

# Wall Insulation Experiments

Winthrop, Maine, October 14, 2003

Sponsored by Maine State Housing  
and Boston Department of Energy as  
part of the O4S Project.



Two 22 inch wide cavities  
1/4 inch Lexan, strapped for  
strength. Fiberglass  
stuffed in bottom of  
cavity. Cavities are  
3 3/4 inches deep.

Ready for test blowing.

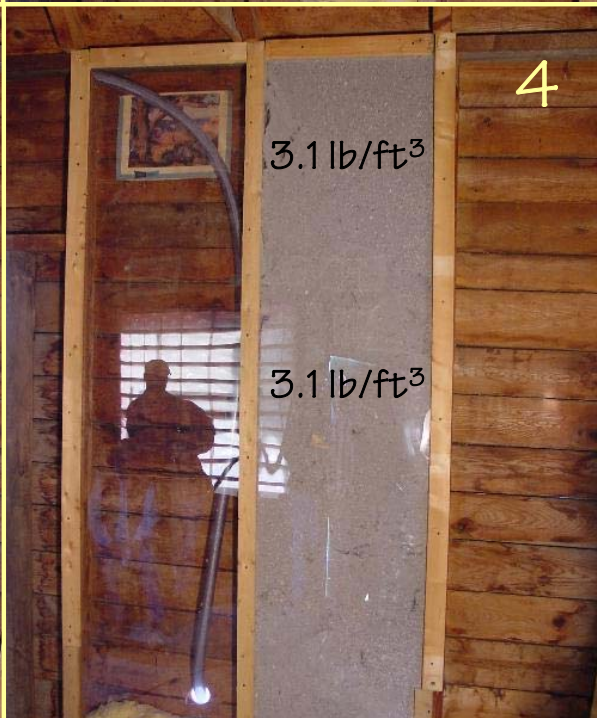


Summer-grade 1 ¼ inch tube inserted in 22 inch wide cavity. Tube is too flexible to reliably travel properly.

The flaccid tube makes it difficult, if not impossible to achieve an adequate density in the wall.



A more rigid 1 ¼ inch Inside diameter tube is inserted in the left cavity. This turgid tube is much less likely to bend downward than the flaccid tube in the right cavity, ensuring a better insulation density.



## Flaccid Tube Blow

The four photos show the sequence of blowing through the sub-standard tube from a fill hole near the bottom of the cavity.

The measured cellulose density in lb/ft<sup>3</sup> at a particular height in the cavity is shown in photo number 4.

Note: Krendl 2090 machine with air on 7 for both blowers and feed set at 3.



## Rigid Tube Blow

The four photos show the sequence of blowing through the more rigid tube (left cavity) from a fill hole near the bottom of the cavity.

Continued...

Note: Krendl 2090 machine with air on 7 for both blowers and feed set at 3.



5



6



7



8

5.6 lb/ft<sup>3</sup> 3.1 lb/ft<sup>3</sup>

3.6 lb/ft<sup>3</sup> 3.1 lb/ft<sup>3</sup>

## Rigid Tube Blow

The four photos show the sequence of blowing through the more rigid tube (left cavity) from a fill hole near the bottom of the cavity.

The measured cellulose density in lb/ft<sup>3</sup> at a particular height in the cavity is shown in photo number 8.

Note: Cavity on right was blown with less rigid tube that curved downward

Note: Krendl 2090 machine with air on 7 for both blowers and feed set at 3.



The Lexan is removed from cavities to get ready for the next test.

The holes through the wall sheathing and cellulose – except the bottom hole in each cavity – are the core sampling holes.





Grams of Cellulose in Core Sample for Listed Density and Core Depth  
(Core Size is 2.500 Diameter ODV Super Sizing, 2.541 inch inside diameter, 1.317 Outside inches per foot depth)

Density	Cellulose Insulation (Core Wall) inches																
	2.00	2.25	2.50	2.75	3.00	3.25	3.50	3.75	4.00	4.25	4.50	4.75	5.00	5.25	5.50	5.75	6.00
0.8	9.6	1.0	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9	2.0	2.1	2.2	2.3	2.4	2.5
0.9	12	14	15	17	18	19	21	22	24	25	27	29	30	32	33	35	36
1.0	15	17	19	21	23	25	27	29	31	33	35	37	39	41	43	45	47
1.1	18	21	24	27	30	33	36	39	42	45	48	51	54	57	60	63	66
1.2	21	25	29	33	37	41	45	49	53	57	61	65	69	73	77	81	85
1.3	24	29	34	39	44	49	54	59	64	69	74	79	84	89	94	99	104
1.4	27	33	39	45	51	57	63	69	75	81	87	93	99	105	111	117	123
1.5	30	37	44	51	58	65	72	79	86	93	100	107	114	121	128	135	142
1.6	33	41	49	57	65	73	81	89	97	105	113	121	129	137	145	153	161
1.7	36	45	54	63	72	81	90	99	108	117	126	135	144	153	162	171	180
1.8	39	49	59	69	79	89	99	109	119	129	139	149	159	169	179	189	199
1.9	42	53	64	75	86	97	108	119	130	141	152	163	174	185	196	207	218
2.0	45	57	69	81	93	105	117	129	141	153	165	177	189	201	213	225	237
2.1	48	61	74	87	100	113	126	139	152	165	178	191	204	217	230	243	256
2.2	51	65	79	93	107	121	135	149	163	177	191	205	219	233	247	261	275
2.3	54	69	84	99	114	129	144	159	174	189	204	219	234	249	264	279	294
2.4	57	73	89	105	121	137	153	169	185	201	217	233	249	265	281	297	313
2.5	60	77	94	111	128	145	162	179	196	213	230	247	264	281	298	315	332
2.6	63	81	99	117	135	153	171	189	207	225	243	261	279	297	315	333	351
2.7	66	85	104	123	142	161	180	199	218	237	256	275	294	313	332	351	370
2.8	69	89	109	129	149	169	189	209	229	249	269	289	309	329	349	369	389
2.9	72	93	114	135	156	177	198	219	240	261	282	303	324	345	366	387	408
3.0	75	97	119	141	163	185	207	229	251	273	295	317	339	361	383	405	427
3.1	78	101	124	147	170	193	216	239	262	285	308	331	354	377	400	423	446
3.2	81	105	129	153	177	201	225	249	273	297	321	345	369	393	417	441	465
3.3	84	109	134	159	184	209	234	259	284	309	334	359	384	409	434	459	484
3.4	87	113	139	165	191	217	243	269	295	321	347	373	399	425	451	477	503
3.5	90	117	144	171	198	225	252	279	306	333	360	387	414	441	468	495	522
3.6	93	121	149	177	205	233	261	289	317	345	373	401	429	457	485	513	541
3.7	96	125	154	183	212	241	270	299	328	357	386	415	444	473	502	531	560
3.8	99	129	160	189	219	249	279	309	339	369	399	429	459	489	519	549	579
3.9	102	133	166	195	226	257	288	319	350	381	412	443	474	505	536	567	598
4.0	105	137	172	201	233	265	297	329	361	393	425	457	489	521	553	585	617
4.1	108	141	178	207	240	273	306	339	372	405	438	471	504	537	570	603	636
4.2	111	145	184	213	247	281	315	349	383	417	451	485	519	553	587	621	655
4.3	114	149	190	219	254	289	324	359	394	429	464	499	534	569	604	639	674
4.4	117	153	196	225	261	297	333	369	405	441	477	513	549	585	621	657	693
4.5	120	157	202	231	268	305	341	377	413	449	485	521	557	593	629	665	701
4.6	123	161	208	237	275	313	350	387	424	461	498	535	572	609	646	683	720
4.7	126	165	214	243	282	321	359	397	435	473	511	549	587	625	663	701	739
4.8	129	169	220	249	289	328	367	406	447	487	527	567	607	647	687	727	767
4.9	132	173	226	255	297	337	377	417	459	501	543	585	627	669	711	753	795
5.0	135	177	232	261	305	346	387	429	473	517	561	605	649	693	737	781	825
5.1	138	181	238	267	313	355	397	441	487	533	581	629	677	725	773	821	869
5.2	141	185	244	273	321	365	409	455	503	551	601	651	701	751	801	851	901
5.3	144	189	250	279	330	375	421	469	519	569	621	673	725	777	829	881	933
5.4	147	193	256	285	339	385	433	483	535	589	643	697	751	805	859	913	967
5.5	150	197	262	291	348	399	453	509	565	623	681	741	801	861	921	981	1041
5.6	153	201	268	297	357	411	467	525	583	643	703	765	827	889	951	1013	1075
5.7	156	205	274	303	366	421	479	539	599	661	723	787	851	917	983	1049	1115
5.8	159	209	280	309	375	431	491	553	615	679	743	809	875	941	1009	1077	1145
5.9	162	213	286	315	384	443	505	569	633	699	765	833	901	971	1041	1111	1181
6.0	165	217	292	321	393	455	519	585	651	719	787	857	927	999	1071	1143	1215

Density in lbs-ft<sup>3</sup> = [grams of cellulose in core sample / (0.3558 × core depth in inches)]  
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Core sampling kit, including the copper tube, scale for weighing the core sample, and the conversion chart



## Center Fill, Up-Down Blow

The three photos show the sequence of blowing through a rigid tube from a fill hole near the center of the cavity.

The fill hole in the left cavity is at the same height as the fill hole in the right cavity.

Note: Krendl 2090 machine with air on 7 f both blowers and feed set at 3.



## Center Fill, Down-Up Blow

The four photos show the sequence of blowing through a rigid tube from a fill hole near the center of the cavity.

For this test, when the tube direction was changed to up, the feed was shut down so that only air came out of the tube. This seemed to “drill” a channel allowing the end of the tube all the way up to the top plate.

Up-Down

5.4 lb/ft<sup>3</sup>

4.5 lb/ft<sup>3</sup>

4.0 lb/ft<sup>3</sup>

Down-Up

4.6 lb/ft<sup>3</sup>

5.8 lb/ft<sup>3</sup>

4.8 lb/ft<sup>3</sup>

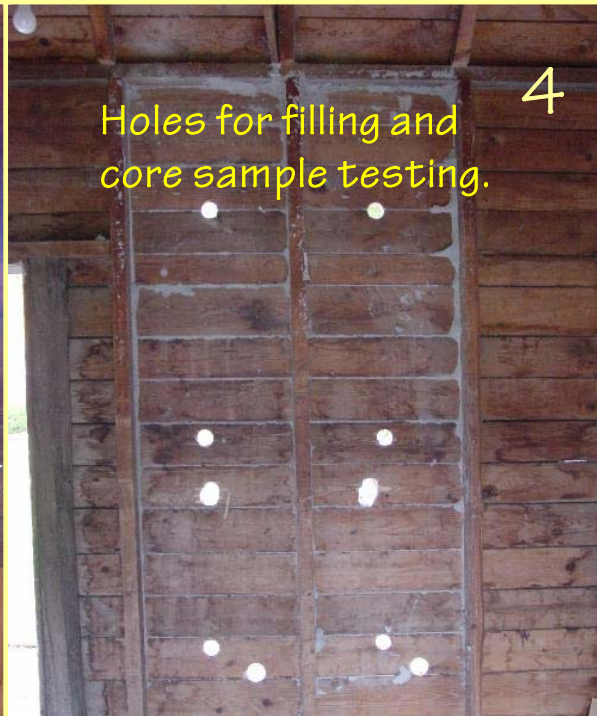
Center-Cavity Fill Hole

In left cavity, the tube directed up and then down.

In right cavity, the tube directed down and then up.

The measured cellulose density in lb/ft<sup>3</sup> at a particular height in the cavities is shown in the photograph.

Note: Krendl 2090 machine with air on 7 f both blowers and feed set at 3.



Holes for filling and core sample testing.

## Two-Hole Method

The first three photos show the sequence of blowing through a nozzle, bottom and then top hole.

The densities measured from core samples are included in photo number 3. The top fill hole and core sample hole are one in the same (see photo number 4).

Note: Krendl 2090 machine with air on 7 ft  
both blowers and feed set at 3.



## Bottom Tube Fill with Inferior Machine Settings

The left cavity is filled from the bottom with a sufficiently rigid summe tube, 1 ¼ inch inside diameter.

(The right cavity was done with the two-hole method with good machine settings.)

The inferior core sample densities are listed

Note: Krendl 2090 machine with air on 1 ¼ for one blower and feed set at 4.

Grain bag pushed into hole with tube



Grain bag filled with cellulose



## 2<sup>nd</sup> floor band joist treatment

Open space blown with cellulose



Finished blow