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There Is No Such Thing
As A Free
Thermodynamic Lunch
Or,
Confrontational Building
Science

Peter Yost



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The Three Laws of Energy Flow

(or why most physicists are manic depressives)

- **1st Law** - ultimately, all we do is busily feed the 2nd Law--see below (Conservation of matter and energy)
- **2nd Law** - the only thing you can do with chaos is accelerate it (entropy)
- **3rd Law** - the universe is inexorably goal-oriented, with a goal of absolute chaos---see above (absolute zero)



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Thermodynamic Reality in the 21st Century

(Or why most building scientists are manic depressives)

- **Sustainability for whom, or what? Mother Nature does not give a Spotted Owl's hoot about anybody, much less "Western" anybodies, in particular.**
- **There are 6 Billion of "Them" and 500 Million of "Us"**
- **That's 92% with the goal of living just like the 8% that uses 40% of carbon-based resources--do the math.**
- **The only constant is change--the carbon economy must be replaced with another base--it's a question of when, not if.**



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Thermodynamic Reality in the 21st Century

- **There is no energy crisis--there is more stored and incoming solar-based energy than we know what to do with**
- **There IS an emerging geo-politico-enviro-econ carbon crisis--but its solution requires an integrated approach among these disciplines--now there is a question of IF rather than WHEN!**
- **The problem with Newton's Third Law in our current situation--the luxury of metered, equal reaction.**
- **Is the problem resource depletion (an economic one) or global warming (an environmental one)?**



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Potential Solutions

(for manic depressives in the physical sciences)

- **Buy an SUV--let's get it over with, politically and economically**
- **Make resource prices “real” to reflect political and environmental costs**
- **Change the albedo (we have inadvertently dabbled in this before and we are still here)**
- **The futile fuel frugality fight (hey, it's what we do and it is a piece of the puzzle, bigger than its face value)**



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The Good Fight - Green Building Science

- **Green as a modifier, the root being building science**
- **Ecology = Physics + Biology + Chemistry**
- **Build homes like cells - they have to honor the laws of science, so should we**
- **Controlling the flows of energy--that's heat AND air AND water AND vapor**
- **Elegance in conservation AND durability**
- **Process NOT Products, systems NOT selections**



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Energy Rules

- **For now, because of carbon's indirect effects**
- **In the future, because of system costs**
- **It's about conservation and management--total and peak loads**
- **Like the 1st Law of Thermodynamics, energy is inextricably linked to matter--that is, energy management is linked to materials management**



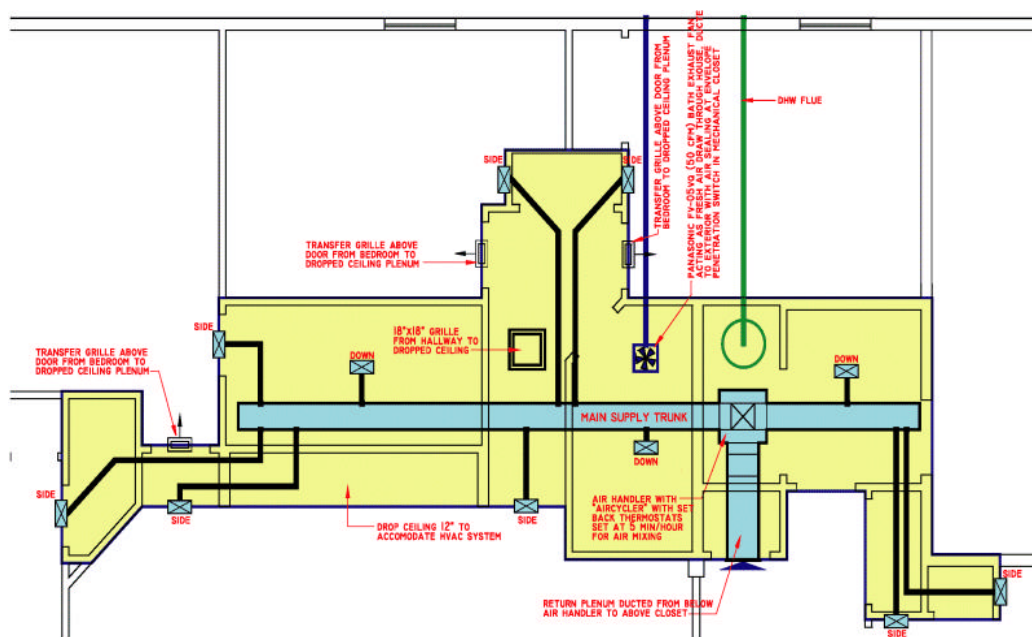
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Our Overall Approach

- **Superior building performance: products AND processes, selections AND systems = the systems approach**
- **The relationship among structure performance, quality, durability, occupant well-being**
- **Process (or, the term building is both a noun AND a verb)**
 - **design**
 - **installation**
 - **commissioning/testing**
 - **operation/maintenance**

Some of our specific approaches

- Systems engineering and integration of structure and HVAC-- thermal envelope, advanced framing & simplified duct distribution





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Specific Approach: Supplemental dehumidification





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Specific Approach: Conditioned Attics

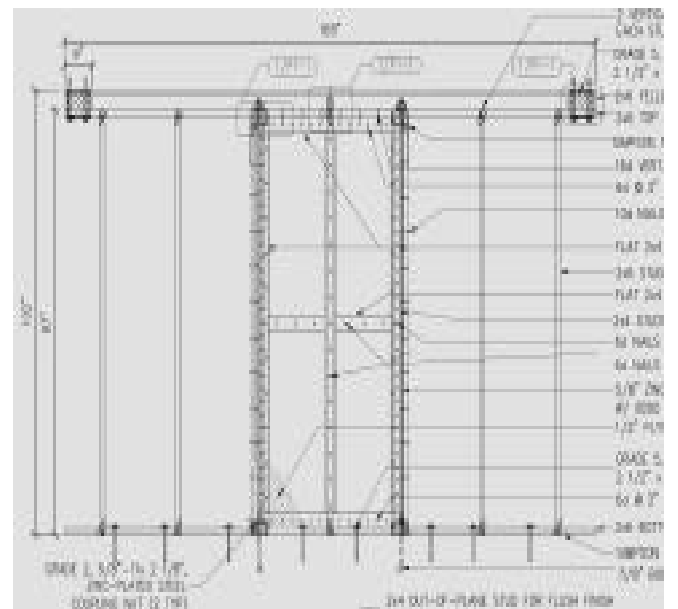




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Specific Approach: Inset Shear Panels





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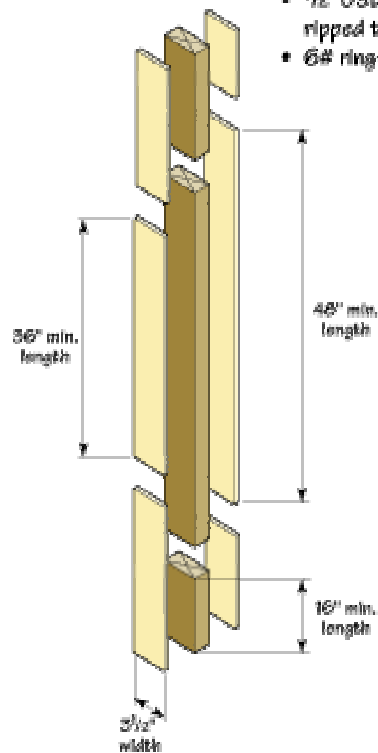
Continuous rigid insulation - thermal envelope/air barrier/drainage plane



Specific Approach: SEE Stud

Components

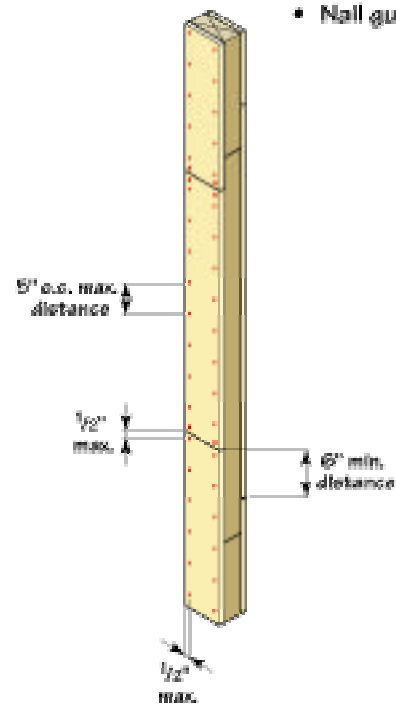
- 2x4 offcuts
- 1/2" OSB or plywood scrap ripped to 3 1/2" width
- 6# ring-shanked nails



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Equipment for assembly

- Tablesaw
- Assembly table with chop as
- Nail gun (or hammer)





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Specific Approach: Basement Wall Systems (Winter Panel - patent pending)

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**One Last “Law” (Alfred Marshall or Adam Smith?) -
“Supply equals demand”**

