Plasti·Fab EPS PRODUCT SOLUTIONS
Better building ideas from PFB™

BULLETIN NO. 203
ISSUED: November 30, 2015
REPLACES: July 9, 2004

Product Information Bulletin

PlastiSpan® Insulation in Soil Applications

In 1998, the ***Canadian Commission on Building and Fire Codes*** (CCBFC) issued a ***Special Change*** to the National Building Code of Canada (*NBC*) 1995 deleting Sentence 9.25.2.2.(4), which had stated:

> *Type 1 expanded polystyrene insulation as described in CAN/CGSB-51.20-M "Thermal Insulation, Polystyrene, Boards and Pipe Covering" shall not be used in contact with the ground or as roof insulation applied above the roofing membrane.*

The primary reason cited by the *CCBFC* for issuing the ***Special Change***[1] removing this Sentence was: "…***experience and recent research have shown that the prohibition is unnecessary and that there is no such prohibition for its use in a building beyond the scope of Part 9***."

The CCBFC process for issuing this ***Special Change*** to the NBC requested by the expanded polystyrene (EPS) insulation industry required submission of supporting documentation that was reviewed by the Standing Committee on Housing and Small Buildings. The Standing Committee then made a recommendation to the CCBFC to accept the proposed change based upon its technical merits.

As part of the EPS industry submission, members of the Standing Committee were provided results of a joint National Research Council of Canada (NRC)/Expanded Polystyrene Association of Canada (EPAC) research project[2] completed in 1997. The NRC/EPAC research program recorded the effect on EPS insulation performance used as exterior basement insulation, including in situ monitoring of EPS insulation thermal performance while installed as below-grade insulation for a 31-month period, as well as removal and testing of specimens after the exposure period. Based upon this research program, the NRC concluded the following:

> "We conclude that the key performance factors of thermal conductivity and compressive strength of the EPS specimens were not affected by the 31-month in-situ exposure."

The CCBFC decision recognized that the **NRC** research cited to support the EPS industry request for a NBC change was conducted by **Canada's premier science and technology research organization, recognized world-wide as a leader in scientific and technical research**.

Water absorption is always a concern for any insulation material in a below grade application. Therefore, it is important to note that the successful use of EPS insulation, as with any insulation product, depends upon its correct installation using good building practice as a part of a complete foundation system.

---

1. CCBFC, Extract from Minutes of the 10th Meeting of the Canadian Commission on Building and Fire Codes, October 15, 1998.
2. Performance of Thermal Insulation on the Exterior of Basement Walls, NRC-CNRC Construction Technology Update No. 36, M.C. Swinton, M.T. Bomberg, M.K. Kumaran, N. Normandin and W. Maref

In below-grade applications, the success of the overall foundation system depends, to a large extent, upon provision for adequate drainage of water away from the foundation system. An Ontario New Home Warranty Program booklet[3] provides home builders with the following general information related to good construction practice that should be considered in the design of basement systems to minimize foundation problems.

1) Direct water away from the foundation:
   a) Provide a slope at grade away from the foundation of at least 6" in 10 feet.
   b) Avoid directing eaves trough down spouts so that they drain against the foundation; direct them at least 3 feet away from the building
   c) Avoid landscaping that requires excessive watering in the vicinity of the foundation wall
2) Ensure there is adequate subgrade drainage:
   a) Wrap a geotextile filter fabric around the drain tile at the base of the foundation or place over the granular fill material over the drain tile
   b) Ensure the drain tile has adequate slope to the outflow point
   c) use well-graded backfill or other appropriate drainage medium to ensure adequate sub-grade drainage adjacent to the foundation wall
3) Use details to minimize leakage potential:
   a) Seal and flash top edge of exterior foundation insulation
   b) Embed lower edge of exterior insulation layer at least six inches into perimeter stone over drain tile
   c) Keep level of perimeter drain tile below the basement floor level
   d) Seal tie rod holes and control joints
   e) Place vapour barrier on inside face of wall, on the warm side of insulated wall

EPS insulation is hydrophobic which means that the **closed cell structure of EPS insulation** provides excellent resistance to moisture absorption when used in contact with moist soil. In the absence of hydrostatic pressure on a foundation constructed using good building practice, moisture absorption can only occur by vapour diffusion as a result of a prevailing thermal/vapour pressure gradient. However, a University of Minnesota research report[4] concluded that in below grade applications building/ground vapor pressure differentials should seldom exceed 0.30" Hg (1015 Pa vapor pressure) outwards and 0.50" Hg (1690 Pa vapor pressure) inwards. Laboratory test results at this level of vapor differential did not result in significant absorption of moisture.

Additional international research results from VTT Building Technology[5] and ASTM[6], among others, confirm EPS insulation absorbs minimal amounts of moisture in below grade applications even over extended periods of time. A research report published by IRC/NRC[7] concluded that EPS insulation is not only suitable for use as a below grade insulation, but it is also a cost effective insulation system that will provide long term energy savings.

---

3. Better Basements Construction Practice Booklet. Ontario New Home Warranty Program, 1995.05
4. University of Minnesota Underground Space Centre, Moisture Absorption and its Effect on the Thermal Properties of EPS Insulation for Foundation Applications, A Review Analysis of Published Laboratory and Field Tests, October 1986.
5. Ojanen, T. and Kokko, E., Moisture Performance Analysis of EPS Frost Insulation, Insulation Materials: Testing and Applications: 3rd Volume, ASTM STP 1320, R.S. Graves and R.R. Zarr, Eds, ASTM International, West Conshohocken, PA, pp. 442-455, 1997.
6. Whalen, James, Performance of Molded Expanded Polystyrene (EPS) Thermal Insulation in Below-Grade Applications, Insulation Materials: Testing and Applications: 4th Volume, ASTM STP 1426, Robert R. Zarr and André O Dejarlais. Eds, ASTM International, West Conshohocken, PA, pp. 366-378, 2002.
7. Performance Guidelines for Basement Envelope Systems and Materials, Final Research Report, Michael C. Swinton and Dr. Ted Kesik, Institute for Research in Construction/National Research Council of Canada, 2005.