

Foundation Wall Systems for Houses

Authors: Eric Burnett and John deGraauw

Date: December 1997

Preface and acknowledgments

This report is the product of one of four projects on basements recently conducted by the Pennsylvania Housing Research Center (PHRC). The four reports together represent a comprehensive effort to address basement-related issues with reference to Pennsylvania in particular and the north-east in general. This report and the report entitled *Below-grade Construction: Issues and Needs* are complementary.

Financial support has been provided by:

- The Pennsylvania Department of Community and Economic Development (DCED);
- The Pennsylvania Builders Association (PBA);
- The individuals, associations, and corporations that are members of the PHRC;
- The Hankin Endowment; and
- The Pennsylvania State University.

Foundation Wall Systems For Houses is intended for builders, developers, homeowners, and others who are interested in the sub-grade aspects of house construction—especially foundation wall systems. Current practice, recent developments, and even newer foundation wall systems are assessed from as comprehensive a perspective as possible. Any report that identifies and compares competing commercial products is likely to spark some controversy. We realize that cost estimates will vary with place and time and that relative differences in cost may be inaccurate or non-representative. While we have tried to be as objective and fair as possible, some of our conclusions are unavoidably subjective. In advocating improvements, we are building on past good practice and seeking to promote better housing.

This document was developed by Dr. Eric Burnett and Mr. John P. deGraauw. Valuable assistance was given by the following individuals and corporations and associations:

Mr. Mike B. Lacher of the CertainTeed Corporation

Dr. Jim Work and Mr. N. Scott Qualls of Armstrong World Industries Inc.

Mr. John Morgan, who responded on behalf of the Pennsylvania Concrete Masonry Association.

We had worthwhile discussions and useful feedback. Thanks are due to each of these individuals for their time, interest, and patience. The assistance of Michelle McMullen and Angela Burnett in producing the final version of the report is also appreciated.

The PHRC is responsible for producing this report. We welcome questions or other feedback.

E. F. P. Burnett

Director

Executive Summary

This report is the product of one of four projects on basements recently conducted by the Pennsylvania Housing Research Center (PHRC). The four reports together represent a comprehensive effort to address basement-related issues with reference to Pennsylvania in particular and the north-east in general. This report and the report entitled *Below-grade Construction: Issues and Needs* are complementary.

The objective of the project was to identify, evaluate, compare, and document the various foundation wall systems that are now available, or soon will be available. The scope of this work was limited to full-height foundation wall systems for new single-family housing in Pennsylvania. The information presented in this report is also relevant to areas in North America where building practices and the climate are similar to those of Pennsylvania.

Foundation Wall Systems For Houses is intended for builders, developers, homeowners, and others who are interested in the sub-grade aspects of house construction—especially foundation wall systems. Current practice, recent developments, and even newer foundation wall systems are assessed from as comprehensive a perspective as possible.

This report:

- describes the enclosure elements in a foundation wall system
- identifies available, or soon to be available, foundation wall systems
- documents the characteristics of a representative uninsulated 10" concrete masonry foundation wall, as well as five other types of wall system:
 - traditional cast-in-place concrete systems
 - a precast concrete system
 - concrete systems using stay-in-place insulating formwork (ICF)
 - concrete systems with PVC encapsulating forms
 - preserved wood foundation wall systems (PWF).
- compares and critically assesses the various types of foundation wall system on the basis of various key attributes.

This study turned out to be longer and its findings more provocative than anticipated. The reason was that a number of developments are occurring, and both change and improvement are inevitable with the below-grade portion of new houses.

One conclusion was that it would be incorrect to say that the non-habitable, uninsulated, and unfinished concrete block basement or cast-in-place concrete walls represent the status quo in Pennsylvania. The inroads that the ICF system and one precast concrete wall system have made are indicative of changes in practice and, probably, consumer demand. Furthermore, the concrete industry, particularly with block and ICF systems, has

been actively promoting better basement walls.

From a purely technical standpoint, the “best” basement wall system is one that simultaneously and integrally:

- satisfies all the functional requirements related to interior and exterior finish, control (especially of heat, air and moisture flow) and support; and
- complies with all the relevant attributes, especially that of cost.

One example of a technically “best” type of system is a multi-cell, extruded-PVC, encapsulating form system. This fully integrated, encapsulating approach has much to commend it, and the opportunity exists to develop similar wall-forming systems, possibly with different materials.

The Superior Advanced Wall System, a precast concrete system, was developed and is readily available in Pennsylvania and seems to be an excellent choice for the potentially habitable or habitable basement market. Any problems that have arisen with this particular system appear to be solvable through better quality control both in the plant and on site.

The many insulated concrete formwork (ICF) systems have, with the support of the concrete industry, become quite popular, as they can also be used for above-grade walls. These systems have considerable merit and, with the adoption of the MEC, should become even more common. The need for the builder to provide finish materials on both sides has been identified as an issue, but this is not necessarily a drawback. The builder retains the flexibility to choose the finish and to choose who does it and how and when it is done.

The one critical concern, not only with ICF systems but also with exterior insulation, that must be addressed is the use of foam insulation and the risk of termite infestation. Although the dimensions of this issue have still be to quantified and documented, there is enough evidence to reveal its seriousness. This issue needs to be assessed immediately if a lot of grief—political and economic—is to be avoided. The issue, of course, goes beyond ICF form systems and has serious implications for the foam insulation industry.

Properly insulated and finished, both concrete block and the cast-in-place concrete systems can certainly perform more than adequately as basement-wall systems. Indeed, by adding the necessary finish and control elements, a “best” solution can be constructed from concrete masonry, cast-in-place concrete, or precast reinforced concrete. The problem that these concrete systems face is the fact that many other foundation-wall systems are (or are becoming) available, and they incorporate many competitive features. In time there must be a swing away from the unfinished, uninsulated concrete block or plain concrete wall. The concrete block industry in Pennsylvania has acknowledged this fact and is developing systems to meet the needs of the builder and the homeowner.

One challenging issue does emerge from this report: why shouldn't more of these new developments be taking place in Pennsylvania? The precast concrete Superior Wall system originated in Pennsylvania, and many of the variants of ICF systems were developed in the US. Nevertheless, at present, most of the ground-breaking new systems are being developed elsewhere. The Blue Maxx and the Durisol systems originated in Switzerland, while the newer, improved versions of the Blue Maxx—probably the most versatile ICF system—and the Durisol system as well as the Royal system were all developed in Canada. The basement issues considered in this report are relevant to the north-east and north-central states, home to more than 60 million Americans. This would seem to provide an opportunity for some enterprise.

