Innovative Assemblies Demonstration Homes Plan

Task 4.1 Report

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Legal Notice

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Task 4.1 – Innovative Assemblies Demonstration Homes Plan

Background

The first technical task (Task 2) of the "Energy Efficient Mold-Resistant Building Assemblies and Construction Practices for California Homes" project was to perform a situation analysis of mold problems and state-of-the-art methods of addressing these problems in the residential new construction market in California. The overall goal of Task 2 was to identify the most challenging mold problems facing California builders and recommend potential solutions for detailed laboratory evaluation and possible use in demonstration homes to be built by the two participating builders. Based on discussions with Commission staff, the project team, Project Advisory Committee (PAC) members, and building industry experts, the highest value areas for this project to address with laboratory testing were drainage plane design options (especially around windows), concrete slab installation practices and materials (especially vapor retarder location and fill materials), and drying times for built up wall assemblies.

This focus was intended to provide defensible, repeatable results that advance the understanding of overall wall system performance. Components and subsystems have been tested for mold growth and impact of moisture by building scientists, universities, and manufacturers. The recommended focus built on that testing to provide a better understanding of the behavior of the entire wall assembly as well as collect unique data on the performance of wall cavities and materials as a part of a complete assembly. This approach also allowed flexible and innovative configurations of materials and installation methods to be tested using a combination of available test protocols and new test methods developed specifically to meet project goals.

Laboratory tests and protocols developed in conjunction with project team members, builders, PAC members, Commission staff, and industry consultants were summarized in the Laboratory Evaluation Test Plan (Task 3.1). The test plan provided the initial framework for laboratory evaluations. Based on experience gained during the performance of laboratory tests, the project team updated test goals, protocols, facilities, and test matrix to maximize the value of each test. Under Tasks 3.2 through 3.4, the project team performed a systematic laboratory evaluation of conventional and innovative residential building materials, assemblies, and construction practices identified in Task 2.4. Task 3 laboratory evaluations were designed to provide experimental evidence of moisture loading, propensity for mold formation, and potential performance improvements associated with innovative building assemblies and construction practices. These tests generated empirical data using existing and newly developed test protocols intended to permit replication by other testing organizations and to provide a technical basis for demonstration home design recommendations, builder guidelines, and future revisions to Title 24 energy efficiency standards. Under Task 3.7, the project team worked closely with the participating builders and manufacturers to identify and recommend mold-resistant building systems and construction practices that participating builders will use in the Task 4 demonstration homes.

Goal

The goal of Task 4.1 was to generate drawings and specifications necessary to incorporate innovative assemblies and construction techniques into the demonstration homes.

Scope

The scope of Task 4.1 was to provide input to participating builders as they develop plans and specifications for the demonstration homes that incorporate innovative assemblies and construction techniques into the demonstration homes. Designs include identical building assemblies to compare

costs, and different assemblies to demonstrate a larger number of innovations. The deliverable for this task is the builder design drawings and specifications for each demonstration home.

Approach

The project team reviewed the list of recommended building assemblies and construction practices identified in Task 3.7 with the participating builders and manufacturers to identify any necessary changes to the builder's current drawings and specifications. Based on interactions with the participating builders, all demonstration home recommendations will be handled in the field without modifying architectural drawings and specifications or changing engineering reports. Builders will coordinate with code inspectors, contractors, and product manufacturers to obtain the necessary materials and detailed installation instructions, integrate into construction schedules, and provide sufficient information for code compliance. The final as built drawings will reflect field changes as required by the building officials.

John Laing Homes Inland Division will build a total of six demonstration homes as a part of the Secret Garden development in Chino, California. Two will include only modifications to the concrete slabs, and 4 will include modifications to the wall assemblies and selected interior spaces. In addition, 2 baseline homes will be monitored to help evaluate the impact of concrete slab installation procedures and materials on slab performance. The Concrete Slab Demonstration Homes Plan is summarized in a separate report.

Clarum Homes will build a single demonstration home as a part of a Zero Energy Homes development in Watsonville, California. The home will be joist construction on built up foundation, and will not include any concrete slab construction features. It will be frame construction, and will incorporate selected innovative assemblies that are compatible with Zero Energy Home construction materials and practices used by Clarum.

For field modifications, sufficient technical information and support is being provided by each participating manufacturer to ensure a successful installation and to provide incremental installed cost data. Data acquisition system specifications for the demonstration homes were developed by the project team in conjunction with participants from the concrete industry to allow the builder to provide the necessary homeowner disclosures prior to construction.

Innovative Assemblies Homes Plan

Table 1 provides information on the materials and installation practices for the four John Laing Homes Inland Division Innovative Assemblies Demonstration Homes. Table 2 provides similar information for the Clarum Homes Innovative Assemblies Demonstration Home.

Concrete slab seats (3/4" deep) will be designed into the footings at sliding doors in one demonstration home to determine the cost and installation issues associated with providing a back dam for door sills.

Different housewrap options will be used on each of the demonstration homes. In all housewrap installations, ASTM E 2112-01 Method A1 will be used, with alternative sill flashing options installed in accordance with the 2005 draft of ASTM E 2112-01R. Caulking with backer rods will be installed around all windows.

Housewraps will include Tyvek® Housewrap, Tyvek® StuccoWrap™, and Styrofoam® Weathermate Plus®. This approach will allow comparison of installed cost, including materials, taping, labor, and trade coordination. Different window flashing systems will be used, including Dupont™ FlexWrap™, Dupont™ StraightFlash™, Pella® SmartFlash™, SureSill™ sill pan flashing, and Fortifiber Moistop E-Z Seal® and FortiFlash® flashing systems. Flashing will be taped to the housewraps to the extent permitted by code.

Table 1 John Laing Inland Division Innovative Assemblies Demonstration Homes Materials and Contacts

Supplier	Product/Service	Contacts
Broan-Nutone LLC	Continuous Duty Bath Fan/Lights	Terry Pond, Kevin Morris
Dow Chemical	Housewrap, Tape, Foam Sealant, Engineering Support	Doug Bibee, Mel Rasco, Bob Braun
Dri-Eaz	Construction Drying System, Engineering Support	Darren Hudema
DuPont Nonwovens	Housewrap, Tape, Flashing, Engineering Support	Theresa Weston, Brett Lubsen
Fortifiber Building Systems Group	Building Paper, Flashing, Engineering Support	David Olson
Foster Products	Fungicidal Protective Coating, Engineering Support	Troy Anderson
Pella Corporaton	Flashing, Engineering Support	Cordell Burton
SureSill	Sill Pan, Engineering Support	Mishko Teodorovich
Tamarack Technologies, Inc.	Ventilation Fan Controllers, Engineering Support	Paul Raymer
USG	Mold-Resistant Gypsum Panels, Engineering Support	Paul Shipp

Table 2 Clarum Demonstration Home Materials and Contacts

Supplier	Product/Service	Contacts
Broan-Nutone LLC	Continuous Duty Bath Fan/Lights	Terry Pond, Kevin Morris
Dow Chemical	Foam Sealant, Engineering Support	Bob Braun
DuPont Nonwovens	Housewrap, Tape, Flashing, Engineering Support	Theresa Weston, Marc Silveira
Tamarack Technologies, Inc.	Ventilation Fan Controllers, Engineering Support	Paul Raymer
USG	Mold-Resistant Gypsum Panels, Engineering Support	Paul Shipp

Stucco treatments will include bond breakers at weep screeds and control joints to permit liquid water to drain effectively. Installation methods and materials will be coordinated with the Lath and Plaster Institute of northern California.

John Laing Homes Inland division plans to use an acrylic coating on stucco walls to reduce cracking. This practice will be coordinated with the Lath and Plaster Institute of northern California to ensure the drainage plane and moisture flow paths are not compromised.

Dri-Eaz will provide construction drying services to at least one additional demonstration home to be scheduled based on weather conditions. Energy usage, schedule impacts, and site conditions will be monitored during the drying process to determine the benefits and costs.

A demand ventilation strategy will be incorporated into at least one of the demonstration homes. This strategy will focus on the bathroom and will automatically operate the exhaust fan whenever humidity conditions exceed the setpoint. The cost and homeowner acceptance of this technology will be evaluated.

Foster® 42-42™ mold-resistant sealer will be applied to at least one of the demonstration homes on selected concealed shear walls and studs to evaluate the incremental cost and impact on construction schedule.

USG HUMITEK™ mold-resistant gypsum panels will be installed in the utility room of one or more of the demonstration homes depending on manufacturer and builder support. In addition, USG Fiberock® moisture-resistant gypsum panels will be installed in shower areas of one or more demonstration homes to compare its cost and ease of use to conventional paper-faced “greenboard.”