

Next Generation of Software Tools

Wall Wizard : DRYVIT

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Dryvit Systems Inc

**Oak Ridge
National Laboratory**

Presentation Layout

- **Development Need**
- **Approach - Challenges**
- **Imbedded Needs**
- **Functionality**
- **Conceptual Design**

WALL WIZARD



DEVELOPMENT NEED



It had to
Include
a Dumb proof
approach
to avoid
miscreations

TECHNOLOGY

- **Powerful Hygrothermal tools have appeared**
- **Engineers & Architect lack training in Building Science (This translates in \$\$\$\$\$\$ for all of u)**
- **Adoption cycles for new technology is very very slow for building industry (5 to 20 years)**
- **A hygrothermal stick for comparison was non-existent**
- **MOISTURE ENGINEERING has MATURED (Ready)**

Approach: MOISTURE ENGINEERING

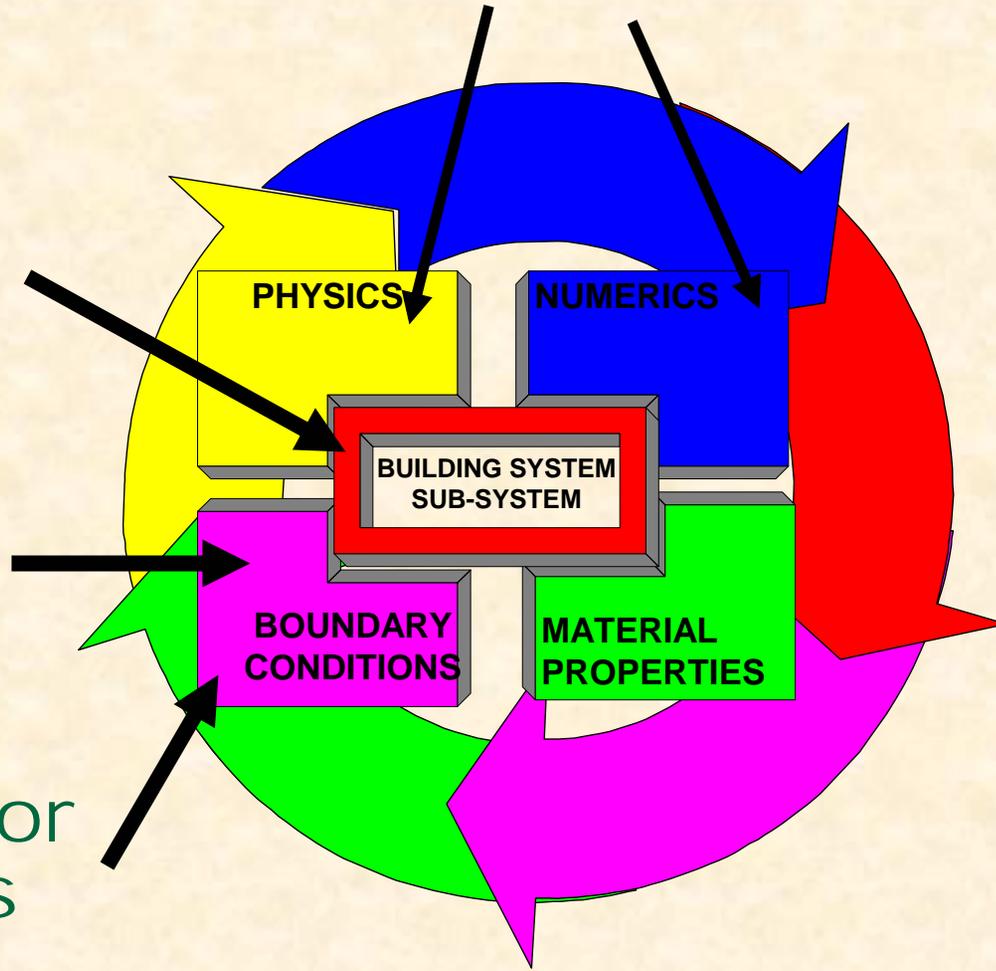
MOISTURE-EXPERT

Inputs:

3-D
Thermal
Drainage
/Tests

Exterior
Loads

Interior
Loads



Constraints: Make Complex Process SIMPLE

- At least 2-Dimensional Transient MODEL
- Heat transport, vapor transport, liquid transport, air transport
- Capture natural convection, wind driven rain,
- Evaporation/condensation and freeze/thaw latent transport,
- Air Ventilation, Drainage, Radiative exchange
- Full material dependencies of material properties
- Hysteresis or temperature dependencies
- Solar radiation, night-time radiation exchange and cloud interference.

Challenge: Never Done Before

APPLICATION : WALL WIZARD

- **EIFS Moisture Engineered Wall Systems**
- **Multiple assessment criteria**
 - **Three assessment elements**
 - **Exterior/Interior Load Assessment**
 - **Energy Consumption Comparitor**
 - **Wall Wizard Selector**
- **Professional Report Document**

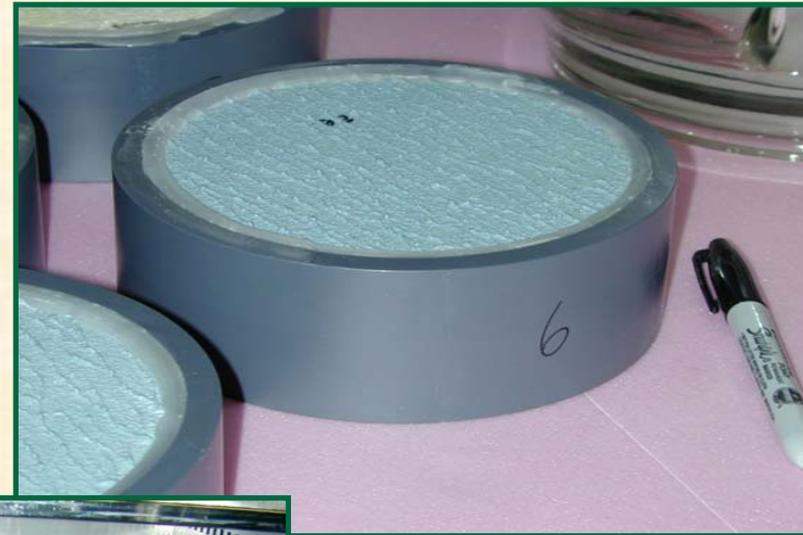
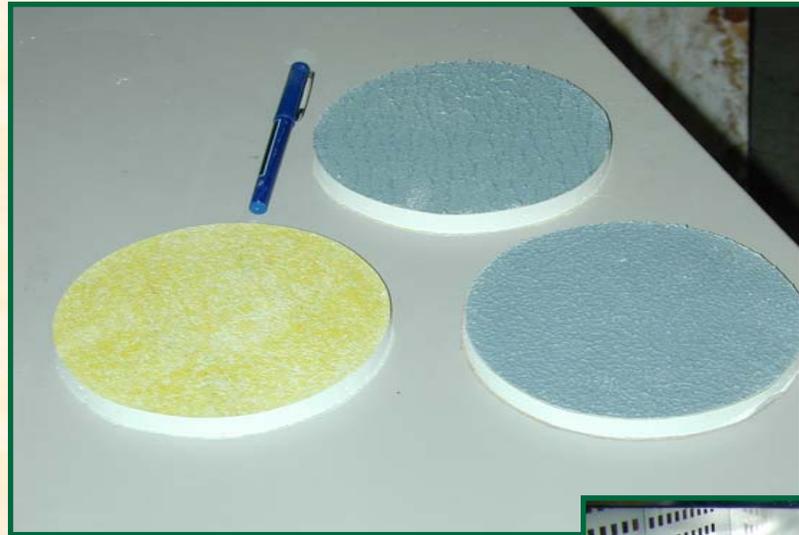
Inputs

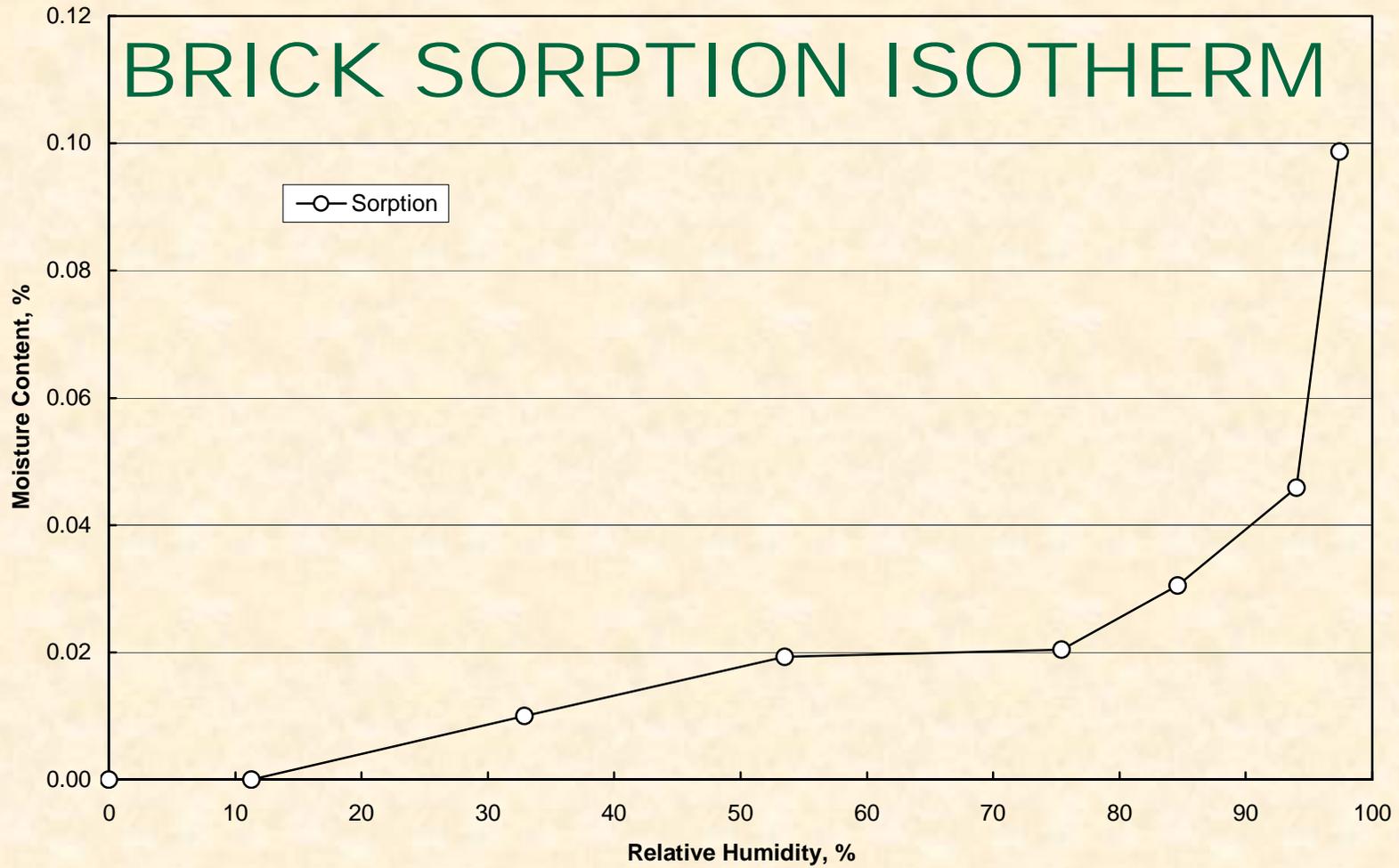
MATERIAL LEVEL INPUTS

All hygrothermal material properties measured

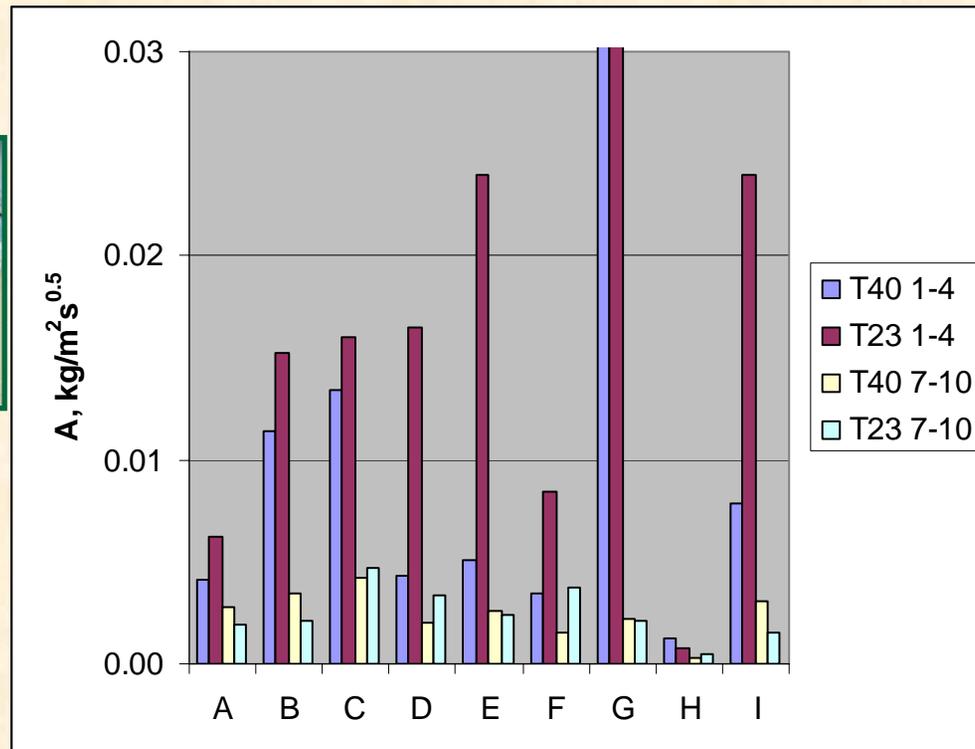
- **WVP (at two temperatures)**
- **Liquid Diffusivity (at two temperatures)**
- **Sorption & Suction Isotherms**
- **Thermal Conductivity measurements**

WATER VAPOR TRANSMISSION





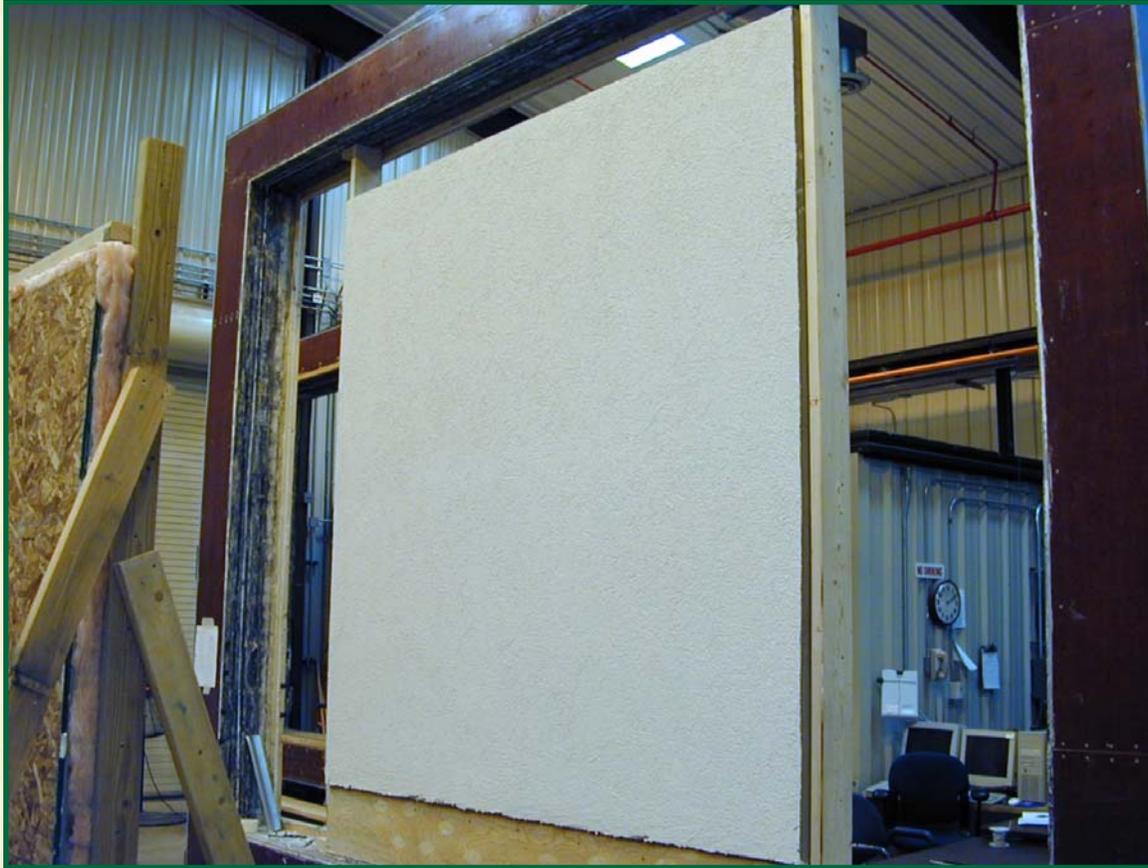
LIQUID UPTAKE RESULTS



System Level Test

HOT BOX

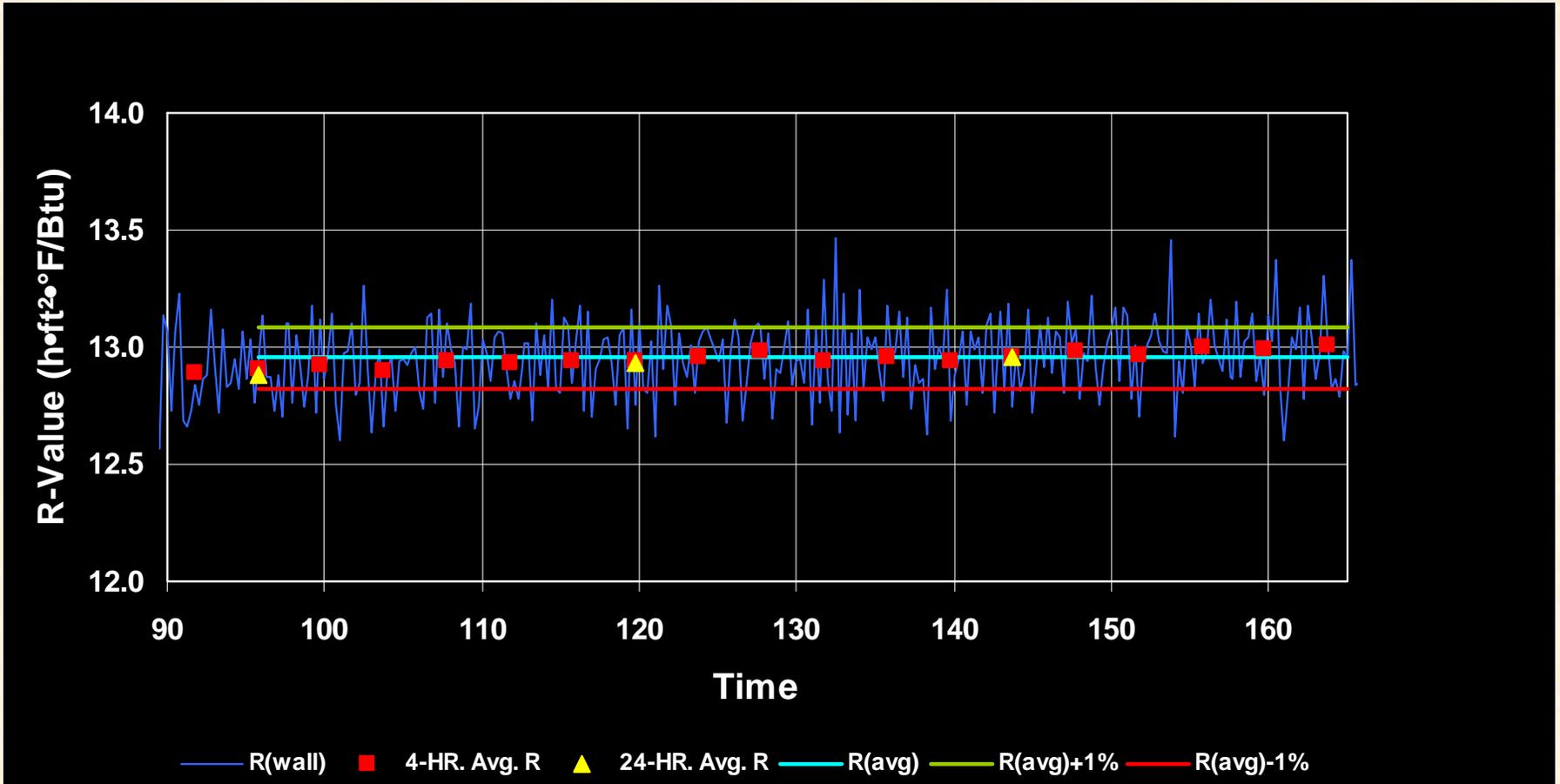
EIFS WALL



HOT BOX RESULTS

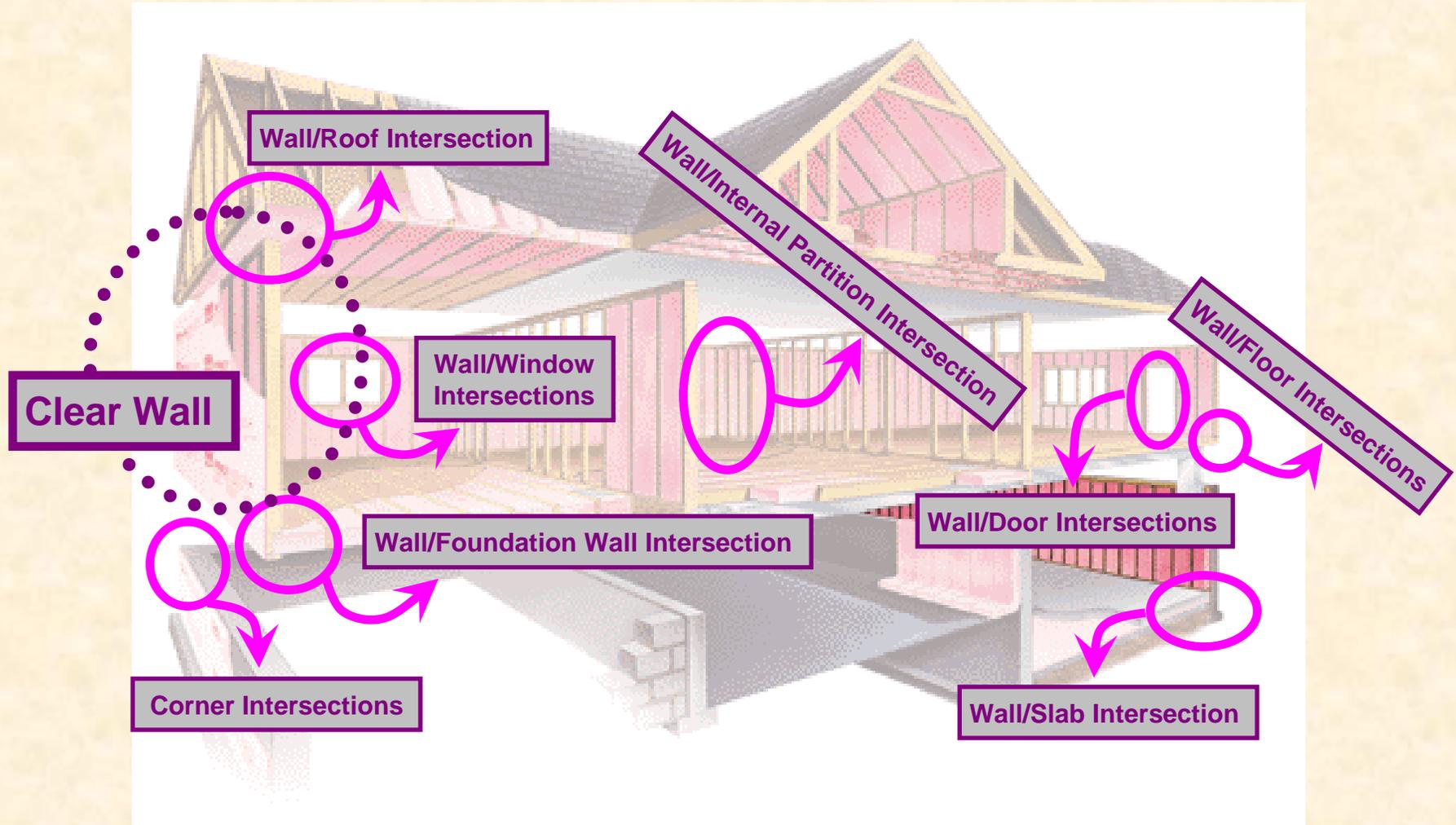
Steady-State R-Value

Interior Side Temp = 100°F; Exterior Side Temp = 50°F



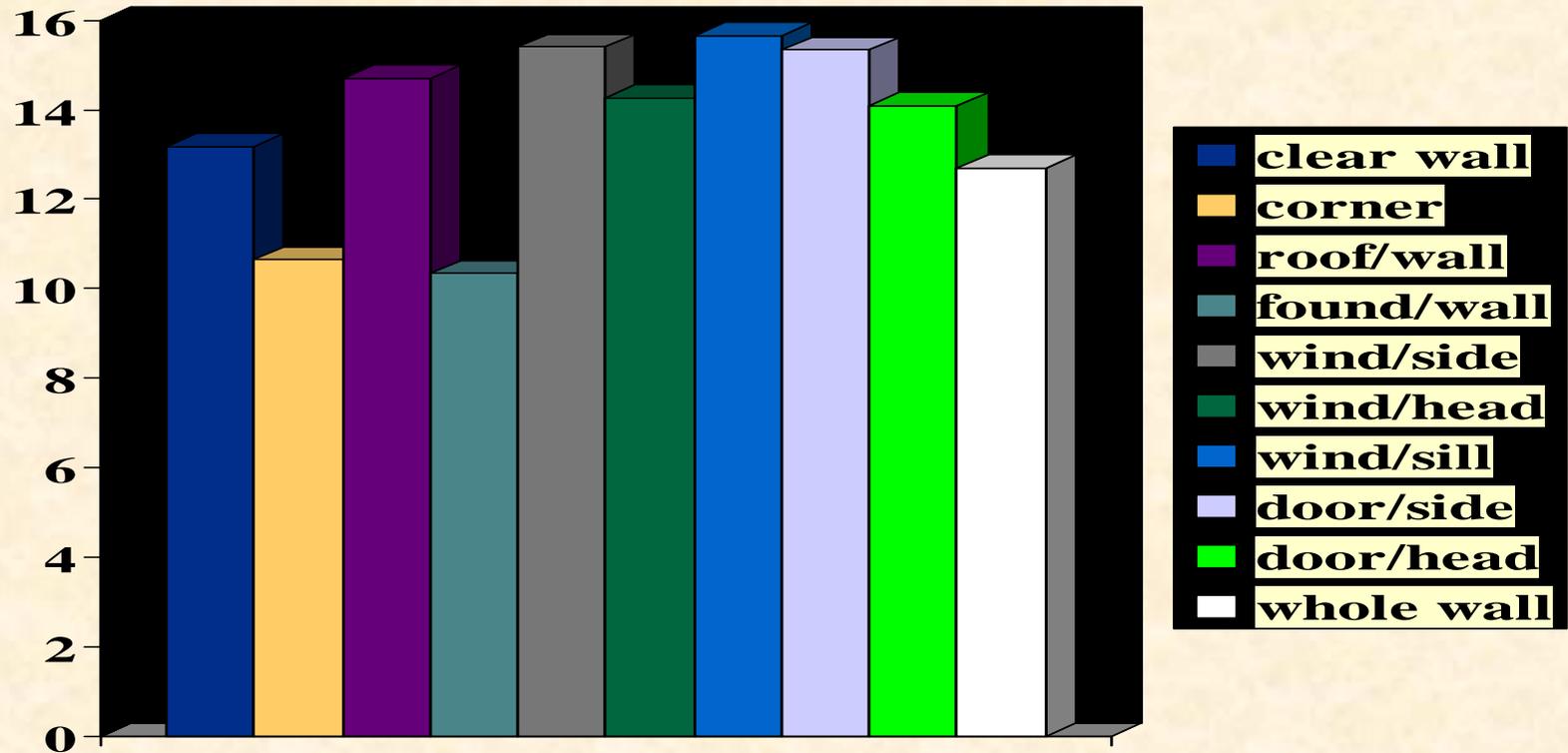
NEXT STEP

Numerous Architectural Components

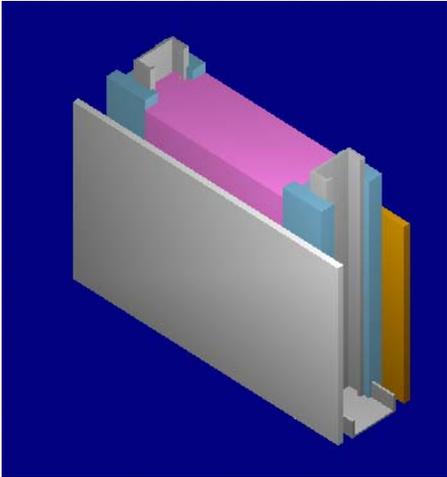


3-D Thermal Analysis (Kosny)

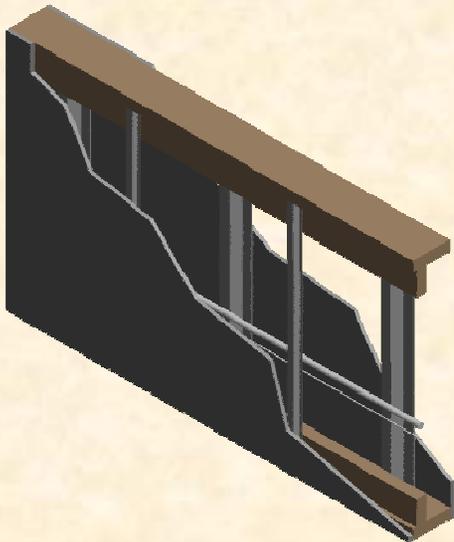
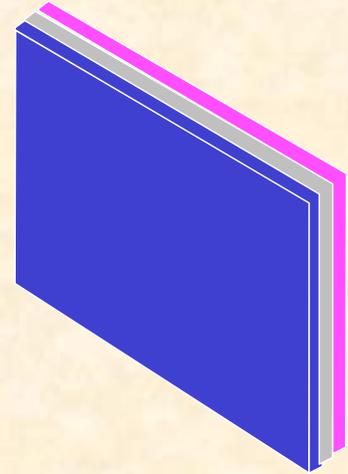
WALL SYSTEM R-VALUES



3D to 2-D and 1-D Equivalent Wall Generator



3-D => 1-D



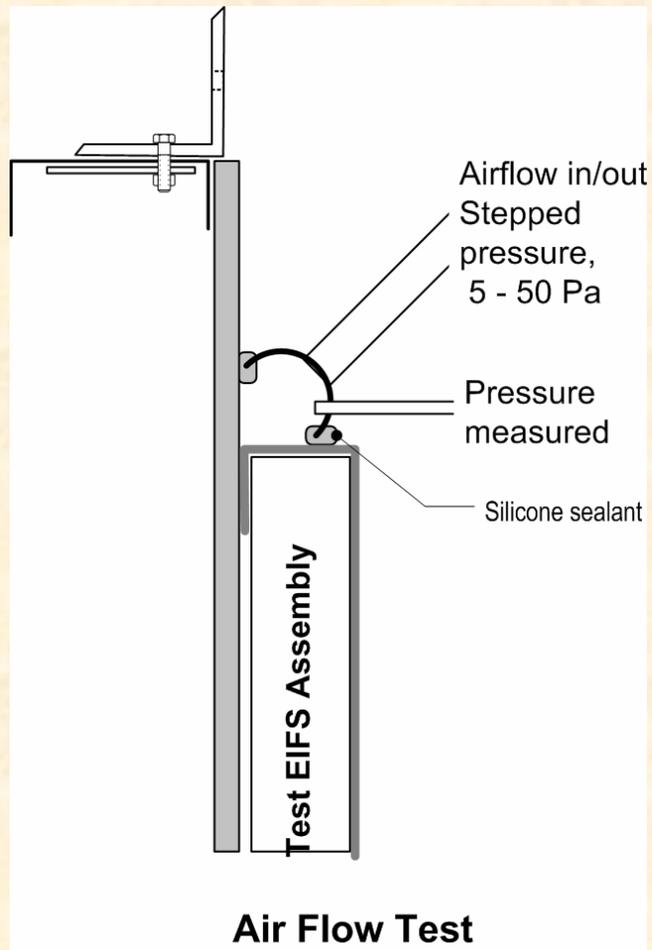
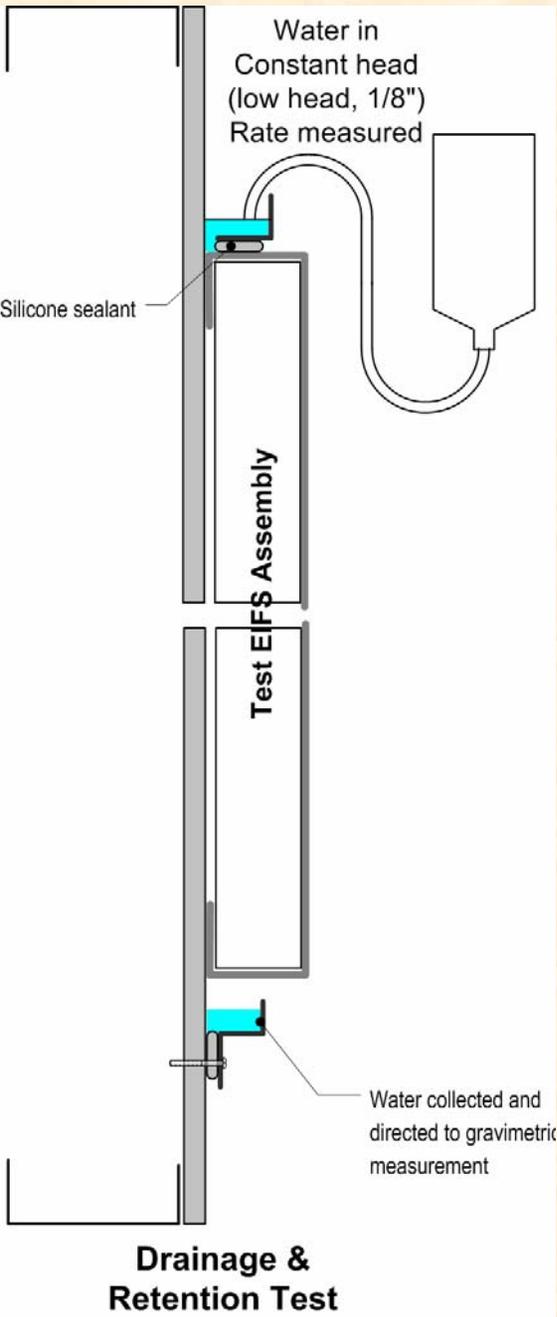
3-D air flow & Drainage analysis

Building Envelope System and Sub-systems

Quantify

- **airflow** through walls
- **drainage** and **retention**
- **drying** of drain space
- **drying** of stud space

(Dr. Straube
& Karagiozis)



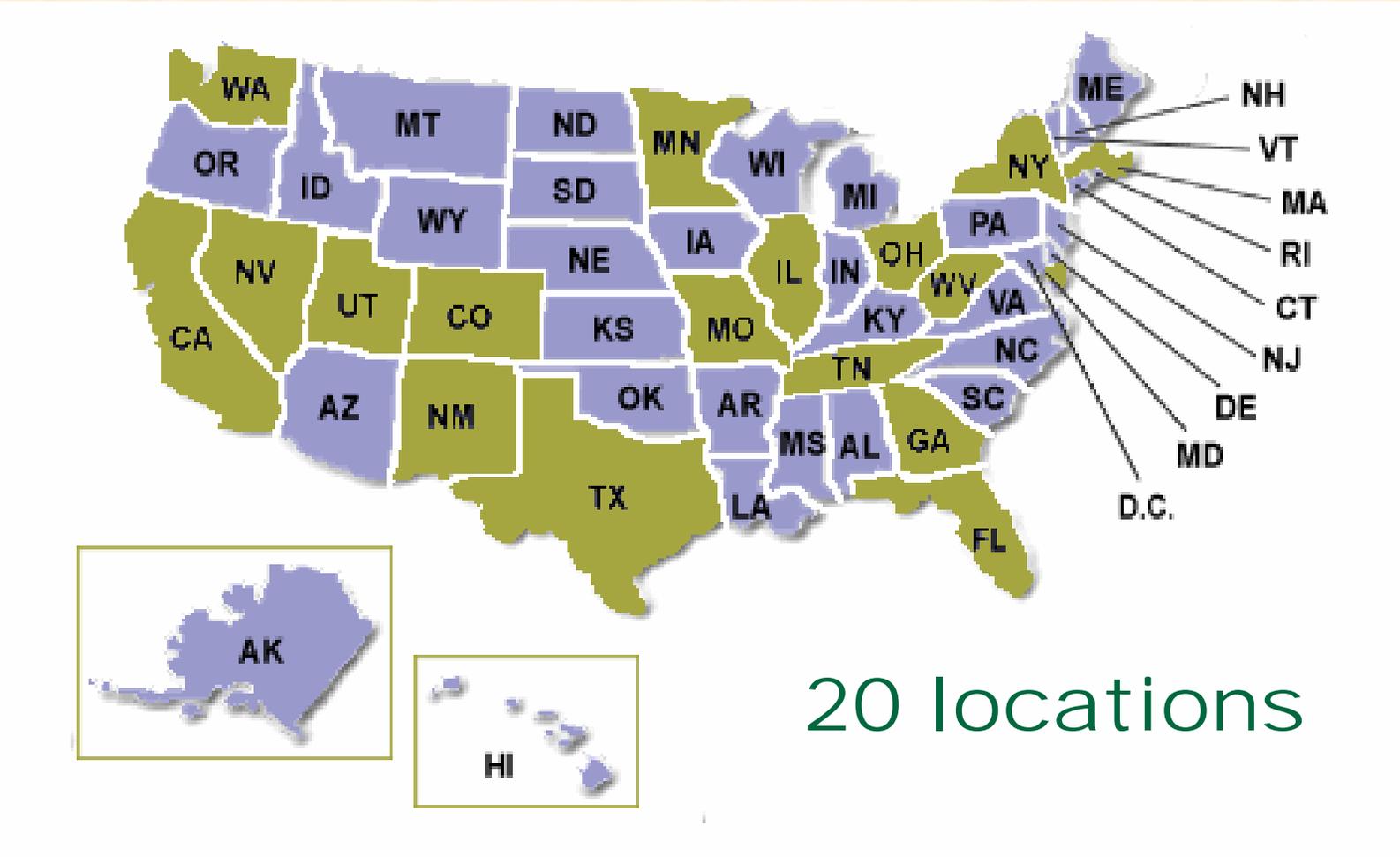
Environmental Conditions

100 locations



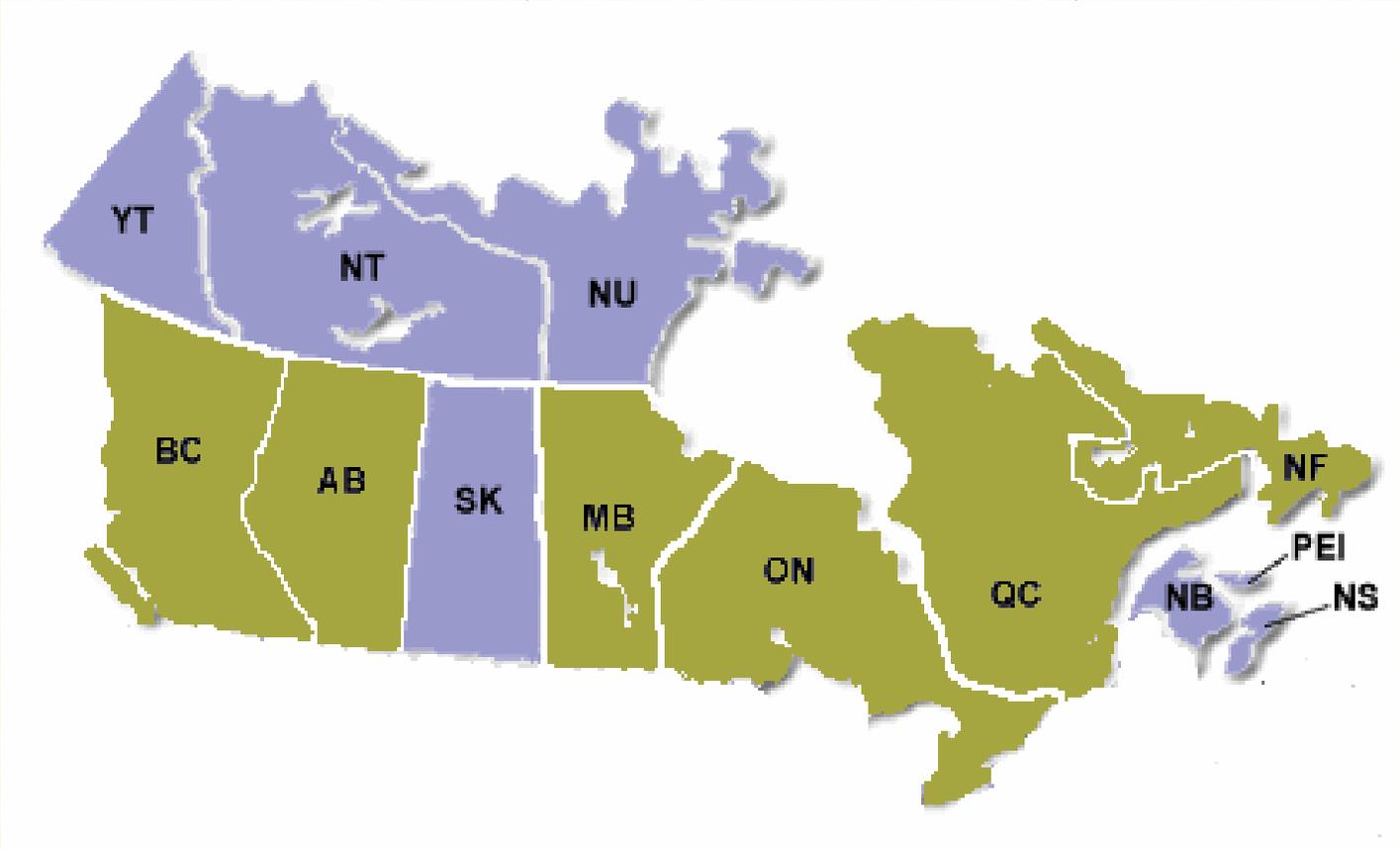
WALL WIZARD

USA

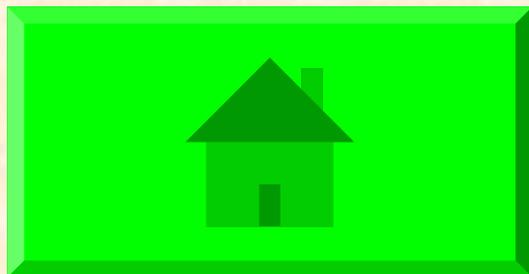


Wall Wizard & Environmental Loads

Canada (7 Locations)



Software Launch



Conclusions

- **New Class of Wall Selection Wizard (Software)**
- **Very Easy to Use**
- **Most Moisture and Thermal Engineered Analysis Available**
- **Promotes innovative “Highly Energy Efficient wall system” and has potential to reduce adoption time**
- **Optimizes the available expertise's (EXPERT SYSTEM)**