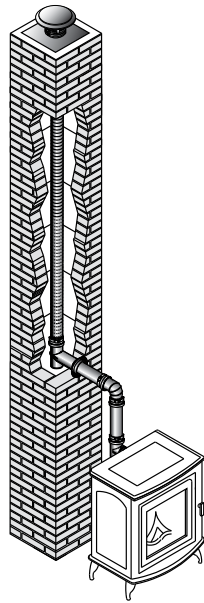


Gas Furnace



Gas Stove

Relining for Gas

Ever since the 1970s energy crisis, manufacturers have greatly improved efficiency ratings of gas & oil furnaces, boilers, stoves, and inserts. Our trade has been fairly successful in educating the public about the benefits – and necessities – of lining chimneys for solid fuel appliances.

Today, gas relining stands poised for a large growth spurt. The reasons are simple: Over the past fifteen years, Natural Gas has experienced terrific growth rates as a primary home heating fuel. Economical, clean, efficient, piped directly into people's homes, it often replaces oil, especially in large population centers.

As with solid fuel heating equipment, much research was done to improve furnace and boiler designs, but not much attention was given to one highly significant part of any heating appliance: its exhaust system. The effects of these well-engineered appliances venting into conventional chimneys became very apparent.

Read on to learn how to identify problem chimneys and what solutions are available today. If you educate yourself in this specialized field, you will encounter a good opportunity for business growth.

DuraVent has thoroughly researched this market, and can help you with solid technical advice. Our VENTINOX[®] product is affordable, and has performed in thousands of homes for over twenty-five years. Information and materials are available through our distributors or directly from us.

We appreciate your feedback and business.

HOME SAFETY - Relining Chimneys For Gas Appliances

GAS RESEARCH INSTITUTE COMMISSIONS BATTELLE LABORATORIES TO CONDUCT STUDY.

In the mid-eighties, gas appliance manufacturers needed help in the selection of corrosion resistant materials for high efficiency, gas fired space-heating equipment. "For maximum efficiency, residential heating equipment must be designed to operate in a condensing mode, in which the latent heat associated with the water vapor in the flue gas is partially recovered. Because the resulting flue-gas condensate is corrosive, materials in the condensing region of the heat exchanger must be corrosion resistant." "The approach of this research was to investigate (1) the corrosivity of the condensate generated in the field using both indoor and outdoor air for combustion and (2) the corrosion resistance of metals in accelerated laboratory corrosion tests." The report does not address chimneys or chimney liners as such. However, field experience and conclusions reached in the report directly relate to the relining trade.

Conclusions of the study which concern us, are:

1. The amount of condensation produced within a furnace or boiler is related to its efficiency rating. Appliances featuring 90% and greater efficiency are referred to as "condensing furnaces." The dew point of the flue gases occurs within the appliance. The dew point is the temperature at which water is released from a gas (approx. 120 to 150° F).
2. Condensate produced by these appliances can be acidic. Acidity levels depend on concentrations of indoor and/or outdoor pollution that is drawn into the heater with the combustion air. Natural gas and "clean" combustion air would not produce significant acidity levels.

Combustion air drawn into the furnace from indoors can be the greater carrier of airborne chlorides than outside air. Chlorides originate from carpeting, leaking refrigerators, paints and thinners, laundry detergents and other household items commonly stored in basements and furnace rooms.
3. Three distinct condensate zones can be identified within a heat exchanger. A "wet" zone, the area that is continually wet with condensate. A "wet/dry" zone, the area that cycles through periods of wetting and drying and a "dry" zone, the area that stays continually free of condensate.
4. The zone that accumulates the most acidic condensate and experiences the greatest corrosion rate is

the 'wet/dry' zone. Here, exhaust vapors condense during the "off" cycle and evaporate again during the "on" cycle of a heater. With each cycle, the acidity level in this zone increases.

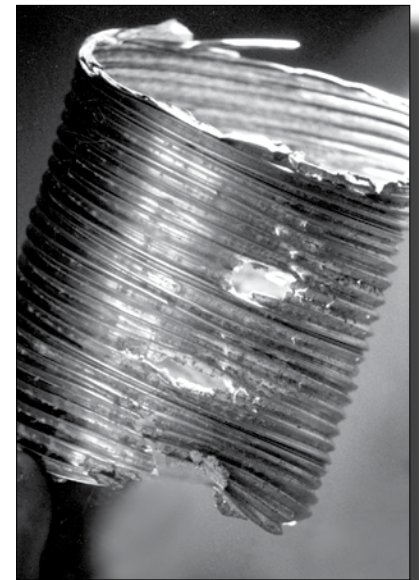
5. Common stainless steels are not immune to the corrosive effects of condensate produced by gas appliances. Most stainless steels tested showed signs of corrosion during testing. However, AL 29-4C, a super-ferritic material, was able to resist corrosion in all zones and was specifically recommended by Battelle Laboratories as an appropriate material for the manufacture of heat exchangers. In contrast, aluminum specimens exhibited corrosion in all zones.

HOW DOES THE BATTELLE LAB STUDY RELATE TO LINERS AND MASONRY CHIMNEYS?

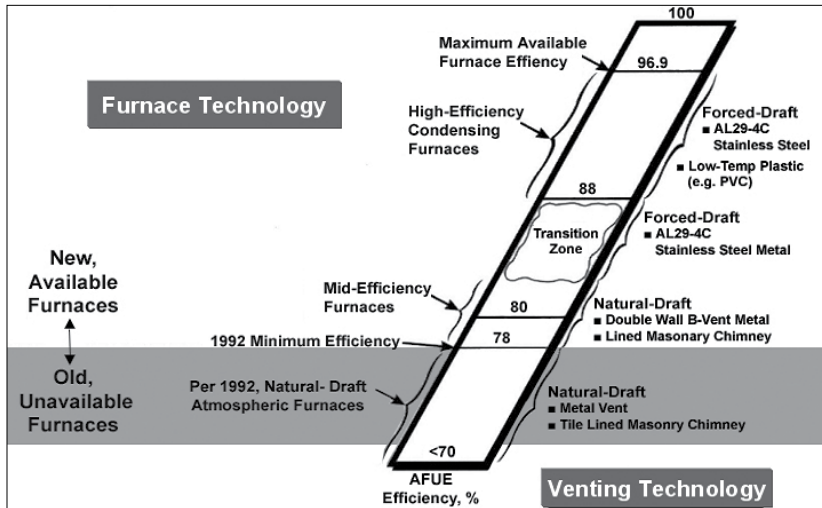
The majority of gas heating appliances in service today are in the 80% efficiency range, not 90% and greater. They are referred to as Mid-Efficiency or "near-condensing" units. Like high efficiency models, they produce significant amounts of water vapor as a natural by-product of combustion. By sacrificing some efficiency, the exit temperatures of exhaust gases are kept just above the dew point, which avoids condensation problems within the heater. The dew point of flue gases now occurs in the vent system. Chimneys, like heat exchangers, develop condensate zones.

Acidity levels in "condensing boilers or furnaces," and in chimneys that vent "near condensing appliances" are similar, since acids are caused by contaminants drawn in with the combustion air, and water. Therefore, condensation zones in the chimney exhibit the same characteristics as those in heat exchangers, they just occur farther up in the heating system. Now that we have established that condensate zones and acidity levels in chimneys can be similar to the ones in the heat exchangers of high efficiency boilers or furnaces, it is logical to conclude that corrosion problems are identical as well.

As the GRI study indicates, "Manufacturers of high efficiency gas appliances need to replace materials



HOME SAFETY - Relining Chimneys For Gas Appliances



that were traditionally used in the fabrication of heat exchangers." At the same time, chimney liners made from traditional stainless steels can also no longer meet expected performance criteria.

VENTINOX® ELIMINATES MOISTURE PROBLEMS & PROVIDES SAFE, RELIABLE VENTING FOR GAS APPLIANCES, BOILERS & WATER HEATERS.

Condensation causes significant problems in masonry chimneys. Acids break down and erode clay tiles, bricks and mortar, destroying the chimney from the inside. Central heating units in the 80% to 83% efficiency range emit low temperature flue gases into the base of a chimney. Experience shows, that even appliances with lower efficiency ratings (higher flue gas temperatures) can produce condensation, especially during the first few minutes of their "on" cycle. This probability increases when a furnace and water heater are vented into the same flue and the water heater operates during the "off" cycle of the boiler or furnace. **In cold climates, or during cold weather periods in warmer regions, rapid cooling of flue gases often leads to condensation on cold flue surfaces.**

Condensation problems can be identified by spalling bricks, chips of flue tiles and mortar in the cleanout pit, signs of mildew and moss on walls, white efflorescence stain on brickwork, leaks around cleanout doors and water stains on walls around or near the chimney.

ARE ACIDS THE ONLY CAUSE OF CHIMNEY DETERIORATION?

Even without acids, moisture produced by a boiler or furnace can cause significant damage. In colder climates, wet exterior chimneys can experience numerous freeze and thaw cycles each day. This causes the erosion of mortar joints and the cracking and spalling of bricks and

clay tiles.

Deterioration is accelerated in flues previously used to vent oil and coal heaters. Chemical deposits left by these fuels now combine with water to form additional destructive acids that can attack masonry and clay tiles. When aluminum liners are used in such contaminated environments, they can be destroyed in short order from the outside-in.

SOME MULTI-FUEL HEATERS CAN CREATE PROBLEMS.

Venting of multi-fuel appliances like oil and gas, oil and wood or gas and wood can be problematic for chimneys. Outlawed in many communities across the country, these

appliances can cause significant damage in venting systems. If you are called in to clean a chimney servicing a combination appliance, be sure to ask the customer how much one fuel is burned as compared to the other. Such details can tell you what to expect in the chimney.

IS CHIMNEY DETERIORATION THE ONLY REASON TO RELINE?

Poor draft results when an efficient gas furnace is discharged into a relatively large masonry chimney flue. The already low temperature exhaust gases expand and cool further, losing the buoyancy necessary to carry them up and out the chimney. As a result, they remain in the flue longer, increasing the possibility of carbon monoxide leakage into the home. Therefore, a chimney may have to be lined just to size the flue properly and to create sufficient draft.

Overall Efficiency of a heater is negatively impacted by poor draft, as combustion air is delivered into the combustion chamber at the same volume or velocity as flue gases are allowed to exit from the appliance. If insufficient volumes of oxygen are mixed with the fuel, incomplete combustion results. This can significantly and negatively impact the performance of a gas appliance. Efficiency ratings achieved in the test labs and featured as marketing advantages in sales literature can not be duplicated where it counts: in you customer's home.

HOW CAN PROBLEM CHIMNEYS BE IDENTIFIED?

When you are called to a home to perform any of the services your company offers, and the dwelling is heated with a relatively new oil or gas heater, spend the time looking for the following:

A) Structural Symptoms Caused by Condensation

- 1) Check for obvious signs of moisture on chimney walls

HOME SAFETY - Relining Chimneys For Gas Appliances

facing either the exterior or living quarters. Look out for: Wet spots, discoloration of plaster walls, spalling of bricks or masonry, peeling wallpaper, blistering paint, mildew, etc.

- 2) Conduct your quick visual inspection floor by floor. Start from the basement and follow the chimney all the way to the attic. Since flue gases cool with distance from the heat source, condensation may not occur right away, but can be severe higher up.
- 3) Check the base of any flues used to vent gas appliances. Any quantities of sand or small pieces of bricks or masonry at the bottom of the flue can point to condensation problems.

B) Health Symptoms Caused by Carbon Monoxide An improperly operating chimney can recycle by-products of combustion into the furnace intake air. If this oxygen-starving process continues long enough, deadly carbon monoxide can be produced and quickly build up to toxic levels inside a home.

Although carbon monoxide is difficult to detect (a colorless, odorless, tasteless gas) it causes several physical symptoms. If customers or members of their families complain about unexplained sleepiness, nausea, headaches, dizziness or heart fluttering, it could be the result of carbon monoxide poisoning caused by a plugged or faulty flue.

Don't be afraid to ask your customers if members of their family show any of these symptoms. Make it part of your safety check.

VENTINOX® OFFERS OPPORTUNITIES IN THE MULTI-MILLION DOLLAR GAS RELINING BUSINESS

Approximately 60% of all homes in the United States are heated by gas. (43% in the Northeast, 73% in the Midwest, 43% in the South and 64% in the West.) A

significant percentage of the estimated 2.5 million gas furnaces and boilers sold each year replace electric and oil heating systems or older gas heaters. How many liners need to be installed in your territory?

VENTINOX®'s super alloys consistently out-perform aluminum and commonly available stainless steel liners in corrosive environments. VENTINOX® liners are made from the right materials and welded, not just interlocked or crimped. Axial and circumferential expansion and contraction during heating cycles are absorbed without creating stresses within the system. VENTINOX® liners do not "grow" out of the top of a chimney. VENTINOX® forms an air and watertight conduit from the appliance to the chimney top. The welded "backbone" renders VENTINOX® lightweight, yet stronger than its competition. VENTINOX® is made in a state of the art manufacturing facility, carries a life-time warranty and serves in thousands of homes since 1979.

Material Choices

Our top of the line **VENTINOX®VG** Gas Liner is constructed from AL 29-4C®, "a specifically designed ferritic stainless steel containing 29% chromium and 4% molybdenum as critical alloy additions. 0.05% titanium is added to combine with carbon and nitrogen to improve weldability, toughness and resistance to intergranular corrosion. This combination represents the best balance of corrosion resistance, ductility and cost." AL29-4C® offers extreme resistance to chloride ion pitting, crevice corrosion and stress corrosion cracking, as well as general corrosion in oxidizing and moderately reducing environments. AL29-4C® experienced no measurable weight loss at chloride levels measured in condensate developed in the Battelle Laboratory tests (see Figure 1).

Our **VENTINOX®VFT** is constructed from 316Ti, an austenitic stainless steel alloy, typically containing 17% Chromium, 12% Nickel, 2.5% Molybdenum and .31%



Wet exterior wall



Spalling bricks



Blistering paint, mildew



Debris at bottom of flue

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Titanium. 316Ti offers excellent corrosion resistance to acidic solutions that contain nitric, nitrous, sulfuric, sulfurous and hydrochloric acids. The addition of titanium provides great physical strength and durability. Typical applications include chemical storage tanks, pressure vessels and use in marine or chemical environments. 316 Ti performs consistently and significantly better than Type 304 stainless steel or aluminum when exposed to corrosive condensates created by fully or partially condensing natural gas or propane fired heating appliances (see Chart).

Construction

Like all of our lining products, VENTINOX®VG and VENTINOX®VFT are continuously welded, seamless and air and watertight. Starting as a flat strip, the liner's open corrugations are formed gently. Spiral winding overlaps one set of corrugations, which are continuously electric resistance welded while being bathed in a stream of cooling water. This produces a lightweight but strong liner, free of any stress that could make other liners susceptible to corrosion. The VENTINOX® weld forms a solid "backbone", spiraling around the liner and over its entire length.

VENTINOX® Components

The components for VENTINOX®VG or VENTINOX®VFT liners are fabricated from 28 gauge AL29-4C® or 316 respectively. All of the components are manufactured to material and tolerance standards exceeding specifications common in the chimney liner industry.

VENTINOX® components feature a unique built-in locking band that fastens any component onto a VENTINOX® liner without the need for pre-drilling holes and the use of pop rivets. This eliminates the probability for using pop rivets made from dissimilar materials and therefore avoids the so often "weakest link" within a system. For more information on our FasClamp™ system, go to our web site www.duravent.com.

Insulation

Gas fired appliances produce a significant volume of moisture during the combustion process. Since modern units deliver most of the heat they generate to living areas, little heat is going into the chimney to keep this moisture in vapor form. When cool flue gases come in contact with cold chimney surfaces, the dew point is reached quickly, water forms and draft becomes sluggish or insufficient altogether.

A VENTINOX® liner installed into a masonry structure by itself can improve overall systems performance greatly. When testing a gas lining system to UL 1777, no insulation is required to pass the "zero clearance" test. Flue gas temperatures are too low for setting combustible

materials on fire that may surround a masonry chimney. Underwriters Laboratories tests focus mainly on public safety however, and do not necessarily concern themselves with a system's operating performance.

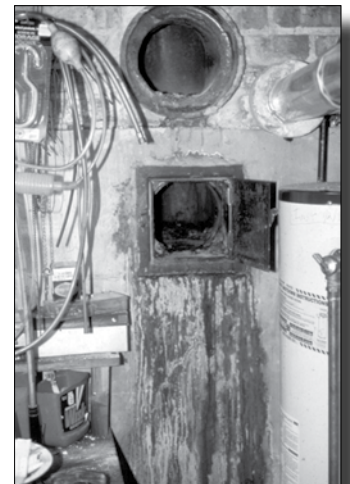
The same low flue gas temperatures that allow us to pass safety tests easily, can be detrimental to the performance of a heater and its vent system. Insulating a liner preserves the available latent heat from the base of the chimney to the top. Draft is established at the beginning of the heater's "on" cycle and the desired efficiency ratings of a boiler or furnace can be achieved.

At the same time, condensation is reduced to a minimum and the "dry" zone is extended as far up into the chimney as possible.

TherMix® Chimney Insulation is the pre-ferred and proven material that is relatively easy to install and delivers the high-est heat retention.

For information on TherMix® Chimney Insulation, contact our customer service at **1.800.835.4429** or visit our web site www.duravent.com

Home owners throughout the United States are willing to pay more for high efficiency heating equipment. Without a proper vent system, these units cannot deliver the expected return on investment. **A well-insulated VENTINOX® chimney liner "turns on" as soon as the thermostat calls for heat and provides for an efficient breathing apparatus for any heater.**



Limitations

The flexibility of all VENTINOX® liners depends on the ability of the corrugations to absorb movement. AL29-4C® is less ductile than 316Ti stainless steel and therefore will not tolerate repeated and rapid flexing. Caution should be taken not to abuse the material during installation.

Ovalization?

VENTINOX® liners may be ovalized with the VOV 612, the VENTINOX® Ovalizing Machine. Please refer to technical bulletin #1009 Ovalizing instructions and sizing chart.

HOME SAFETY - Relining Chimneys For Gas Appliances

Table 10.2:
Capacity of Chimney Liner with Single-Wall Connectors Serving a Single Category I Appliance
Vent Diameter — D

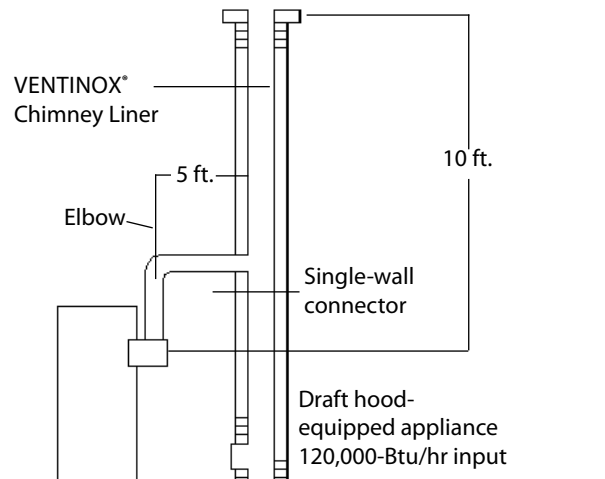
Height H (ft)	Lateral L (ft)	Appliance Input Rating (Thousands of BTUs per Hour)																													
		3"			4"			5"			5.5"			6"			7"			8"			9"			10"			12"		
		FAN Min	NAT Max	Max	FAN Min	NAT Max	Max	FAN Min	NAT Max	Max	FAN Min	NAT Max	Max	FAN Min	NAT Max	Max	FAN Min	NAT Max	Max	FAN Min	NAT Max	Max	FAN Min	NAT Max	Max	FAN Min	NAT Max	Max			
6	0	38	77	45	59	151	85	89	249	140	108	311	172	126	373	204	165	522	284	211	695	369	267	894	469	371	1118	569	537	1639	849
6	2	39	51	36	60	96	66	85	156	104	104	194	130	123	231	156	159	320	213	201	423	284	251	541	368	347	673	453	498	979	648
6	4	NA	NA	33	74	92	63	102	152	102	124	189	127	146	225	152	187	313	208	237	416	277	295	533	360	409	664	443	584	971	638
6	6	NA	NA	31	83	89	60	114	147	99	139	184	124	163	220	148	207	307	203	263	409	271	327	526	352	449	656	433	638	962	627
8	0	37	83	50	58	164	93	83	273	154	103	343	194	123	412	234	161	580	319	206	777	414	258	1002	536	360	1257	658	521	1852	967
8	2	39	56	39	59	108	75	83	176	119	102	219	149	121	261	179	155	363	246	197	482	321	246	617	417	339	768	513	486	1120	743
8	5	NA	NA	37	77	102	69	107	168	114	129	210	143	151	252	171	193	352	235	245	470	311	305	604	404	418	754	500	598	1104	730
8	8	NA	NA	33	90	95	64	122	161	107	149	202	135	175	243	163	223	342	225	280	458	300	344	591	392	470	740	486	665	1089	715
10	0	37	87	53	57	174	99	82	293	165	101	369	210	120	444	254	158	628	344	202	844	449	253	1093	584	351	1373	718	507	2031	1057
10	2	39	61	41	59	117	80	82	193	128	101	240	161	119	287	194	153	400	272	193	531	354	242	681	456	332	849	559	473	1242	848
10	5	52	56	39	76	111	76	105	185	122	127	231	154	148	277	186	190	388	261	241	518	344	299	667	443	409	834	544	584	1224	825
10	8	NA	NA	34	97	100	68	132	171	112	160	216	142	188	261	171	237	369	241	296	497	325	363	643	423	492	808	520	688	1194	788
15	0	36	93	57	56	190	111	80	325	186	98	412	235	116	499	283	153	713	388	195	966	523	244	1259	681	336	1591	838	488	2374	1237
15	2	38	69	47	57	136	93	80	225	149	98	281	187	115	337	224	148	473	314	187	631	413	232	612	543	319	1015	673	457	1419	983
15	5	51	63	44	75	128	86	102	216	140	123	271	179	144	326	217	182	459	298	231	616	400	287	795	526	392	997	657	562	1469	963
15	10	NA	NA	39	95	116	79	128	201	131	155	255	167	182	308	203	228	438	284	284	592	381	349	768	501	470	966	628	664	1433	928
15	15	NA	NA	NA	NA	NA	72	158	186	124	189	238	158	220	290	192	272	418	269	334	568	367	404	742	484	540	937	601	750	1399	894
20	0	35	96	60	54	200	118	78	346	201	96	442	254	114	537	306	149	772	428	190	1053	573	238	1379	750	326	1751	927	473	2631	1346
20	2	37	74	50	56	148	99	78	248	165	96	312	207	113	375	248	144	528	344	182	708	468	227	914	611	309	1146	754	443	1689	1098
20	5	50	68	47	73	140	94	100	239	158	121	301	199	141	363	239	178	514	334	224	692	457	279	896	596	381	1126	734	547	1665	1074
20	10	NA	NA	41	93	129	86	125	223	146	151	284	185	177	344	224	222	491	316	277	666	437	339	866	570	457	1092	702	646	1626	1037
20	15	NA	NA	NA	NA	NA	80	155	208	136	186	267	173	216	325	210	264	469	301	325	640	419	393	838	549	526	1060	677	730	1587	1005
20	20	NA	NA	NA	NA	NA	NA	186	192	126	220	249	161	254	306	196	309	448	285	374	616	400	448	810	526	592	1028	651	808	1550	973
30	0	34	99	63	53	211	127	76	372	219	93	478	277	110	584	334	144	849	472	184	1168	647	229	1542	852	312	1971	1056	454	2996	1545
30	2	37	80	56	55	164	111	76	281	183	93	355	231	109	429	279	139	610	392	175	823	533	219	1069	698	296	1346	863	424	1999	1308
30	5	49	74	52	72	157	106	98	271	173	117	344	222	136	417	271	171	595	382	215	806	521	269	1049	684	366	1324	846	524	1971	1283
30	10	NA	NA	NA	91	144	98	122	255	168	147	326	213	171	397	257	213	570	367	265	777	501	327	1017	662	440	1287	821	620	1927	1243
30	15	NA	NA	NA	115	131	NA	151	239	157	180	308	200	208	377	242	255	547	349	312	750	481	379	985	638	507	1251	794	702	1884	1205
30	20	NA	NA	NA	NA	NA	NA	181	223	NA	214	290	NA	246	357	228	298	524	333	360	723	461	433	955	615	570	1216	768	780	1841	1166
30	30	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	389	477	305	461	670	426	541	895	574	704	1147	720	937	1759	1101
50	0	33	99	66	51	213	133	73	394	230	89	512	296	105	629	361	138	928	515	176	1292	704	220	1724	948	295	2223	1189	428	3432	1818
50	2	36	84	61	53	181	121	73	318	205	89	407	259	104	495	312	133	712	443	168	971	613	209	1273	811	280	1615	1007	401	2426	1509
50	5	48	80	NA	70	174	117	94	308	198	113	395	252	131	482	305	164	696	435	204	953	602	257	1252	795	347	1591	991	496	2396	1490
50	10	NA	NA	NA	89	160	NA	118	292	186	140	377	239	162	461	292	203	671	420	253	923	583	313	1217	765	418	1551	963	589	2347	1455
50	15	NA	NA	NA	112	148	NA	145	275	174	172	358	227	199	441	280	244	646	405	299	894	562	363	1183	736	481	1512	934	668	2299	1421
50	20	NA	NA	NA	NA	NA	NA	176	257	NA	206	339	NA	236	420	267	285	622	389	345	866	543	415	1150	708	544	1473	906	741	2251	1387
50	30	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	315	376	NA	373	573	NA	442	809	502	521	1086	649	674	1399	848	892	2159	1318
100	0	NA	NA	NA	49	214	NA	69	403	NA	85	531	NA	100	659	395	131	991	555	166	1404	765	207	1900	1033	273	2479	1300	395	3912	2042
100	2	NA	NA	NA	51	192	NA	70	351	NA	84	457	NA	98	563	373	125	828	508	158	1152	698	196	1532	933	259	1970	1168	371	3021	1817
100	5	NA	NA	NA	67	186	NA	90	342	NA	108	447	NA	125	551	366	156	813	501	194	1134	688	240	1511	921	322	1945	1153	460	2990	1796
100	10	NA	NA	NA	85	175	NA	113	324	NA	133	428	NA	153	532	354	191	789	486	238	1104	672	293	1477	902	389	1905	1133	547	2938	1763
100	15	NA	NA	NA	132	162	NA	138	310	NA	163	411	NA	188	511	343	230	764	473	281	1075	656	342	1443	884	447	1865	1110	618	2888	1730
100	20	NA	NA	NA	NA	NA	NA	168	295	NA	196	391	NA	224	487	NA	270	739	458	325	1046	639	391	1410	864	507	1825	1087	690	2838	1696
100	30	NA	NA	NA	NA	NA	NA	231	264	NA	266	356	NA	301	448	NA	355	685	NA	418	988	NA	491	1343	824	631	1747	1041	834	2739	1627
100	50	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	540	584	NA	617	866	NA	711	1205	NA	895	1591	NA	11382547	1489	

Note: Listed corrugated metallic chimney liner systems in masonry chimneys shall be sized by using Table 10.2 or 10.7 for Ventinox® liners with the maximum capacity reduced by 20 percent (0.8 x maximum capacity) and the minimum capacity as shown in Table 10.2 or 10.7.

Example: Single Draft Hood-Equipped Appliance

Problem: An installer has a 120,000-Btu/hr input appliance with a 5-in. diameter draft hood outlet that needs to be vented into a 10-ft. high VENTINOX® lining system. What size liner should be used assuming a 5-ft. lateral single-wall metal vent connector is used with two 90 degree elbows?

(See solution on page 7)



HOME SAFETY - Relining Chimneys For Gas Appliances

**Table 10.7: Capacity of Chimney Liner (Common Vent)
with Single-Wall Connectors Serving Two or More Category I Appliances**

Vent Height H (ft)	VENTINOX® Liner Diameter — D																				
	4"			5"			5.5"			6"			7"			8"			9"		
	Combined Appliance Input Rating (Thousands of BTUs per Hour)																				
	FAN +FAN	FAN +NAT	NAT +NAT	FAN +FAN	FAN +NAT	NAT +NAT	FAN +FAN	FAN +NAT	NAT +NAT	FAN +FAN	FAN +NAT	NAT +NAT	FAN +FAN	FAN +NAT	NAT +NAT	FAN +FAN	FAN +NAT	NAT +NAT	FAN +FAN	FAN +NAT	NAT +NAT
67	NA	78	64	NA	113	99	NA	136	122	200	158	144	304	244	196	398	310	257	541	429	332
8	NA	87	71	NA	126	111	NA	150	135	218	173	159	331	269	218	436	342	285	592	473	373
10	NA	94	76	163	137	120	200	163	147	237	189	174	357	292	236	467	369	309	638	512	398
15	121	108	88	189	159	140	232	190	170	275	221	200	416	343	274	544	434	357	738	599	456
20	131	118	98	208	177	156	257	212	190	305	247	223	463	383	302	606	487	395	824	673	512
30	145	132	113	236	202	180	293	244	219	350	286	257	533	446	349	703	570	459	958	790	593
50	159	145	128	268	233	208	337	285	252	406	337	296	622	529	410	833	686	535	1139	954	689
100	166	153	NA	297	263	NA	383	331	NA	469	398	NA	726	633	464	999	846	606	1378	1185	780

Example: Common Venting Two Draft Hood-Equipped Appliances. A 35,000-Btu/hr water heater is to be common venting with a 150,000-Btu/hr furnace, using a VENTINOX® liner (common vent) with a total height of 30 ft. The connector rise is 2 ft for the water heater with a horizontal length of 4 ft. The connector rise for the furnace is 3 ft with a horizontal length of 8 ft. Assume single-wall metal connectors will be used with a VENTINOX® liner. What size VENTINOX® liner (common vent) should be used in this installation?

Solution:
In the common vent capacity portion of Table 10.7, find the row associated with a 30 ft vent height and read over to the NAT + NAT portion of the 6-in diameter columns to find a maximum combined capacity of 257,000 Btu/hr. Now reduce by 20% ($257,000 \times 0.8 = 205,600$). Since the two appliances total only 185,000 Btu/hr, a 6 in. VENTINOX® liner (common vent) can be used.

Example: Single Draft Hood-Equipped Appliance (from page 6)

Solution: Table 10.2 should be used to solve this problem, because single-wall vent connectors are being used with a VENTINOX® liner.

Read down the first column in Table 10.2 until the row associated with a 10-ft. height and 5-ft. lateral is found. Read across this row until a vent capacity greater than 120,000 Btu/hr is located, realizing that you must multiply the NAT Max value in the shaded columns by 0.8 ($186,000 \times 0.8 = 148,800$). In this case, a 6-in diameter vent has the capacity of 148,800 Btu/hr and can be used for this application.

NOTE:

These examples are only used to familiarize yourself with reading and using the tables. For complete tables, refer to NFPA 54 National Fuel Gas Code or call us at 1.800.835/4429 for help.

HOME SAFETY - Relining Chimneys For Gas Appliances

INSTALLATION SUGGESTIONS FOR GAS LINERS

I. Installation Procedures

The VENTINOX® Installation Manual (download from our website www.duravent.com for your copy) and the following information should be used as a guide.

- 1) The masonry chimney must be thoroughly cleaned and inspected before relining. Caution: debris found in gas flues can be acidic. Follow proper safety procedures during cleaning operations. Always rinse and lubricate tools to avoid corrosion and empty acidic debris from your vacuum.
- 2) Any loose mortar or broken clay tiles should be removed and all structural cracks repaired.
- 3) Proper sizing of the liner is extremely important. Use the tables on page 6 and 7 or NFPA 54 to calculate specific size requirements. A good hint: determine if the customer plans to add other gas appliances in the future. Example: a chimney for the existing gas furnace needs relining. An electric water heater might be replaced with a gas unit when necessary. If you size the liner to match the needs of the furnace alone, it may not be large enough to service additional appliances later.
- 4) Good liner insulation is crucial to reducing condensation in the chimney. Any Underwriters Laboratories approved insulation method for stainless steel liners is acceptable. Remember that our primary concern here is to keep the liner warm to reduce condensation, not the danger resulting from high temperatures. The type and minimum thickness of insulation materials recommended for solid fuel liners should be used as a guideline. The amount of insulation may vary according to the location and operating conditions of a chimney. Example: exterior chimneys facing north tend to run much colder than interior chimneys, and would benefit from more insulation. If you face a situation requiring a judgment call, please feel free to contact our technical staff.

WHAT'S THE BOTTOM LINE?

Experience gained in the solid fuel industry demonstrates, that a heating system is not complete unless a proper vent system is provided for a boiler or furnace. To maximize efficiency ratings of the appliance alone is a shortsighted approach for serving the energy conscious public. It is necessary to optimize the functioning of each systems component and so maximizes the overall performance, efficiency and safety of a heating system.

With VENTINOX®, you can offer your customers the optimal vent system for their gas heating appliances:

- it is welded, not interlocked or crimped
- it is reasonably priced
- is available in 3" through 12" diameters
- can be ordered in job specific lengths
- is made from the right metals for the job
- is water and vapor tight
- exhibits little or no expansion/contraction during operating cycles
- features ideal installation weight
- offers a complete assortment of parts and components
- makes pop rivets unnecessary
- is supported by a knowledgeable technical staff
- is made by solid manufacturers right here in the USA

The information presented in this Newsletter has been carefully collected and researched. Resources and references include: National Fire Protection Assoc., National Fuel Gas Code, Underwriters Laboratories Inc., Allegheny Ludlum, Battelle Laboratories, & others. We continue our research into gas venting and will issue updates periodically. If you wish to be included in our mailings, give us a call or contact us via our website. We'd like to hear from you.

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