PHRC Report#41: Creep Behavior of Composite Structural Insulated Panels

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BACKGROUND:

Structural insulated panels (SIPs) are being developed as an alternative structural system to conventional framing for residential and light commercial buildings. SIPs also have applications as foundation systems, refrigeration wall systems, and curtain walls covering timber frame and light frame construction. SIPs are constructed with a rigid insulating foam core (typically urethane or expanded polystyrene (EPS)) sandwiched between two facings or skins (typically oriented strand board (OSB)). SIPs show distinct advantages in thermal insulation qualities, the ability to provide desirable architectural features, and speed of installation when compared to other types of wood building construction. It is for these reasons, plus their exceptional short term structural capabilities, that SIPs are of increasing interest to both consumers and builders.

Evidence shows that this stress skin building product can capture increasing market shares. Because of the increasing use of the product and the documented growth in sales, it is becoming increasingly important to investigate and document the long term structural behavior of wood-foam SIPs. To date no data exist that demonstrates or predicts the creep behavior of wood- foam SIPs under sustained flexural loads at normal or at elevated temperatures and moisture conditions.

OBJECTIVES:

The objectives of this portion of the research were to:

- Measure the long term midspan deflection of 24 - 114 mm (4-1/2 in) thick SIPs with OSB faces and both urethane and EPS cores under sustained flexural loading
- Test the suitability of a power law model to predict the primary and secondary relative creep behavior of OSB/foam SIPs for a three month load duration.

The remainder of this research, as described in the progress report, will define simplified models for use in the prediction of the long term SIP behavior under flexural loads.

WHAT IT MEANS TO YOU:

This project will be the first of its kind to describe the time dependent behavior of SIPs under long term flexural loads. With this information, engineers, architects, designers and researchers will have the basis for

the development of a design tool to describe SIP behavior for various combinations of panel core thicknesses, core types, load duration's and stress levels.