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Portland, OR

OSB SHEATHINGS WITH INTEGRAL WATER RESISTIVE BARRIER

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Re-examination of WRB

WRB products contribute to the following aspects of environmental control:

(1) water penetration,

(2) drainage,

(3) air flow resistance,

(4) water vapor diffusion to and from the wall and if the rain-screen principle is used, than

(5) WRBs affect the pressure in the air cavity.

Installation practice – a problem

- This paper shows also the significance of details in the installation of WRB materials
- This was a reason for the development of integral WRB that is applied directly to OSB boards.
- Air control performance of integral WRB was found superior to plastic films, which combined with easier adjustment of water vapor permeance to the required level for a given climate zone and with the ease of installation makes them a winning technology.
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Installation survey (Burnett)

1997/8 Survey Results

- 70% fastened with staples (mainly 1/2” crown)
- Spacing of fasteners adequate
- 73% had vinyl siding as cladding
- 73% had neither taped nor sealed window detail
- 93% joints neither taped nor sealed overlapping
- Tears, holes, etc., were prevalent
- Any significant improvements since then?

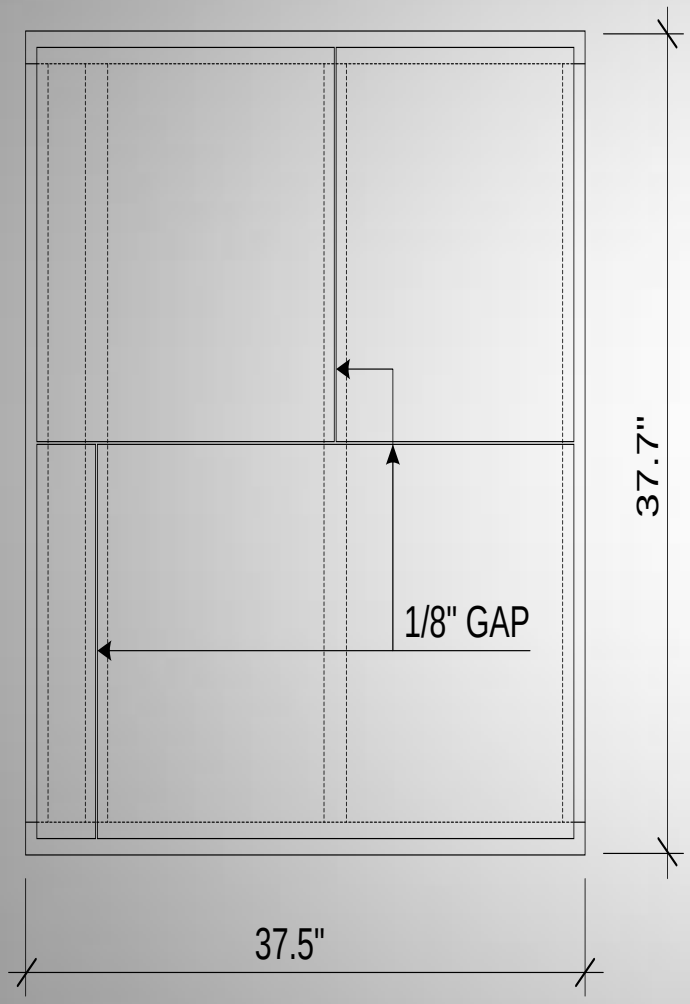
Manufacturers follow the market forces

- BEST 1 showed the need for a new paradigm of hygrothermal design (increased airtightness and reduced heat flows caused lower drying ability of walls)
- New design paradigm calls for wetting and drying from both sides of the wall and strive to develop materials or composite components that may perform several functions.
- An integral WRB on OSB sheathing is a good illustration of this trend.

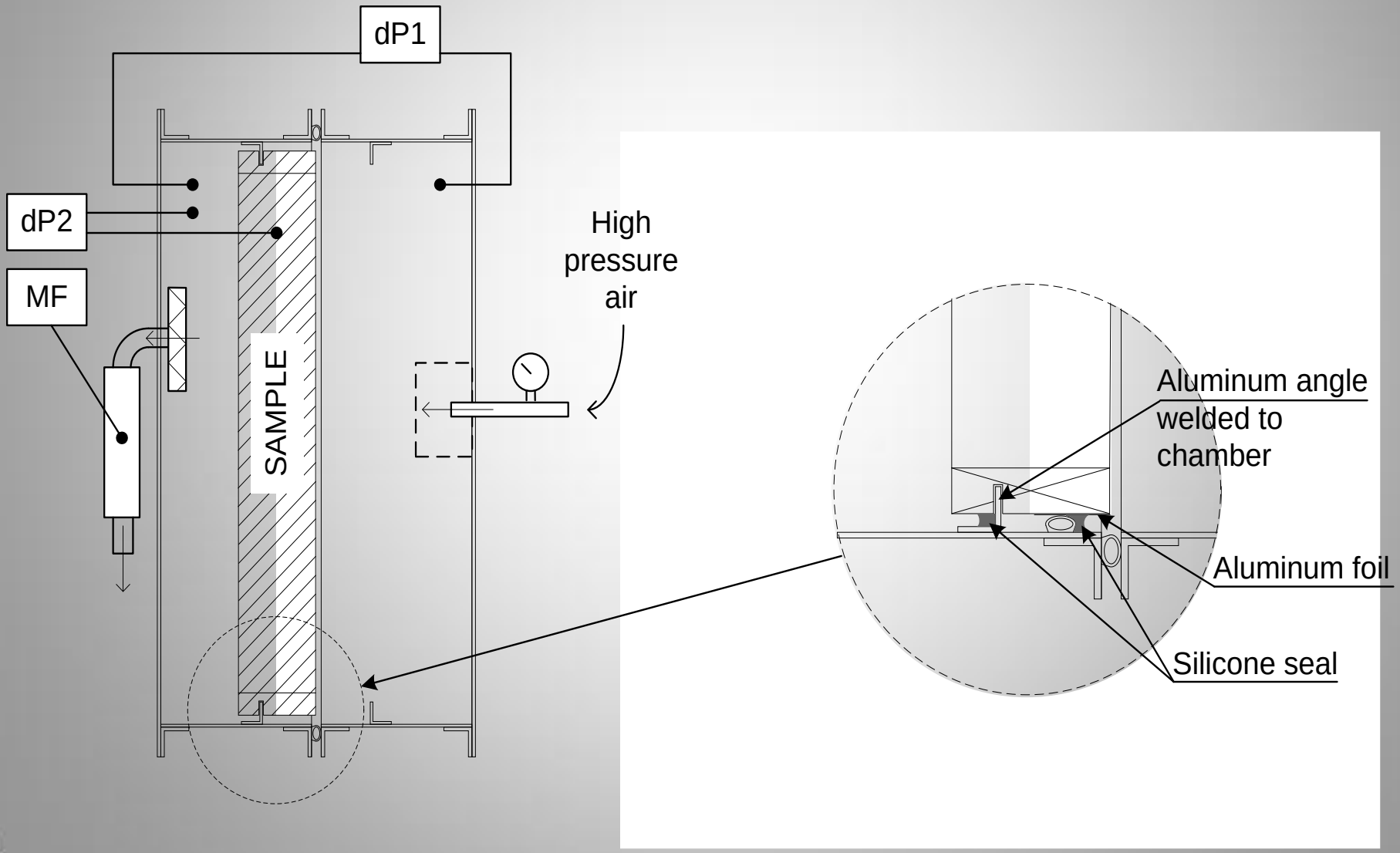
This project examined:

1. A reference wood-frame wall with glass fiber batt, drywall and OSB. A polymeric membrane (house wrap) was applied on OSB sheathing board.
2. An identical wall but OSB was coated with integral WRB and sealing tapes were placed on the OSB joints.

Reference wall - front view



Experimental set-up

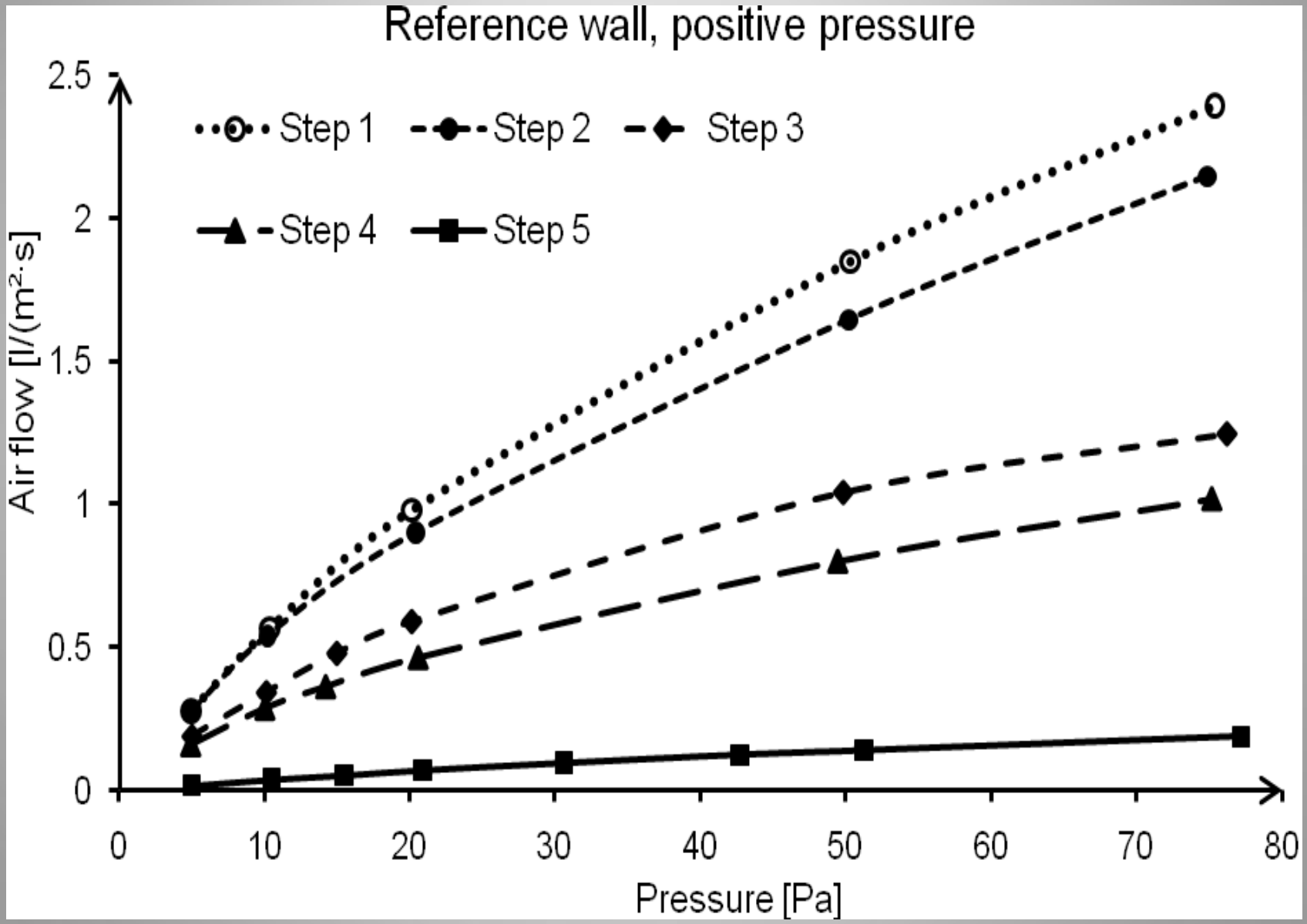


Reference wall (a) WRB joints untapped (b) installation of the siding

Table: Stages in the test sequence

Step 1	Wall with mounted OSB and WRB only
Step 2	As step 1 + Vertical edges of the specimen taped
Step 3	As step 2 + All outer edges of the specimen taped
Step 4	As step 3 + All gaps and overlaps of the WRB taped
Step 5	As step 4 + vinyl siding

Air flux versus pressure difference measured on the reference wall



Air flux measured at positive pressures through the reference wall

	Step 1		Step 2		Step 3		Step 4		Step 5	
Nom. dP [Pa]	dP [Pa]	Air Flux [l/m²·s]	dP [Pa]	Air Flux [l/m²·s]	dP [Pa]	Air Flux [l/m²·s]	dP [Pa]	Air Flux [l/m²·s]	dP [Pa]	Air Flux [l/m²·s]
5	4.97	**0.28**	4.96	**0.28**	5.00	**0.19**	4.97	**0.16**	4.99	**0.02**
10	10.39	**0.57**	10.21	**0.54**	10.12	**0.34**	10.07	**0.29**	10.49	**0.04**
20	20.14	**0.98**	20.44	**0.90**	20.12	**0.59**	20.61	**0.46**	20.88	**0.07**
50	50.32	**1.85**	50.18	**1.64**	49.82	**1.04**	49.45	**0.80**	51.26	**0.14**
75	75.39	**2.39**	74.87	**2.15**	76.22	**1.24**	75.16	**1.02**	77.18	**0.19**

Air flux measured at positive pressures through the integral WRB

	Step 1		Step 2		Step 3		Step 4		Step 5	
Nom. dP [Pa]	dP [Pa]	Air Flux [l/m²·s]	dP [Pa]	Air Flux [l/m²·s]	dP [Pa]	Air Flux [l/m²·s]	dP [Pa]	Air Flux [l/m²·s]	dP [Pa]	Air Flux [l/m²·s]
5	5.13	0.24	5.01	0.23	4.86	0.21	6.15	0.00	4.83	**0.00**
10	10.06	0.49	10.42	0.46	9.81	0.43	10.52	0.00	10.16	**0.00**
20	19.88	0.88	20.33	0.83	19.36	0.79	20.33	0.01	21.19	**0.01**
50	50.52	1.81	50.46	1.67	45.49	1.55	54.08	0.01	50.01	**0.01**
75	75.24	2.41	75.06	2.24	74.92	2.21	75.93	0.02	75.57	**0.02**

Air flux measured at negative pressures through the integral WRB

	Step 1		Step 2		Step 3		Step 4		Step 5	
Nom. dP [Pa]	dP [Pa]	Air Flux [l/m²·s]	dP [Pa]	Air Flux [l/m²·s]	dP [Pa]	Air Flux [l/m²·s]	dP [Pa]	Air Flux [l/m²·s]	dP [Pa]	Air Flux [l/m²·s]
5	4.82	0.35	5.16	0.33	5.68	0.35	5.58	0.002	5.74	**0.00**
10	9.88	0.57	10.14	0.55	10.14	0.53	9.14	0.004	11.00	**0.01**
20	19.89	0.95	18.92	0.85	19.92	0.88	20.75	0.008	19.89	**0.01**
50	49.65	1.84	49.93	1.71	49.92	1.69	51.89	0.014	51.58	**0.02**
75	76.03	2.40	75.72	2.25	75.16	2.23	77.57	0.017	74.95	**0.02**

Repeatability of the tests when rebuilding the wall (a-positive, b-negative pressure)

Series Nom. dP [Pa]	A st4a Air Flux [l/m²·s]	B st4a Air Flux [l/m²·s]	C st4a Air Flux [l/m²·s]	D st4a Air Flux [l/m²·s	D st5a Air Flux [l/m²·s	D st5b Air Flux [l/m²·s	D st5b Air Flux [l/m²·s
50 ± 0.5	0.011	0.028	0.028	0.013	0.015	0.014	0.017

Conclusions

- The use of membrane WRB is only as good as the tape used to seal its junctions and the perimeter.
- For membrane type of WRB products, from consideration of airtightness, hygric and thermal movements of OSB one may recommend using only vertical orientation of OSB boards.
- Integral WRB that were tested showed a superior air tightness and easier application than the membrane WRB.