RESNET ANNUAL CONFERENCE FEBRUARY 20, 2007





FIRST SOME CONTEXT...



If you're in the home building business... your world has changed!

CHANGING WORLD...





CHANGING WORLD: INTEREST IN ENERGY EFFICIENCY





CHANGING WORLD: INTEREST IN ENERGY EFFICIENCY



Small Cars in Focus As Gas Prices Rise

By MATT MOORE The Associated Press Tuesday, September 13, 2005; 11:52 AM Power Information Network expects the number of compacts and sub-compacts on the U.S. market grow to grow from 33 this year to 40 in 2010.



CHANGING WORLD...





CHANGING WORLD: BUILDER LIABILITY: OLD STORM





Courtesy of Building Science Corp.

CHANGING WORLD: BUILDER LIABILITY: NEW STORM





CHANGING WORLD: BUILDER LIABILITY: NEW STORM



Defects no longer hidden...



02/15/93 INFRAMETRICS 260 BB 20:41:59

poor sealing at window opening

no insulation

leaky sill plate



at partit.

supply duct at exterior wall

poor insulation at light boxes

2.5°C IMAGE MODE BAT=11.4VOLTS +12.5°C

CHANGING WORLD: BUILDER LIABILITY





Panasonic

AW-E650 1/2-Inch 3-CCD Convertible System Camera with Extreme Low-Light Sensitivity, Built-In Filters and Infrared Total Darkness Vision <u>More Info</u>

Mfr # AWE650 + B&H # PAAWE650

Availability : <u>Accepting Orders</u>

Add to Cart



Quantity 1

Price : \$ 4,099.95 ⇔Shipping Cost

Add to Wishlist

CHANGING WORLD: BUILDER LIABILITY





CHANGING WORLD: BUILDER LIABILITY



Liability insurance is scarce and expensive

"If you deliver a safe, durable and efficient home, you typically won't be sued." Stan Luhr, Risk Auditor

CHANGING WORLD...



• Interest in Energy Efficiency

• Builder Liability

• Customer Satisfaction







Reliability Quality of the Home Energy Efficiency

Durability



JD Powers and Assoc. 2005 Builder Quality Rankings

	Market	2005		
	Maior Market Total	112	Raleigh/Durham	113
		erry	Seattle/Tacoma	113
erenor sta	Austin	122	Denver/Colorado Springs	111
Energy Sta	Orange County (CA)**	122	San Diego	111
Energy Sta	Sacramento	120	San Francisco Bay Area	111
CHENGY STA	Houston	118 📻	Portland*	109
Energy STA	Tucson	118	Atlanta	108
Energy STA	Dallas/Ft. Worth	117 🔄	Detroit	108
Completion State	Los Angeles/Ventura Counties**	116	Ft. Myers/Naples	108
Commit Sta	Minneapolis	116	Palm Beach	107
	Charlotte	115 📻	Baltimore*	106
	Chicago	115	Albuquerque*	104
	Tampa	115 🐖	Orlando	104
er the	Phoenix	114 📻	Washington, D.C.	104
anth	Inland Empire (CA)**	113	Philadelphia	101
anti	Las Vegas	113	Jacksonville	98
- 40 Mar - 310				





Find Your Home Where do you want to live? Select a state to begin your search. SELECT STATE:





Ready to Move

Sign up to receive email updates on available homes.



-80% of New Homes Buyers use the Web before purchasing a new home

CHANGING WORLD...





CHANGING WORLD: LEADERSHIP SHOWS





WHY, HOW, AND WHERE HEADED?





WHAT IS ENERGY STAR?



The national, US government-backed



energy efficiency

while assuring same or better performance

GROWING BRAND TO PROTECT





WHAT IS ENERGY STAR FOR HOMES?



Voluntary • Truly Energy Efficient • Builder Recognition Government-Backed Label Third-Party Verified Awards

COST-EFFECTIVE





ASSURING BETTER PERFORMANCE



Unless you're prepared to break the laws of physics, energy efficiency delivers: • Lower Utility Cost More Comfort More Durability • Improved Indoor Air Quality • Protect Environment

RESULTS: 700,000+ HOMES





RESULTS: MARKET PENETRATION





ENERGY STAR FOR HOMES METRICS



• 700,000+ Labeled Homes Cum.

>25 Markets >20% Penetration

• 3,500+ Builder Partners

• 60%+ 100 Largest Builders

WHAT OLD SPEC DELIVERED...





OLD SPEC FIELD OBSERVATIONS...




















Cool

Residual warmth from heat run Cantilever boundary clearly visible

Insulation will not stop air flow

Courtesy of Advanced Energy







ThermaCAM[™]

Trefl=68.0 Tatm=68.0 Dst=6.6 FOV 24 1/11/03 6.46.10 AM -40 - +250 e=0.96

69.2

°F

74

68

WHY, HOW, AND WHERE HEADED?





NEW SPEC: PERFORMANCE PATH



HERS Index Threshold: • 80 in North • 85 in South Note: Exceptions are CA, OR, WA, HA and Manufactured Housing

NEW SPEC: PERFORMANCE PATH REQTS.



Insulation inspection for full R-value
Thermal Bypass Inspection Checklist
Right-sized" cooling equipment

Leakage < 6 cfm to outdoors/100 sq. ft.

- Min. 1 ENERGY STAR Product category
- No on-site power generation trade-off
- Max. 20% screw-in CLF light sockets

• Programmable thermostats with heat pumps must have "Adaptive Recovery"

NEW SPEC: PRESCRIPTIVE PATH





INSULATION VALUE KILLERS





THERMAL BYPASS PRINCIPLE





THERMAL BYPASS IN ACTION





WHAT THERMAL BYPASS LOOKS LIKE





THERMAL BYPASS CHECKLIST: 1. INSULATION ALIGNMENT





THERMAL BYPASS CHECKLIST: 1. INSULATION ALIGNMENT





THERMAL BYPASS CHECKLIST: **1. INSULATION ALIGNMENT**







THERMAL BYPASS CHECKLIST: 2. SHOWER/TUB EXTERIOR WALL





Courtesy of Building Science Corp.

THERMAL BYPASS CHECKLIST: 2. SHOWER/TUB EXTERIOR WALL







THERMAL BYPASS CHECKLIST: 3. INSULATED FLOOR OVER GARAGE





Improper insulation! It must touch the surface it is intended to insulate

THERMAL BYPASS CHECKLIST: 4. ATTIC KNEE WALLS





Courtesy of Building Science Corp.

THERMAL BYPASS CHECKLIST: 5. ATTIC ACCESS PANEL/STAIRS





I mages courtesy of Energy Services Group

THERMAL BYPASS CHECKLIST: 5. ATTIC ACCESS STAIRS





THERMAL BYPASS CHECKLIST: 6. CANTILEVERED FLOOR





THERMAL BYPASS CHECKLIST: 6. CANTILEVERED FLOOR





THERMAL BYPASS CHECKLIST: 7. DUCT/PIPING PENETRATIONS





THERMAL BYPASS CHECKLIST: 7. DUCT/PIPING PENETRATIONS



Use caulk or mastic to seal the penetrations

Courtesy of Advanced Energy

THERMAL BYPASS CHECKLIST: **8. FLUE SHAFT**





THERMAL BYPASS CHECKLIST: **8. FLUE SHAFT**



TIP: Specially colored fire-rated foam now available for sealing difficult air gaps at flue openings

Courtesy of Building Science Corp.

I mage courtesy of EnergyLogic

THERMAL BYPASS CHECKLIST: 9. ATTIC EAVES





THERMAL BYPASS CHECKLIST: 9. ATTIC EAVES





I mage courtesy of MaGrann Associates

THERMAL BYPASS CHECKLIST: 10. DROPPED CEILINGS





Courtesy of Building Science Corp.

THERMAL BYPASS CHECKLIST: 10. DROPPED CEILINGS





THERMAL BYPASS CHECKLIST: 11. FIREPLACE SHAFT WALL





Courtesy of EnergyLogic
THERMAL BYPASS CHECKLIST: 11. FIREPLACE SHAFT WALL





THERMAL BYPASS CHECKLIST: 12. STAIRCASE FRAMING







Courtesy of MaGrann Associates

I mage courtesy of Energy Services Group

THERMAL BYPASS CHECKLIST: 13. RECESSED LIGHTING





THERMAL BYPASS CHECKLIST: 13. RECESSED LIGHTING





can, air-tight (ICAT) recessed fixtures.

THERMAL BYPASS CHECKLIST: 14. PORCH ROOF





THERMAL BYPASS CHECKLIST: 14. PORCH ROOF





THERMAL BYPASS CHECKLIST: 15. WHOLE-HOUSE FAN





Problem: Whole-house fan is equivalent to a ~10 sq. ft. thermal hole

THERMAL BYPASS CHECKLIST: 15. WHOLE-HOUSE FAN





Cover (min. R-5) shall open either automatically or with a simple mechanism that does not require the homeowner to climb into the attic

THERMAL BYPASS CHECKLIST: 16. COMMON WALLS





THERMAL BYPASS CHECKLIST: 16. COMMON WALLS





Courtesy of Energy Services Group

WHY CHANGE SPEC?





NEW SPEC SCHEDULE





WHY, HOW, AND WHERE HEADED?





IT'S NOT YOUR GRANDPA'S HOME



More Exposure to Mold

 Colder surfaces with more insulation
 More internal air flow and pressures

- more exhaust fans

- more forced air systems with fewer returns

- more air pathways with open framing systems

- Less drying potential

• More Exposure to Pollutants

- Lower vent gas temperatures

- Attached garages now standard
- More VOC content in materials/finishes

Less Fresh Air

- They're tighter







SHOULD BUILDERS CARE ABOUT IAQ?



• Asthma Epidemic (20 million Americans have it); ~2 million ER visits per year

• Increasing Risks of Radon >20,000 lung cancer deaths per year

• Increasing Respiratory Problems widespread indoor dampness (e.g. wet basements and visible mold)

• Chemical Pollutants EPA estimates 2-5 times more than outdoor air

Now consider this:

People spend >90% of their time indoors, and >60% in their homes!

WHAT POLLUTANTS AFFECT IAQ?



Biological pollutants

Mold & Mildew
Dust Mites & Pests

Combustion products

CO, NO2, Smoke

Radon & Soil gases
Formaldehyde
Other Chemicals
Airborne Particles

Dust, Pollen

More IAQ Info available at: <u>http://www.epa.gov/iaq/ia-intro.html</u> Or call 1-800-438-4318



Linked to health problems ranging from minor respiratory irritation to death, depending on exposure and sensitivity

House design and construction can reduce exposure risk for indoor air pollutants!

DO HOMEBUYERS CARE ABOUT IAQ?



 Moisture and mold litigation – Up [~9,000 moisture and mold court cases - American Banker, 1/03] Home moisture problem inquiries – High [30%, double the next closest subject - NAHB Research Center] • Asthma prevalence - High [19% of US households have at least 1 person with asthma - EPA] Air cleaner product sales – Up [\$1.2 Billion annual sales - Levin, 2005] Radon mitigation sales – Up [300% increase in home radon mitigations since 1990 - EPA]

CONSUMERS NEED BETTER CHOICES



IAQ RISK REDUCTION PRINCIPLES



1. Source Control

eliminate, substitute, or modify pollutant sources

2. Dilution ventilate to dilute unavoidable pollutants

3. Filtration remove targeted pollutants, last resort after source control & dilution

ENERGY STAR INDOOR AIR PACKAGE





MOISTURE CONTROL HIGHLIGHTS: WATER MANAGED ROOFS





MOISTURE CONTROL HIGHLIGHTS: WATER MANAGED ROOFS



MORE ROOF FLASHING DETAILS ...



MOISTURE CONTROL HIGHLIGHTS: WATER MANAGED WALLS





MOISTURE CONTROL HIGHLIGHTS: WATER MANAGED WALLS





Doorsil

BEST PRACTICE INSTALLATION



 Cut the hosarmup covering the range opening in the shape of a modified "Y".

Above the window opening, our a liead flap and flip up to capous shratking, and hously tupe in place

O Crulk the southide adges of the head and side justice

O Incid the window using correction resistant safe and

following monufacture ('s apocifications,

O Do not call across the all

O Fuld due side and horstony flags into the window

oponing and senate.

STEP 3 + Jose College

ion of the way.

- Apply at least a 12° flap, or speed, of building paper to beautoup just below the windows all.
- If the window sill is close to the sill plane, the spreecase restored all the way to the sill plane.
 The approx should correct as two 10² past the sides of the window opening, or to the first ratio to open wall conservation
- window operang, or to the first stud in open wall constant
 Areads only the spons's top edge with op sala.



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MOISTURE CONTROL HIGHLIGHTS: WATER MANAGED WALLS





MOISTURE CONTROL HIGHLIGHTS: WATER MANAGED FOUNDATIONS





MOISTURE/RADON CONTROL HIGHLIGHTS: WATER MANAGED FOUNDATIONS



RADON CONTROL HIGHLIGHTS: RADON RESISTANT CONSTRUCTION



ENERGY STAR Radon Risk is High in much of the U.S. Check State & local authorities for more detailed information on Radon risk in your area.



RADON CONTROL HIGHLIGHTS: RADON RESISTANT CONSTRUCTION



R

A. Gas Permeable Layer (4" clean gravel) B. Plastic Sheeting (under slab or over crawl space)

C. Sealing and Caulking (all openings in concrete floor)

D. Vent Pipe (3 or 4 inch PVC pipe) E. Junction Box (if fan needed later)

PEST CONTROL HIGHLIGHTS: TERMITE SHIELD







HVAC SYSTEM HIGHLIGHTS: DUCTWORK AIR SEALING





HVAC SYSTEM HIGHLIGHTS: HVAC CABINET/PLENUM AIR SEALING





SEALING WITH MASTIC





HVAC SYSTEM HIGHLIGHTS: PRESSURE BALANCING PROBLEM





HVAC SYSTEM HIGHLIGHTS: PRESSURE BALANCING SOLUTIONS





HVAC SYSTEM HIGHLIGHTS: DUCT BOOTS COVERED*





* Only required during heavy dust-creating construction activity

HVAC SYSTEM HIGHLIGHTS: WHOLE-HOUSE VENTILATION







FRESH AIR DAMPER

CONTINUOUS EXHAUST





DUCTED FRESH AIR SUPPLY
HVAC SYSTEM HIGHLIGHTS: WHOLE-HOUSE VENTILATION





HVAC SYSTEM HIGHLIGHTS: SPOT VENTILATION





HVAC SYSTEM HIGHLIGHTS: MERV 8 FILTER





COMBUSTION SYSTEM HIGHLIGHTS: POWER/DIRECT VENTED EQUIPMENT





POWER VENTED WATER HEATER

DIRECT VENTED FURNACE







COMBUSTION SYSTEM HIGHLIGHTS: POWER/DIRECT VENTED EQUIPMENT



COMBUSTION SYSTEM HIGHLIGHTS: CO ALARMS





BUILDING MATERIALS HIGHLIGHTS: PROTECTION





BUILDING MATERIALS HIGHLIGHTS: LOW-EMITTING MATERIALS





HOME COMMISSIONING HIGHLIGHTS: FINAL PREPARATION





ENERGY STAR INDOOR AIR PACKAGE





HOMEBUYER VALUE PROPOSITION



All this for

<\$1 a Day!

RIGES & LAS ?

Added Protection:

- wet basements
- mold and mildew problems
- radon exposure
- pests and termites
- harmful chemicals
- dust and pollen
- combustion gases

Plus Fresh Filtered Air

replaced ~8 times per day

Plus More Quality Assurance

- third party verified
- government backed-label

BUILDER VALUE PROPOSITION



Reduced Risk

Mold Litigation
Comfort Complaints
Fixing Trades Mistakes
Catching up to Competition

Improved Reputation

- Quality Builder
- Innovation Leader

What's this worth to your bottom-line?

WHERE HOUSING IS HEADED:





NEXT LOW-HANGING FRUIT



- Thermal Bridging
- Compact Ducts Inside Conditioned Space
 Efficient Water Heating/Distribution
 Efficient Lighting and Appliances
- HVAC Proper Installation
- Super-Efficient Equipment
- 'Not-So-Big' Homes



energ





ener

ENERGY STAR

Courtesy of Building Science Corp.













Courtesy of Building Science Corp.











~48 wall corners and intersections





CORNER FRAMING





Courtesy of Building Science Corp.

Courtesy of Southface Institute

INSIDE "TWO-STUD" CORNERS



WALL INTERSECTION FRAMING



Ladder T – Allows insulation in exterior wall cavity at wall intersections







ABOUT US | PRODUCTS | EMERCOR HOMES | WARRANTY & SERVICES | KNOWLEDGE CENTRE

Floors

 Insulated Rimboard Cantilever Soffit Insulated Panels
 Exterior Walls
 Foundation & Basement
 Walls
 Cathedral Ceilings & Attics
 Bonus Rooms



Insulated Rimboard

The Quick & Easy Way To Insulate The Floor Perimeter

EMERCOR's Insulated Rimboard is an integral part in building a better home, delivering comfort, health and energy efficiency to homeowners. Accounting for up to 14 per cent of a homes total air infiltration, the Insulated Rimboard eliminates air leakage and enables proper workmanship during installation. Truly a time saving material, the Insulated Rimboard turns a three-step process into one easy and sure way to install insulation at the floor system.

<u>Advantages</u> Load Table Specifications Brochure

Advantages

Energy Efficient - R 14:

Up to 14 per cent of total home air leakage occurs around the rim joist. EMERCOR's Insulated Rimboard decreases air leakage by ensuring that continuous R-14 insulation is placed around the floor perimeter.

Easy Installation - 20% Faster Install:

EMERCOR's Insulated Rimboard has a unique joining detail and installs up to 20 per cent faster than regular Rimboard. It also eliminates the nightmare of trying to insulate and seal around every floor joist.

Moisture Resistant - Type 1 Vapor Barrier:

EMERCOR's Insulated Rimboard has a vapor permeance of less than one, making it a Type 1 vapor barrier. This barrier prevents moisture condensation in the building envelope which leads to rot, mold and eventually structural damage.

Environmental - Reduce job site waste:

EMERCOR's Insulated Rimboard is engineered with a unique joining detail. This joining detail allows traditionally discarded pieces to be reused along the floor perimeter. EMERCOR's commitment to sustainability is driven through the <u>'EMERGreen Program'</u>, with an internal focus on implementing lean in both their manufacturing and office facility.




WHY SPRAY FOAM

Closed

Cell

Foam



Air Barrier

Insulation

Consider using at:

- Band Joists
- Behind Tubs/Showers
- Cantilevered Floors
- Conditioned Space Above Garage
- Party Walls (must be fire-proof)



WHY INSULATED SHEATHING



Rigid Insulation

Air Barrier + Insulation + Thermal Break

Where code acceptable, consider using at:

- Exterior Sheathing
- Attic Knee Walls
- Skylight Shafts
- Porch/House Interface







STRUCTURAL INSULATED PANELS (SIPs)

ener



WHY SYSTEMS BUILDING



Systems Building (e.g. SIPs, ICFs) Reduced Time *t* Less Waste Less Vandalism Less Subs

Air Barrier Insulation Zero-Tolerance OVE Framing *Durability*







THE SCIENCE BEHIND HOME PERFORMANCE DUCT INSIDE CONDITIONED SPACE





THE SCIENCE BEHIND HOME PERFORMANCE COMPACT DUCTS INSIDE COND. SPACE

66



16 . 10







HVAC PROPER INSTALLATION



• Right-Sized Equipment (ACCA Manuals J/S) • Engineered Duct Layout (ACCA Manual D) • Register Design (ACCA Manual T) • Duct Sealing/Testing • Refrigerant Charge • Air Flow Across Coil Air Flow Balance • Gas Equipment On Rate/Combustion Venting Dehumidification in Hot/Humid Climates

Single Trunk and Branch



Half Loop Recirculation Pump Separated from Thermo-sensor



Structured Plumbing Dedicated Return Line



ADVANCED LIGHTING





QUESTION FOR BUILDERS...



Are your customers willing to pay less for advanced technology lighting with ...



• 75% lower energy costs

• 80% less un-wanted heat

• 1000% less nuisance replacing bulbs

...that meets or exceed all expectations?

ADVANCED LIGHTING COST ADVANTAGE























END GAME: CARBON NEUTRAL HOME



Optimized energy efficiency plus some combination of renewable energy to offset remaining energy loads:
Passive Solar

- Solar Hot Water Heating
- Active Solar Heating/Cooling
- Renewable Electric Generation (PV, Wind)
- Green Tags

• Planting Trees

"It wasn't raining when Noah built the Ark."

Howard Duff

HOW TO GET MORE INFORMATION



