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Capillary Moisture Transport and Foundation Implications

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Background

- Used increasingly as finished space
- Energy use of basements (insulation)
- Moisture-related failures of basement wall systems
- Capillary moisture as part of the problem



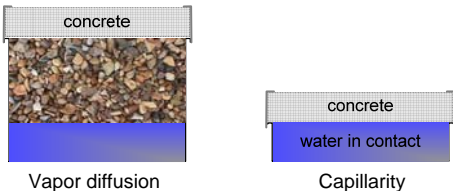
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Vapor Diffusion vs. Capillarity



concrete

Vapor diffusion

concrete

water in contact

Capillarity

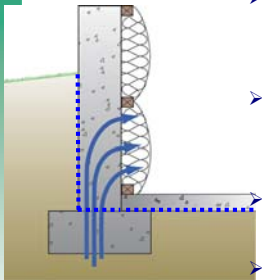
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Controlling Capillary Water



- Polyethylene under floor slab (w. free-draining fill)
- Capillary break between soil & basement wall
- Measures already in building codes
- Capillary break at footing-wall connection

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Capillarity vs. Vapor Diffusion

- 1-dimensional hygrothermal simulation (WUFI 3.0)
- 0.5 water to cement ratio concrete
- 8" thick wall; no coating on either side
- Case 1: Capillarity (100% rain on surface)**
- Cases 2 through 4: Vapor diffusion**

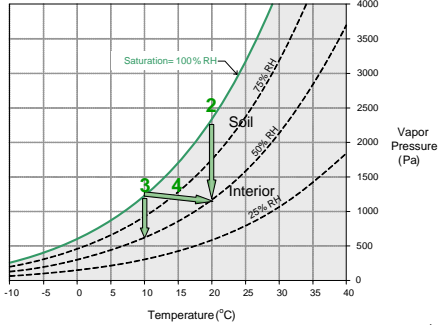
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Simulation Boundary Conditions



Saturation= 100% RH

75% RH

50% RH

25% RH

Soil

Interior

25% RH

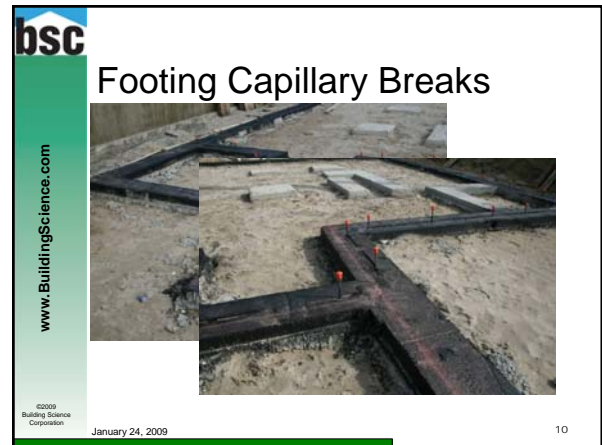
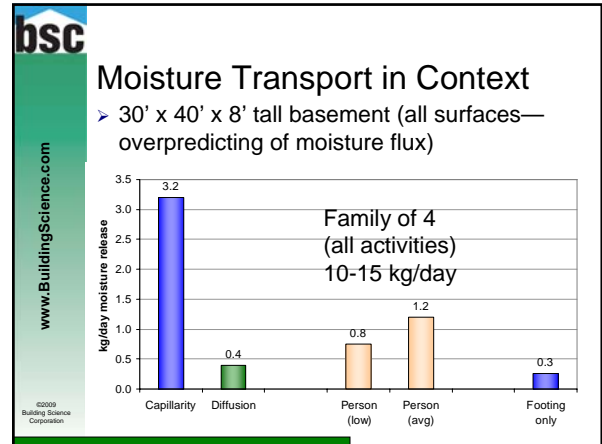
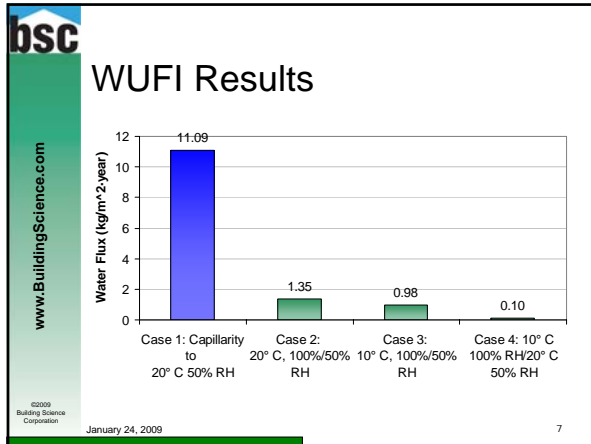
Vapor Pressure (Pa)

Temperature (°C)

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Material Choices

- Asphalt-based (standard dampproofings)
- Cementitious coatings (cement-based waterproofing, polymer modified)
- Can add acrylic polymer admixture if desired (greater durability?)
- Latex paint based waterproofing coatings
- Silanes & siloxanes

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bsc Membrane Material



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bsc Conclusions

- Capillarity moisture flow through footings can contribute to interior insulation/finish failure
- Can do without capillary break at footing if appropriate/alternate assemblies are used
- But problem can be dealt with by providing capillary break

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Questions & Discussion

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