Eighth Bend	\$9.77	\$1,465.50	0.60	90.00
50	2" Cast Iron No-Hub Wye	\$14.28	\$714.00	0.90	45.00
132	2" Cast Iron No-Hub Sanitary Tee	\$15.30	\$2,019.60	0.90	118.80
68	2" x 1-1/2" Cast Iron No-Hub Reducer	\$8.19	\$556.92	0.60	40.80
25	2" Cast Iron No-Hub Double Sanitary Tee	\$25.62	\$640.50	1.20	30.00
90	2" x 1-1/2" Cast Iron No-Hub Sanitary Tee	\$15.30	\$1,377.00	0.90	81.00
177	1-1/2" Copper Tubular P-Trap	\$24.77	\$4,384.29	0.50	88.50
30	1-1/2" Copper Direct Connect E.O. Waste	\$30.89	\$926.70	0.50	15.00
26	1-1/2" Copper Tub Trap and Overflow	\$48.80	\$1,268.80	0.50	13.00
Total for Cast Iron No-Hub Pipe and Fittings			\$186,488.57		2736.88

Table D-1 CPVC Water Pipe Material List

Qty	CPVC Pipe Material List	Unit Cost	Total Cost	Unit Labor	Total Labor
60	3" Schedule 80 CPVC Schedule 80 Plastic Pipe	\$10.22	\$613.20	0.08	4.80
240	2-1/2" Schedule 80 CPVC Schedule 80 Plastic Pipe	\$7.62	\$1,828.80	0.07	16.80
160	2" Schedule 80 CPVC Schedule 80 Plastic Pipe	\$5.00	\$800.00	0.06	9.60
80	1-1/2" Schedule 80 CPVC Schedule 80 Plastic Pipe	\$3.62	\$289.60	0.05	4.00
40	1-1/4" Schedule 80 CPVC Schedule 80 Plastic Pipe	\$2.98	\$119.20	0.05	2.00
40	1" Schedule 80 CPVC Schedule 80 Plastic Pipe	\$2.16	\$86.40	0.04	1.60
6	3" Schedule 80 CPVC Plastic Coupling	\$47.09	\$282.54	0.70	4.20
2	3" Schedule 80 CPVC Plastic Tee	\$89.42	\$178.84	1.05	2.10
4	3" x 2-1/2" Schedule 80 CPVC Plastic Bushing	\$56.21	\$224.84	0.70	2.80
3	2-1/2" Schedule 80 CPVC Plastic Couplings	\$43.31	\$129.93	0.60	1.80
2	2-1/2" Schedule 80 CPVC Plastic 90° Elbow	\$60.73	\$121.46	0.60	1.20
4	2-1/2" x 2" Schedule 80 CPVC Plastic Bushing	\$36.87	\$147.48	0.60	2.40
20	2-1/2" x 1-1/2" Schedule 80 CPVC Plastic Tee	\$89.42	\$1,788.40	0.60	12.00
8	2" Schedule 80 CPVC Plastic Coupling	\$19.47	\$155.76	0.44	3.52
8	2" x 1" Schedule 80 CPVC Plastic Tee	\$35.13	\$281.04	0.66	5.28
16	2" x 3/4" Schedule 80 CPVC Plastic Tee	\$35.13	\$562.08	0.66	10.56
4	2" x 1-1/2" Schedule 80 CPVC Plastic Reducer	\$30.30	\$121.20	0.44	1.76
4	1-1/2" x 3/4" Schedule 80 CPVC Plastic Tee	\$27.53	\$110.12	0.60	2.40
4	1-1/2" x 1" Schedule 80 CPVC Plastic Tee	\$27.53	\$110.12	0.60	2.40
10	1-1/2" x 1" Schedule 80 CPVC Plastic Reducer	\$23.46	\$234.60	0.40	4.00
12	1-1/2" x 3/4" Schedule 80 CPVC Plastic Bushing	\$23.46	\$281.52	0.40	4.80
4	1-1/2" x 1-1/4" Schedule 80 CPVC Plastic Reducer	\$23.46	\$93.84	0.40	1.60
2	1-1/4" x 1" x 1" Schedule 80 CPVC Plastic Tee	\$31.57	\$63.14	0.54	1.08
4	1-1/4" Schedule 80 CPVC Plastic Tee	\$27.53	\$110.12	0.54	2.16

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Qty	CPVC Pipe Material List	Unit Cost	Total Cost	Unit Labor	Total Labor
4	1-1/4" x 3/4" Schedule 80 CPVC Plastic Bushing	\$20.77	\$83.08	0.36	1.44
2	1" Schedule 80 CPVC Plastic Tee	\$13.06	\$26.12	0.48	0.96
7	1" x 3/4" Schedule 80 CPVC Plastic Tee	\$13.06	\$91.42	0.48	3.36
Total for Schedule 80 CPVC Schedule 80 Plastic Pipe			\$8,934.85		110.62
120	1" CPVC (CTS) Plastic Pipe	\$3.35	\$402.00	0.05	6.00
3,252	3/4" CPVC (CTS) Plastic Pipe	\$1.67	\$5,430.84	0.04	130.08
7,392	1/2" CPVC (CTS) Plastic Pipe	\$0.92	\$6,800.64	0.04	295.68
24	1" CPVC (CTS) Plastic Coupling	\$2.61	\$62.64	0.32	7.68
24	1" CPVC (CTS) Plastic 90° Elbow	\$3.12	\$74.88	0.32	7.68
24	1" x 3/4" x 3/4" CPVC (CTS) Plastic Tee	\$7.13	\$171.12	0.48	11.52
168	3/4" CPVC (CTS) Plastic Coupling	\$0.71	\$119.28	0.28	47.04
168	3/4" CPVC (CTS) Plastic 90° Elbow	\$1.07	\$179.76	0.28	47.04
48	3/4" CPVC (CTS) Plastic 45° Elbow	\$1.31	\$62.88	0.28	13.44
72	3/4" CPVC (CTS) Plastic Tee	\$1.56	\$112.32	0.42	30.24
210	3/4" x 1/2" CPVC (CTS) Plastic Tee	\$1.62	\$340.20	0.42	88.20
108	3/4" x 1/2" x 1/2" CPVC (CTS) Plastic Tee	\$1.62	\$174.96	0.42	45.36
48	3/4" x 1/2" CPVC (CTS) Plastic Bushing	\$0.66	\$31.68	0.28	13.44
1,248	1/2" CPVC (CTS) Plastic 90° Elbow	\$0.62	\$773.76	0.24	299.52
314	1/2" CPVC (CTS) Plastic 45° Elbow	\$0.75	\$235.50	0.24	75.36
198	1/2" CPVC (CTS) Plastic Tee	\$0.84	\$1,414.56	0.36	606.24
Total for CPVC (CTS) Plastic Pipe			\$16,387.02		1724.52
Total			\$25,321.87		1835.14

Table D-2 CPVC Water Pipe and PEX Tubing Material List

Qty	CPVC Pipe Material List	Unit Cost	Total Cost	Unit Labor	Total Labor
60	3" Schedule 80 CPVC Schedule 80 Plastic Pipe	\$10.22	\$613.20	0.08	4.80
240	2-1/2" Schedule 80 CPVC Schedule 80 Plastic Pipe	\$7.62	\$1,828.80	0.07	16.80
160	2" Schedule 80 CPVC Schedule 80 Plastic Pipe	\$5.00	\$800.00	0.06	9.60
80	1-1/2" Schedule 80 CPVC Schedule 80 Plastic Pipe	\$3.62	\$289.60	0.05	4.00
40	1-1/4" Schedule 80 CPVC Schedule 80 Plastic Pipe	\$2.98	\$119.20	0.05	2.00
40	1" Schedule 80 CPVC Schedule 80 Plastic Pipe	\$2.16	\$86.40	0.04	1.60
6	3" Schedule 80 CPVC Plastic Coupling	\$47.09	\$282.54	0.70	4.20
2	3" Schedule 80 CPVC Plastic Tee	\$89.42	\$178.84	1.05	2.10
4	3" x 2-1/2" Schedule 80 CPVC Plastic Bushing	\$56.21	\$224.84	0.70	2.80
3	2-1/2" Schedule 80 CPVC Plastic Couplings	\$43.31	\$129.93	0.60	1.80
2	2-1/2" Schedule 80 CPVC Plastic 90° Elbow	\$60.73	\$121.46	0.60	1.20
4	2-1/2" x 2" Schedule 80 CPVC Plastic Bushing	\$36.87	\$147.48	0.60	2.40
20	2-1/2" x 1-1/2" Schedule 80 CPVC Plastic Tee	\$89.42	\$1,788.40	0.60	12.00
8	2" Schedule 80 CPVC Plastic Coupling	\$19.47	\$155.76	0.44	3.52
8	2" x 1" Schedule 80 CPVC Plastic Tee	\$35.13	\$281.04	0.66	5.28
16	2" x 3/4" Schedule 80 CPVC Plastic Tee	\$35.13	\$562.08	0.66	10.56
4	2" x 1-1/2" Schedule 80 CPVC Plastic Reducer	\$30.30	\$121.20	0.44	1.76
4	1-1/2" x 3/4" Schedule 80 CPVC Plastic Tee	\$27.53	\$110.12	0.60	2.40
4	1-1/2" x 1" Schedule 80 CPVC Plastic Tee	\$27.53	\$110.12	0.60	2.40
10	1-1/2" x 1" Schedule 80 CPVC Plastic Reducer	\$23.46	\$234.60	0.40	4.00
12	1-1/2" x 3/4" Schedule 80 CPVC Plastic Bushing	\$23.46	\$281.52	0.40	4.80
4	1-1/2" x 1-1/4" Schedule 80 CPVC Plastic Reducer	\$23.46	\$93.84	0.40	1.60
2	1-1/4" x 1" x 1" Schedule 80 CPVC Plastic Tee	\$31.57	\$63.14	0.54	1.08
4	1-1/4" Schedule 80 CPVC Plastic Tee	\$27.53	\$110.12	0.54	2.16

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Qty	CPVC Pipe Material List	Unit Cost	Total Cost	Unit Labor	Total Labor
4	1-1/4" x 3/4" Schedule 80 CPVC Plastic Bushing	\$20.77	\$83.08	0.36	1.44
2	1" Schedule 80 CPVC Plastic Tee	\$13.06	\$26.12	0.48	0.96
7	1" x 3/4" Schedule 80 CPVC Plastic Tee	\$13.06	\$91.42	0.48	3.36
Total for Schedule 80 CPVC Schedule 80 Plastic Pipe			\$8,934.85		110.62
120	1" PEX Tubing	\$3.35	\$402.00	0.02	2.40
180	3/4" PEX Tubing	\$1.67	\$300.60	0.02	3.60
33,720	3/8" PEX Tubing	\$0.92	\$31,022.40	0.01	337.20
48	12 Port Manifold with Shutoff Valves	\$209.90	\$10,075.20	0.75	36.00
24	10 Port Manifold with Shutoff Valves	\$170.70	\$4,096.80	0.75	18.00
12	8 Port Manifold with Shutoff Valves	\$140.25	\$1,683.00	0.75	9.00
12	1" PEX Adapters	\$10.20	\$122.40	0.28	3.36
18	3/4" PEX Adapters	\$4.85	\$87.30	0.28	5.04
1400	3/8" PEX Rings	\$0.13	\$182.00	0.00	0.00
Total for PEX Tubing			\$47,971.70		414.60
Total			\$56,906.55		525.22

Table D-3 Copper Water Tubing Material List

Qty	Copper Tubing Material List	Unit Cost	Total Cost	Unit Labor	Total Labor
60	3" Copper Tubing	\$43.27	\$2,596.20	0.15	9.00
240	2-1/2" Copper Tubing	\$32.69	\$7,845.60	0.14	33.60
160	2" Copper Tubing	\$22.02	\$3,523.20	0.08	12.80
80	1-1/2" Copper Tubing	\$13.90	\$1,112.00	0.06	4.80
40	1-1/4" Copper Tubing	\$10.05	\$402.00	0.05	2.00
180	1" Copper Tubing	\$6.63	\$1,193.40	0.05	9.00
3,252	3/4" Copper Tubing	\$4.67	\$15,186.84	0.04	130.08
7,392	1/2" Copper Tubing	\$3.01	\$22,249.92	0.04	295.68
Totals for Copper Tubing			\$54,109.16		496.96
6	3" Copper Coupling	\$44.46	\$266.76	1.24	7.44
2	3" Copper Tee	\$147.60	\$295.20	1.86	3.72
4	3" x 2-1/2" Copper Reducer	\$59.89	\$239.56	1.24	4.96
24	2-1/2" Copper Coupling	\$30.69	\$736.56	1.16	27.84
2	2-1/2" Copper 90° Elbow	\$54.26	\$108.52	1.16	2.32
4	2-1/2" x 2" Copper Reducer	\$52.88	\$211.52	1.16	4.64
10	2-1/2" x 1" T-Drill Connection	\$0.00	\$0.00	0.50	5.00
12	2-1/2" x 3/4" T-Drill Connection	\$0.00	\$0.00	0.50	6.00
8	2" Copper Coupling	\$13.63	\$109.04	0.68	5.44
8	2" x 1" T-Drill Connection	\$0.00	\$0.00	0.50	4.00
16	2" x 3/4" T-Drill Connection	\$0.00	\$0.00	0.50	8.00
2	2" x 1-1/2" Copper Reducer	\$23.04	\$46.08	0.70	1.40
4	1-1/2" x 1" Copper Tee	\$22.87	\$91.48	0.90	3.60
4	1-1/2" x 3/4" Copper Tee	\$22.87	\$91.48	0.90	3.60
4	1-1/2" x 1-1/4" Copper Reducer	\$22.87	\$91.48	0.60	2.40

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Qty	Copper Tubing Material List	Unit Cost	Total Cost	Unit Labor	Total Labor
4	1-1/2" x 1" T-Drill Connection	\$0.00	\$0.00	0.50	2.00
7	1-1/2" Copper Coupling	\$8.16	\$57.12	0.60	4.20
2	1-1/4" x 1" T-Drill Connection	\$0.00	\$0.00	0.50	1.00
4	1-1/4" x 3/4" T-Drill Connection	\$0.00	\$0.00	0.50	2.00
4	1-1/4" x 1" Copper Reducer	\$8.36	\$33.44	0.54	2.16
24	1" Copper Coupling	\$3.52	\$84.48	0.50	12.00
24	1" Copper 90° Elbow	\$6.00	\$144.00	0.50	12.00
24	1" x 3/4" x 3/4" Copper Tee	\$17.93	\$430.32	0.75	18.00
168	3/4" Copper Coupling	\$1.62	\$272.16	0.42	70.56
168	3/4" Copper 90° Elbow	\$2.44	\$409.92	0.42	70.56
48	3/4" Copper 45° Elbow	\$3.50	\$168.00	0.42	20.16
72	3/4" Copper Tee	\$4.48	\$322.56	0.63	45.36
210	3/4" x 1/2" Copper Tee	\$6.32	\$1,327.20	0.63	132.30
108	3/4" x 1/2" x 1/2" Copper Tee	\$8.62	\$930.96	0.63	68.04
48	3/4" x 1/2" Copper Reducer	\$3.83	\$183.84	0.42	20.16
1,248	1/2" Copper 90° Elbow	\$1.09	\$1,360.32	0.40	499.20
314	1/2" Copper 45° Elbow	\$1.99	\$624.86	0.40	125.60
198	1/2" Copper Tee	\$1.86	\$368.28	0.60	118.80
Total for Copper Fitting			\$9,005.14		1314.46
Total			\$63,114.30		1811.42

Table D-4 Copper Water Tubing Using Press Connect Fittings Material List

Qty	Copper Tubing Material List	Unit Cost	Total Cost	Unit Labor	Total Labor
60	3" Copper Tubing	\$43.27	\$2,596.20	0.15	9.00
240	2-1/2" Copper Tubing	\$32.69	\$7,845.60	0.14	33.60
160	2" Copper Tubing	\$22.02	\$3,523.20	0.08	12.80
80	1-1/2" Copper Tubing	\$13.90	\$1,112.00	0.06	4.80
40	1-1/4" Copper Tubing	\$10.05	\$402.00	0.05	2.00
180	1" Copper Tubing	\$6.63	\$1,193.40	0.05	9.00
3,252	3/4" Copper Tubing	\$4.67	\$15,186.84	0.04	130.08
7,392	1/2" Copper Tubing	\$3.01	\$22,249.92	0.04	295.68
Totals for Copper Tubing			\$54,109.16		496.96
6	3" Copper Press Connect Coupling	\$53.30	\$319.80	0.83	4.96
2	3" Copper Press Connect Tee	\$129.70	\$259.40	1.24	2.48
4	3" x 2-1/2" Copper Press Connect Reducer	\$63.10	\$252.40	0.83	3.31
24	2-1/2" Copper Press Connect Coupling	\$47.00	\$1,128.00	0.77	18.56
2	2-1/2" Copper Press Connect 90° Elbow	\$94.60	\$189.20	0.77	1.55
4	2-1/2" x 2" Copper Press Connect Reducer	\$55.60	\$222.40	0.77	3.09
10	2-1/2" x 1" Copper Press Connect Tee	\$137.25	\$1,372.50	1.16	11.60
12	2-1/2" x 3/4" Copper Press Connect Tee	\$137.25	\$1,647.00	1.16	13.92
8	2" Copper Press Connect Coupling	\$11.35	\$90.80	0.45	3.63
8	2" x 1" Copper Press Connect Tee	\$33.20	\$265.60	0.68	5.44
16	2" x 3/4" Copper Press Connect Tee	\$32.15	\$514.40	0.68	10.88
2	2" x 1-1/2" Copper Press Connect Reducer	\$9.80	\$19.60	0.47	0.93
8	1-1/2" x 1" Copper Press Connect Tee	\$20.10	\$160.80	0.60	4.80
4	1-1/2" x 3/4" Copper Press Connect Tee	\$19.70	\$78.80	0.60	2.40
4	1-1/2" x 1-1/4" Copper Press Connect Reducer	\$7.30	\$29.20	0.40	1.60

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7	1-1/2" Copper Press Connect Coupling	\$8.90	\$62.30	0.40	2.80
2	1-1/4" x 1" Copper Press Connect Tee	\$10.90	\$21.80	0.53	1.07
4	1-1/4" x 3/4" Copper Press Connect Tee	\$10.45	\$41.80	0.53	2.13
4	1-1/4" x 1" Copper Press Connect Reducer	\$4.95	\$19.80	0.36	1.44
24	1" Copper Press Connect Coupling	\$3.85	\$92.40	0.33	8.00
24	1" Copper Press Connect 90° Elbow	\$4.70	\$112.80	0.33	8.00
24	1" x 3/4" x 3/4" Copper Press Connect Tee	\$10.30	\$247.20	0.50	12.00
168	3/4" Copper Press Connect Coupling	\$1.90	\$319.20	0.28	47.04
168	3/4" Copper Press Connect 90° Elbow	\$2.35	\$394.80	0.28	47.04
48	3/4" Copper Press Connect 45° Elbow	\$2.00	\$96.00	0.28	13.44
72	3/4" Copper Press Connect Tee	\$3.75	\$270.00	0.42	30.24
210	3/4" x 1/2" Copper Press Connect Tee	\$3.15	\$661.50	0.42	88.20
108	3/4" x 1/2" x 1/2" Copper Press Connect Tee	\$5.80	\$626.40	0.42	45.36
48	3/4" x 1/2" Copper Press Connect Reducer	\$1.40	\$67.20	0.28	13.44
1,248	1/2" Copper Press Connect 90° Elbow	\$1.40	\$1,747.20	0.27	332.80
314	1/2" Copper Press Connect 45° Elbow	\$1.60	\$502.40	0.27	83.73
198	1/2" Copper Press Connect Tee	\$2.15	\$425.70	0.40	79.20
Total for Copper Press Connect Fitting			\$12,258.40		905.08
Total			\$66,367.56		1402.04

Table D-5 Galvanized Steel Water Pipe Material List

Qty	Galvanized Steel Pipe Material List	Unit Cost	Total Cost	Unit Labor	Total Labor
60	3" Galvanized Steel Pipe	\$25.50	\$1,530.00	0.19	11.40
240	2-1/2" Galvanized Steel Pipe	\$19.82	\$4,756.80	0.18	43.20
160	2" Galvanized Steel Pipe	\$12.53	\$2,004.80	0.08	12.80
80	1-1/2" Galvanized Steel Pipe	\$9.34	\$747.20	0.08	6.40
40	1-1/4" Galvanized Steel Pipe	\$7.81	\$312.40	0.07	2.80
180	1" Galvanized Steel Pipe	\$6.41	\$1,153.80	0.06	10.80
3,252	3/4" Galvanized Steel Pipe	\$4.74	\$15,414.48	0.05	162.60
7,392	1/2" Galvanized Steel Pipe	\$3.93	\$29,050.56	0.05	369.60
Totals for Galvanized Steel Pipe			\$54,970.04		619.60
6	3" Galvanized Steel Coupling	\$81.82	\$490.92	1.90	11.40
2	3" Galvanized Steel Tee	\$112.79	\$225.58	2.85	5.70
4	3" x 2-1/2" Galvanized Steel Reducer	\$87.07	\$348.28	2.85	11.40
24	2-1/2" Galvanized Steel Coupling	\$61.22	\$1,469.28	1.80	43.20
2	2-1/2" Galvanized Steel 90° Elbow	\$62.04	\$124.08	1.80	3.60
4	2-1/2" x 2" Galvanized Steel Reducer	\$84.16	\$336.64	1.80	7.20
10	2-1/2" x 1" Galvanized Steel Tee	\$145.98	\$1,459.80	2.70	27.00
12	2-1/2" x 3/4" Galvanized Steel Tee	\$145.98	\$1,751.76	2.70	32.40
8	2" Galvanized Steel Coupling	\$20.00	\$160.00	0.80	6.40
8	2" x 1" Galvanized Steel Tee	\$51.77	\$414.16	1.20	9.60
16	2" x 3/4" Galvanized Steel Tee	\$51.77	\$828.32	1.20	19.20
2	2" x 1-1/2" Galvanized Steel Reducer	\$26.61	\$53.22	1.20	2.40
8	1-1/2" x 1" Galvanized Steel Tee	\$46.28	\$370.24	1.15	9.20
4	1-1/2" x 3/4" Galvanized Steel Tee	\$46.28	\$185.12	1.15	4.60
4	1-1/2" x 1-1/4" Galvanized Steel Reducer	\$13.68	\$54.72	0.75	3.00

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 Appendix D

Qty	Galvanized Steel Pipe Material List	Unit Cost	Total Cost	Unit Labor	Total Labor
7	1-1/2" Galvanized Steel Coupling	\$13.68	\$95.76	0.75	5.25
6	1-1/4" x 1" Galvanized Steel Tee	\$27.51	\$165.06	1.10	6.60
4	1-1/4" x 3/4" Galvanized Steel Tee	\$27.51	\$110.04	1.10	4.40
24	1" Galvanized Steel Coupling	\$8.54	\$204.96	0.60	14.40
24	1" Galvanized Steel 90° Elbow	\$7.01	\$168.24	0.60	14.40
24	1" x 3/4" x 3/4" Galvanized Steel Tee	\$16.42	\$394.08	0.90	21.60
168	3/4" Galvanized Steel Coupling	\$5.21	\$875.28	0.55	92.40
168	3/4" Galvanized Steel 90° Elbow	\$3.79	\$636.72	0.55	92.40
48	3/4" Galvanized Steel 45° Elbow	\$7.01	\$336.48	0.55	26.40
72	3/4" Galvanized Steel Tee	\$6.59	\$474.48	0.80	57.60
210	3/4" x 1/2" Galvanized Steel Tee	\$10.46	\$2,196.60	0.80	168.00
108	3/4" x 1/2" x 1/2" Galvanized Steel Tee	\$10.46	\$1,129.68	0.80	86.40
48	3/4" x 1/2" Galvanized Steel Reducer	\$6.66	\$319.68	0.55	26.40
1,248	1/2" Galvanized Steel 90° Elbow	\$3.09	\$3,856.32	0.50	624.00
314	1/2" Galvanized Steel 45° Elbow	\$4.88	\$1,532.32	0.50	157.00
198	1/2" Galvanized Steel Tee	\$4.00	\$792.00	0.75	148.50
Total for Galvanized Steel Fitting			\$21,559.82		1742.05
Total			\$76,529.86		2361.65