

Vapour Barriers: how important are they?

Moisture is a major concern in construction. New building practices and materials have changed the dynamics of a building so poor details or errors will lead to problems with serious consequences.

Many still have a concern about tight construction, thinking that it will bottle up moisture and lead to early deterioration. If we remember that a house is a total system and the house is built properly, that will not be a problem.

To better understand potential problems of high moisture levels in wood frame walls, a study was started at the Prairie Regional Station of the Institute for Research in Construction in Saskatoon.

Six different wall sections and three floor sections were built, and testing started in December 1989. The intent is to monitor the sections for 2 years.

The insulation levels in the walls are high (nominal value of R22 to R43):

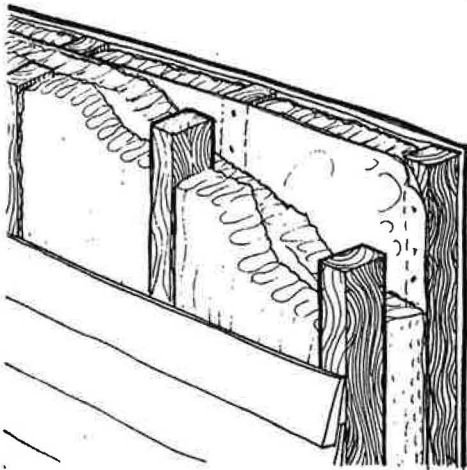


Figure 1

1. Double stud wall with a polyethylene vapour barrier approximately 1/3 of the way through the insulation. (Fig. 1)

2. Double stud wall with a polyethylene vapour barrier half way through the wall. (Fig. 2)

3. Single stud wall with vertical strapping, and sandwiched

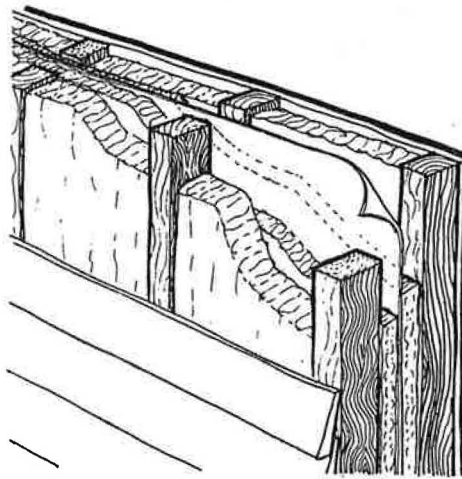


Figure 2

polyethylene vapour barrier about 34% of the way through the insulation.

4. Single stud wall with horizontal strapping, and sandwiched polyethylene vapour barrier 46% of the way through the insulation.

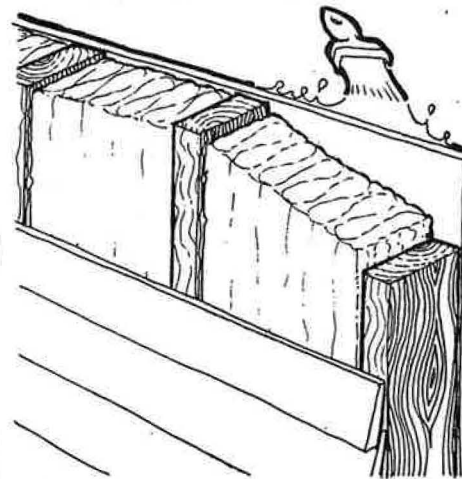


Figure 3

5. Single 2 x 8 stud with no vapour barrier, paint on gypsum board. (fig. 3)

6. Single 2 x 8 stud with poly vapour barrier

The interior relative humidity was kept at about 50% and the air temperature at 22°C. For these conditions the corresponding dew point temperature is 11°C. To keep a constant air flow through the structure from inside to outside, the pressure inside the room was set at 20 pascals.

The 50% relative humidity is higher than the measured average value for even new houses. A 1984 survey of 46 new air tight houses in Saskatoon, measured the average relative humidity at 34% (in January). While high, it is not an unreasonable value as the relative humidity values ranged from a low of 23% to a high of 49%.

Data are available for the period December 6, 1989 to May 22, 1990.

A complete analysis of data has not been done and with the closing of the Prairie Regional station of IRC the whole project may be jeopardized. The Building Science Division of the Saskatchewan Research Council is hoping to generate the funds needed to complete the work.

What has been learned so far?

Vapour barriers are important, as is their location. The 1/3 - 2/3 rule of thumb is close to the limit for acceptable positions (i.e. the vapour barrier can be up to 1/3 the way through the wall as measured by R-values, with 2/3 of the insulation value on the outside). Where the vapour barrier was in the middle, there are moisture problems.

The moisture content in the double stud wall indicated no moisture problems, as the maximum moisture content was 17% on the base plate of the inner stud wall.

The double stud wall with the vapour barrier sandwiched 1/2 of the way through the insulation had a moisture content above 30% for most of the monitoring period. This indicates that serious moisture accumulation was happening. 160 days after the start of the test the moisture content in the wall was still rising. It remains to be seen if significant drying will occur in the wall during the warmer summer months.

The single stud wall with vertical strapping had a moisture content with a maximum value of about 20%, and as of day 160, the moisture level was decreasing.

The single stud wall with horizontal strapping and poly vapour barrier 46% through the insulation showed a considerable moisture accumulation with a peak value of about 42%, declining to about 30% at day 160.

The single stud wall with no vapour barrier showed high moisture levels with a maximum of about 42% reached about day 150.

Single stud with polyethylene. On the warm side of the base plate the moisture content was less than 10% over the monitoring period while on the cold side the moisture content reached a high of 36%.

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Gas Fireplace Alert (3)

We've reported on the problems that were discovered with direct vent gas fireplaces. Certification tests and procedures were modified and all units on sale now meet new requirements. However, Superior Fireplaces sent out a safety notice to owners of GDV-5000 Direct Vent Gas Fireplaces.

The memo says "we must advise you to cease using this gas appliance until further notice. . . the green control knob on the gas valve should be placed in the "off" position. . . ."

Under certain conditions, it may be possible for a gas explosion to occur during the operation of the appliance. While the likelihood of this occurring is very remote, such an explosion could cause glass breakage and could expel glass fragments and the protective screen into the living space. Please note the GDV-5000 continues to meet all known applicable safety standards. . . the probability of such an explosion is unlikely. . . we strongly recommend that you do not operate the appliance until we complete our assessment of the situation."

A major Vancouver builder that got the notice is concerned because the manufacturer will not disclose any more information, nor answer any questions.♦

Freeze Protection

Keeping water supply lines from freezing is a big problem in cold climates, especially with small diameter pipes that can freeze quickly.

Freezing happens when frost penetrates down through the soil. Standard practice is to bury the lines below the frost line. Not an easy task in northern areas with permafrost, where frost can penetrate down 10 feet or more, because of a high water table or bedrock. Common practice is to insulate the lines, to install some form of freeze protection and to bury the service at a shallow depth.

A variety of insulation techniques and/or freeze protection systems are used with varying degrees of success and expense, but no single method is completely reliable. Most commonly water is bled continuously. Despite the problems and costs involved in the continuous bleeding of water it is a fact that flowing or moving water does not freeze readily.

How big a deal is it?

In most northern communities water consumption rates peak in the winter. The national average water consumption is 420 litres per person per day. In Dawson City, Yukon it is 3890 litres, in Whitehorse it is 1680!

A recently developed system, Aqua-flow, is an energy saving invention that ensures the prevention of water service line freezing. Aqua-flo is a device to control the continuous flow of water 365 days of the year and 24 hours per day. This is accomplished by a BLEED, CAPTURE and RETURN method.

A constant flow of water is maintained through a single service line. The water into is returned into the system through the same line without any loss. Water is constantly flowing, but not from the tap into the sewer systems. Rather, water is bled from its source (usually the water main) into a sealed container. When the container is full, it is pumped back to its source. This cycle is repeated over and over in a closed, sterile system. During periods of electrical or mechanical failure, flow is maintained

by over-flowing from the holding tank into a drain, discharged through a one-way check valve into the drain and into the sewer main or sump at a flow rate that remains unchanged at a metered flow rate of 1 litre per minute. When the power comes back on, or the malfunction is rectified the pump resumes its normal pumping cycle.

As the water bleeds into the tank, it absorbs heat from the surrounding air. The water temperature may increase by 2° to 4°C. Warmer water, pumped back at a high velocity, melts any ice formations that may begin to form in the bleed cycle.

This patented appliance consists of an 18" x 18" x 24" opaque polyethylene tank with a 74.0 litres capacity. All monitoring devices, electric motor, pump, by-pass valve, check valve, standard tie-in adaptors and tees, etc., that come in contact with water are either polyethylene, copper or brass.

To eliminate the potential for air borne contaminants to enter the system, an activated carbon air filter is used.

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Credit where it's due

In Solplan Review No. 33 we reported on indoor airflow patterns and temperature stratification in rooms with windows open or closed ("Is the window open or closed?"). This was a report on work done by Dr. Koos Van der Maas of the Ecole Polytechnique Federale de Lausanne in Switzerland. It originally appeared in 'flow flash' a newsletter of Annex 20, a special task group of the International Energy Agency that is focusing on Air Flow Patterns in Buildings.

Unfortunately, we omitted to give credit to the item. Our apologies to Dr Koos Van der Maas.♦