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October 21, 2009

Joseph Zellers
Ward Manufacturing, Inc.
P.O. Box 9 (115 Gulick Street)
Blossburg, PA 16912-0009

RESEARCH REPORT: RR 5535
EFFECTIVE DATE: 10/01/09
EXPIRATION DATE: 10/01/10
Telephone: 570-638-2131 x 310

GENERAL APPROVAL - Renewal - "WARDFLEX™" Corrugated Stainless Steel gas tubing (CSST) sizes 3/8 inches through 2 inches and brass fittings Models A and M, manufactured by Ward Manufacturing, Inc.

DETAILS

These products are corrugated stainless steel tubing utilizing mechanical attachment fittings with taper pipe threads and intended to convey natural or propane gas. The tubing is made of corrugated Type 304 stainless steel with a PVC external coating. The fittings are made of brass.

This approval is subject to the following conditions:

1. The tubing may be installed for natural gas or propane gas in indoor locations in conjunction with other piping materials using pipe threads at the interface and in residential building occupancies under the jurisdiction of the Department of Housing and Community Development (HCD) under the categories HCD 1 and HCD 2 as defined by the latest edition of the Los Angeles Plumbing Code (LAPC), 2008 Edition.

2. The tubing may be installed in low and medium pressure gas piping not to exceed 5 psig.

3. The gas tubing shall be sized in accordance with the following:

Low pressure systems - The tubing shall be sized in accordance with the attached flow capacity table for a 0.5 inch W.C. pressure loss in the piping system in accordance with Section 94.1217.3 of LAPC, 2008 Edition and Table 12-36 of Los Angeles Mechanical Code, 2008 Edition.

Medium pressure systems and low pressure systems with longer runs, or greater gas demands - the tubing shall be sized using Table -12-37 or Table 12-38 of Los Angeles Plumbing Code, 2008 Edition or by standard engineering methods acceptable to the Administrative Authority.

4. Mechanical Plan Check of the gas system shall be required in the following cases:

a. Low pressure CSST systems having 10 outlets or more.

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- b. Low pressure CSST systems sized with a higher than 0.5 inch W.C. maximum pressure loss.
 - c. All medium pressure gas system installations.
5. When approved plans are required, they shall be drawn in accordance with Section 94.101.3 of LAPC, 2008 Edition, submitted to Mechanical Plan Check, and approved prior to issuing permits and beginning construction. Appropriate technical materials shall be provided to the Plan Check Engineer at time of plan submittal to complete the plan check.
 6. Systems utilizing pressure regulators shall have a standard listed shut-off valve installed upstream of the inlet side of the regulator. The pressure regulator shall be mounted in an accessible location. Regulators shall have a separate vent to the outside unless supplied with a vent-limiting orifice capable of releasing not more than five cubic feet of gas per hour.
 7. CSST shall be installed in accordance with the manufacturer's "DESIGN & INSTALLATION GUIDE," latest edition, and Section 94.1211.0 of Los Angeles Plumbing Code, 2008 Edition.
 8. During installation of these products, tests for leaks shall be conducted as per manufacturer's recommendations and in accordance with the Los Angeles Plumbing Code, 2008 Edition, prior to installation of the finished walls.
 9. CSST may be directly attached to non-moveable appliances. An accessible shut-off valve as required by the Los Angeles Plumbing Code, shall be installed before each appliance. Union connections and / or appliance connectors shall be required for attachment to other moveable appliances.
 10. Shielding shall only be required where CSST is concealed, constrained and within 3" of a potential puncture threat.
 11. The PVC jacket shall be removed from tubing where the pipe penetrates fire separations and when running within plenums.
 12. Direct contact with concrete or soil (below grade) shall not be permitted. The tubing shall be routed in a non-metallic, watertight conduit with minimum bend radii specified by the manufacturer. No joints or fittings are permitted within the conduit.
 13. The supports used for this system shall be those typically used to support other tubular utility systems within residential or commercial buildings.
 14. For roof mounted equipment, these products may be installed in direct sunlight without any special protection after first removing the PVC external coating. Long runs of tubing shall be supported with non-metallic blocks every 4 feet along the outdoor length and elevated not less than 6 inches above the roof structure per Section 94.1211.0 of the LAPC, 2008 Edition.

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15. Marking

a. The tubing shall be marked at intervals of not more than 2 feet with at least the following:

- i Manufacturer's name, or trade mark "Wardflex", part number
- ii Size, "EHD", equivalent hydraulic diameter
- iii Rated Pressure,
- iv "Fuel Gas piping",
- v CSA logo

b. The fittings/components shall be marked with the following.

- i "cCSA_{US}"
- ii Model Number

DISCUSSION

These products have been tested by CSA International under Certificate No. 1004880.

These products are currently listed by CSA and IAPMO. This information and the supporting test data submitted by the applicant indicate that these products are suitable for the intended use and comply with the Plumbing Code in quality, strength, effectiveness, durability, and safety.

For this General Approval to be valid on any individual construction project in the City of Los Angeles, an engineer or inspector of the Department of Building and Safety must make a determination that all conditions of the General Approval required to provide equivalency have been met in the case of each construction project under consideration.

This approval is granted under Sections 94.301, 94.1204, 94.1205, 94.1209, 94.1211, and 94.1217 of LAPC, 2008 Edition.

Approved by:

Concurred by:

Yogen R. Thakar, Test Engineer
Mechanical Testing Laboratory
Engineering Bureau

Michael Tharpe, Chief
Plumbing / Mechanical Inspection Division
Inspection Bureau

APPENDIX I - Tables for Sizing WARDFLEX Gas Systems

Low Pressure Natural Gas Systems for Sizing Gas Piping Systems Carrying Gas of 0.60 Specific Gravity

Capacity of Pipes of Different Diameters and Lengths in Cubic Feet per Hour for Low Pressure Gas with a Pressure Drop of 0.5 inches W.C.

Pipe Size	(inch)	Length (feet)							
		5	10	15	20	25	30	40	50
	3/8	63	44	36	31	27	25	21	19
	1/2	134	95	77	67	60	55	47	42
	3/4	270	192	157	137	122	112	97	87
	1	471	330	268	231	206	188	162	144
	1 1/4	1091	781	642	559	502	460	400	360
	1 1/2	2073	1473	1206	1046	937	857	743	666
	2	3993	2880	2379	2077	1870	1716	1498	1348
Pipe Size	(inch)	50	60	80	100	150	200	300	500
	3/8	19	17	15	13	10	9	7	5
	1/2	42	39	33	30	24	21	17	13
	3/4	87	80	69	62	51	44	36	28
	1	144	131	113	101	82	71	57	44
	1 1/4	360	329	287	257	212	184	151	118
	1 1/2	666	609	528	473	387	336	275	214
	2	1348	1237	1080	972	803	701	579	455

Medium Pressure Natural Gas Systems for Sizing Gas Piping Systems Carrying Gas of 0.60 Specific Gravity

Capacity of Pipes of Different Diameters and Lengths in Cubic Feet per Hour for 2 PSI Gas with a Pressure Drop of 1 PSI

Pipe Size	(inch)	Length (feet)							
		5	10	15	20	25	30	40	50
	3/8	505	353	286	247	220	200	172	154
	1/2	988	700	572	496	444	405	351	314
	3/4	1926	1372	1125	977	876	801	696	624
	1	3698	2592	2105	1816	1620	1475	1273	1135
	1 1/4	7545	5404	4445	3870	3476	3183	2772	2489
	1 1/2	15008	10664	8732	7578	6788	6205	5384	4823
	2	26511	19122	15795	13795	12415	11392	9948	8954
Pipe Size	(inch)	50	60	80	100	150	200	300	500
	3/8	154	140	120	107	87	75	61	46
	1/2	314	287	249	222	182	157	129	100
	3/4	624	571	496	445	364	317	260	202
	1	1135	1034	892	795	646	557	453	348
	1 1/4	2489	2280	1985	1783	1466	1277	1050	821
	1 1/2	4823	4409	3826	3427	2806	2435	1994	1550
	2	8954	8217	7175	6459	5335	4658	3848	3024

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Medium Pressure Natural Gas Systems for Sizing Gas Piping Systems Carrying Gas of 0.60 Specific Gravity

Capacity of Pipes of Different Diameters and Lengths in Cubic Feet per Hour for 5 PSI Gas with a Pressure Drop of 3.5 PSI

Pipe Size	(inch)	Length (feet)							
		5	10	15	20	25	30	40	50
	3/8	965	675	547	472	420	382	330	294
	1/2	1842	1305	1067	925	827	756	655	586
	3/4	3554	2532	2076	1804	1617	1479	1285	1152
	1	7030	4927	4002	3453	3080	2805	2420	2158
	1 1/4	13794	9879	8127	7075	6354	5820	5067	4551
	1 1/2	27832	19776	16193	14052	12588	11506	9985	8945
	2	47851	34514	28509	24894	22408	20563	17955	16163
Pipe Size	(inch)	50	60	80	100	150	200	300	500
	3/8	294	267	230	205	166	143	116	89
	1/2	586	535	464	415	339	294	240	186
	3/4	1152	1054	915	821	673	585	479	373
	1	2158	1966	1696	1513	1229	1060	861	662
	1 1/4	4551	4168	3629	3259	2681	2334	1920	1501
	1 1/2	8945	8176	7095	6356	5204	4516	3698	2875
	2	16163	14831	12951	11658	9629	8408	6945	5459

Low Pressure Natural Gas Systems for Sizing Gas Piping Systems Carrying Gas of 0.60 Specific Gravity (USE FOR MED. PRESSURE SYSTEMS PAST REGULATOR ONLY)

Capacity of Pipes of Different Diameters and Lengths in Cubic Feet per Hour for 7-8 inches W.C. Gas with a Pressure Drop of 3 inches W.C.

Pipe Size	(inch)	Length (feet)							
		5	10	15	20	25	30	40	50
	3/8	160	112	90	78	69	63	54	48
	1/2	327	231	189	164	147	134	116	104
	3/4	649	462	379	329	295	270	234	210
	1	1182	828	673	580	518	471	407	363
	1 1/4	2585	1851	1523	1326	1191	1091	949	853
	1 1/2	5014	3563	2917	2531	2268	2073	1799	1611
	2	9293	6703	5536	4834	4352	3993	3487	3139
Pipe Size	(inch)	50	60	80	100	150	200	300	500
	3/8	48	44	38	34	27	23	19	14
	1/2	104	95	62	73	60	52	42	33
	3/4	210	192	167	149	122	106	87	68
	1	363	330	285	254	206	178	144	111
	1 1/4	853	781	680	611	502	437	360	281
	1 1/2	1611	1473	1278	1145	937	813	666	518
	2	3139	2880	2515	2264	1870	1633	1348	1060

For flow capacities not shown on the tables and for propane systems, contact the Mechanical Test Lab at 213-482-0414.