

Joseph Lstiburek, Ph.D., P.Eng, ASHRAE Fellow

## Building Science

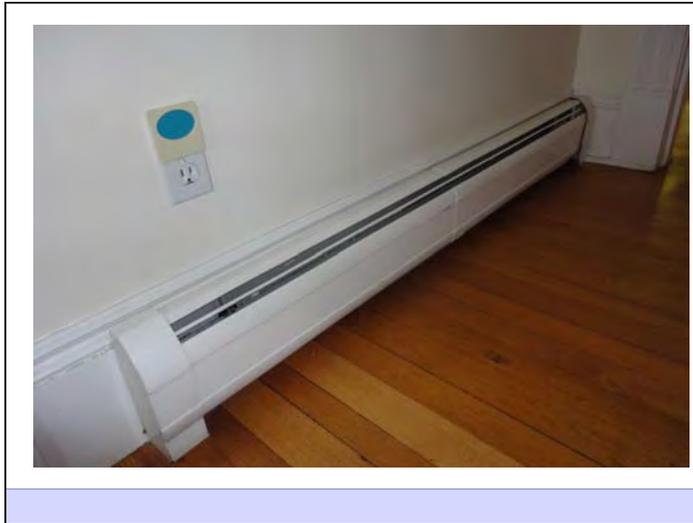
Adventures In Building Science

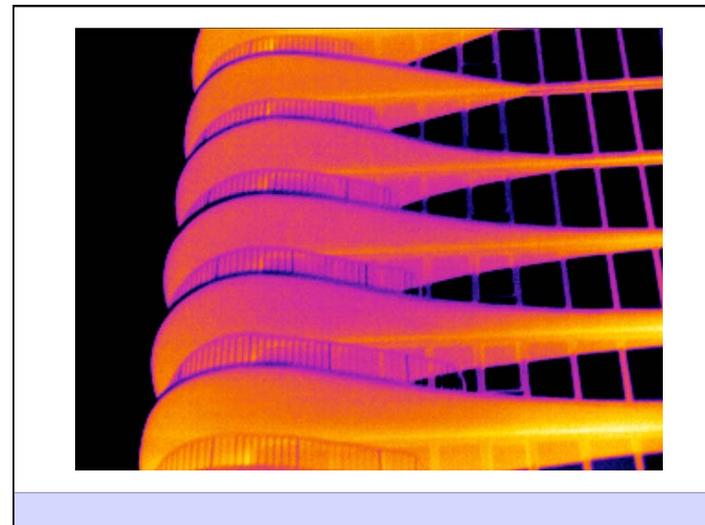
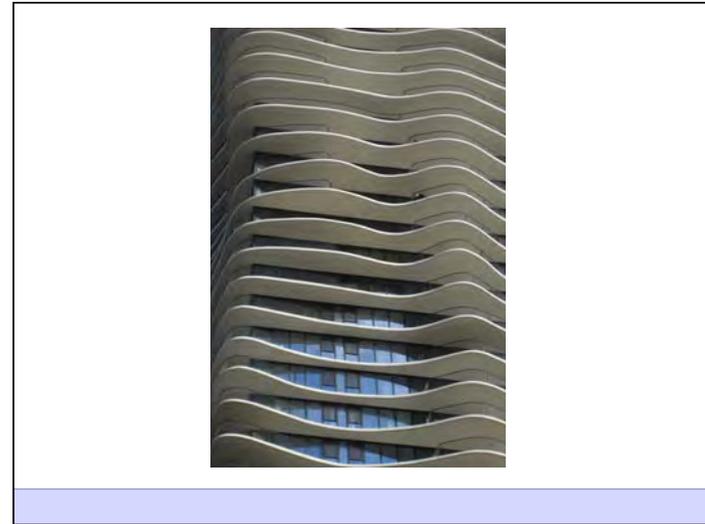
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Life is Tough Enough As it Is...

Life is Tough Enough As it Is...  
It's Harder When You Are Stupid

Don't Do Stupid Things





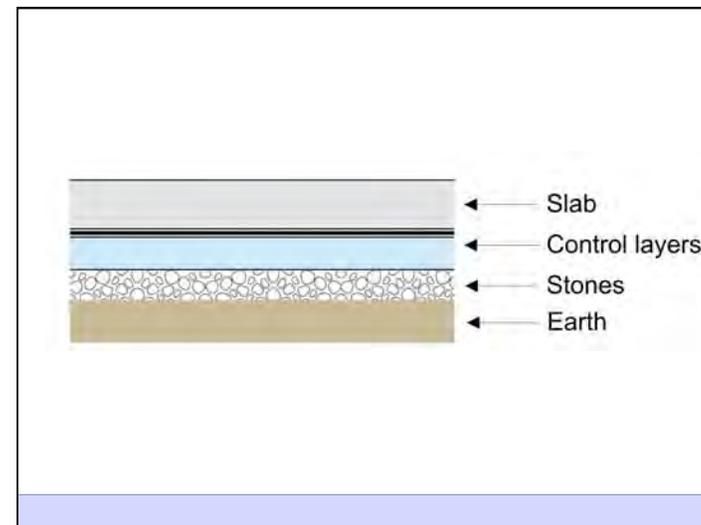
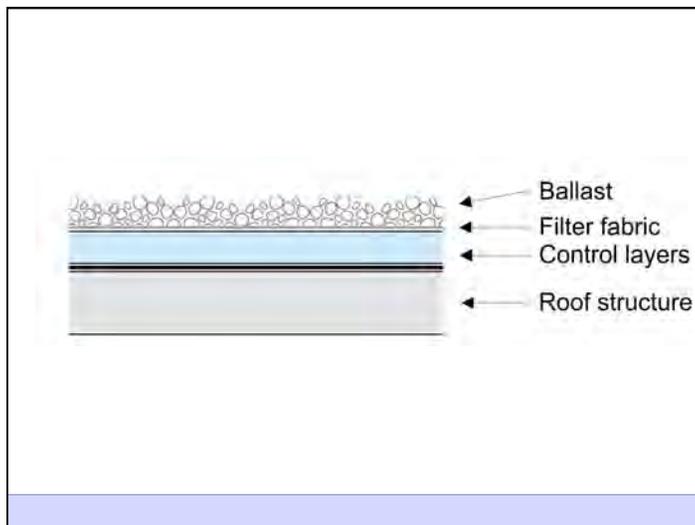
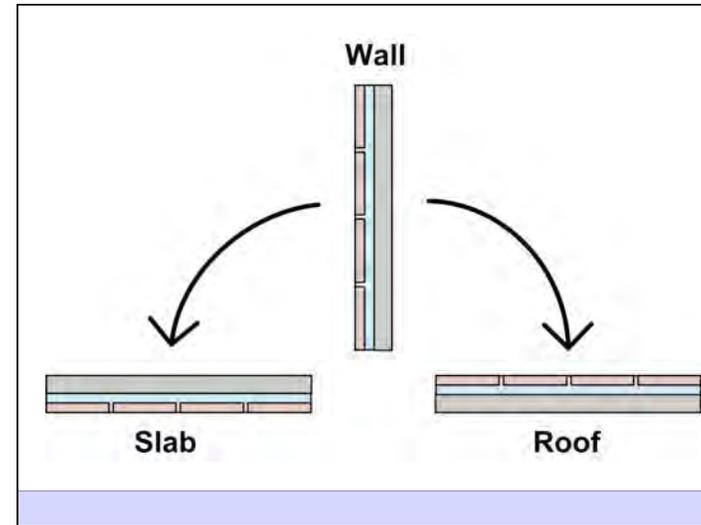
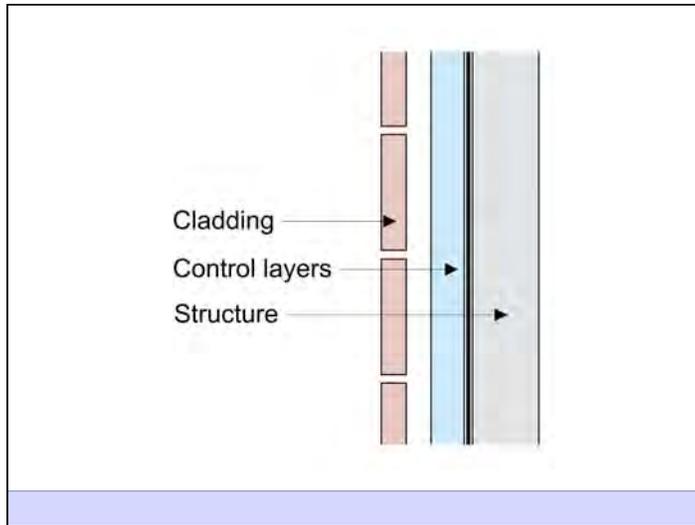
## What Is A Building?

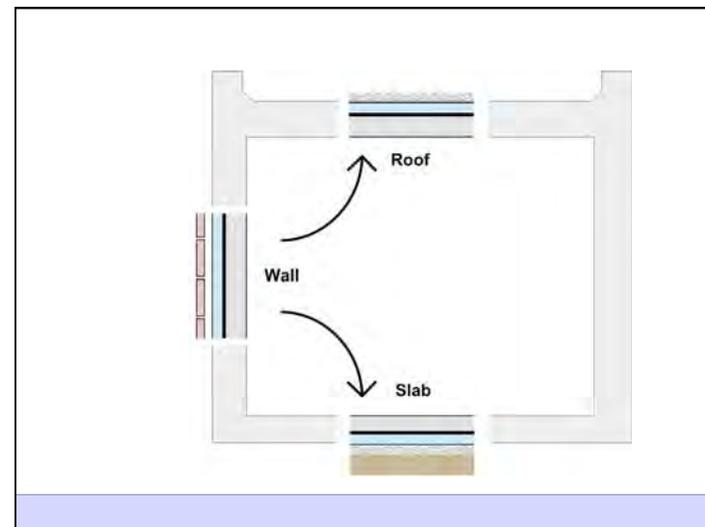
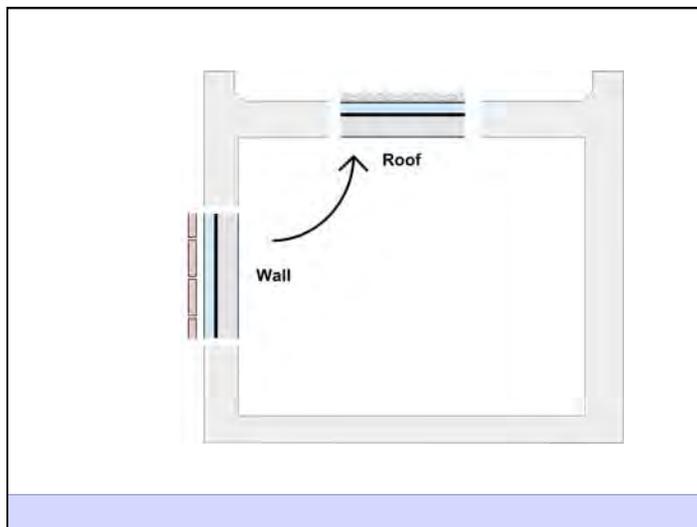
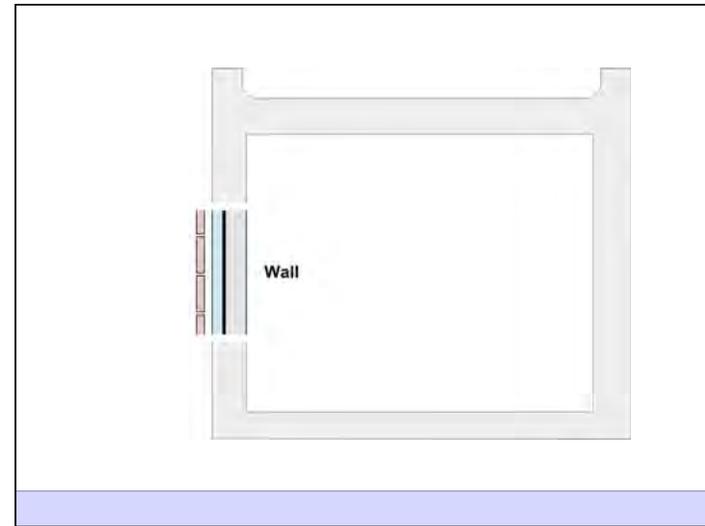
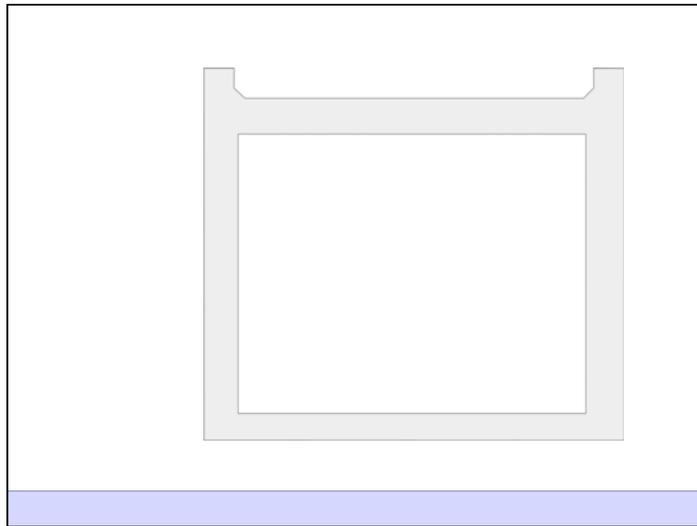
It is an environmental separator

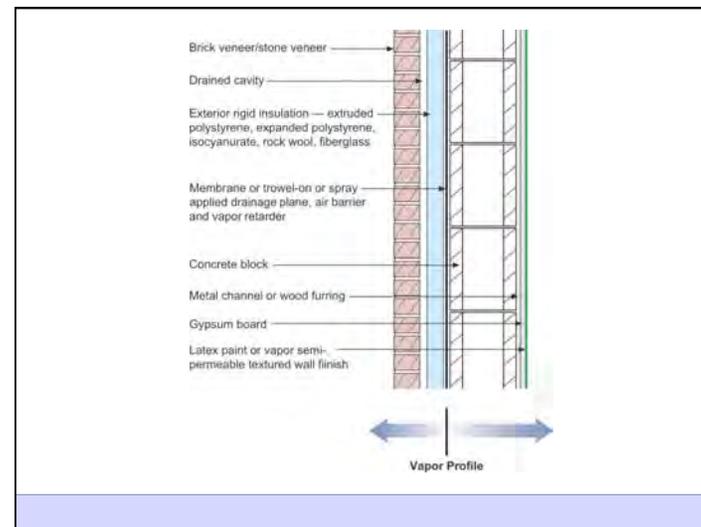
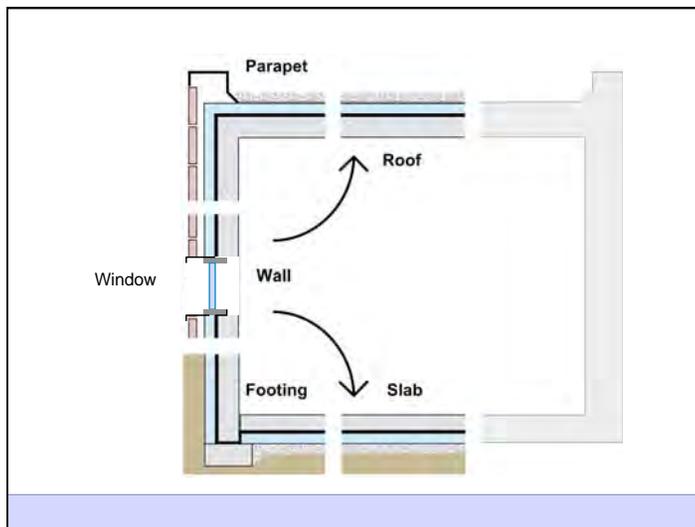
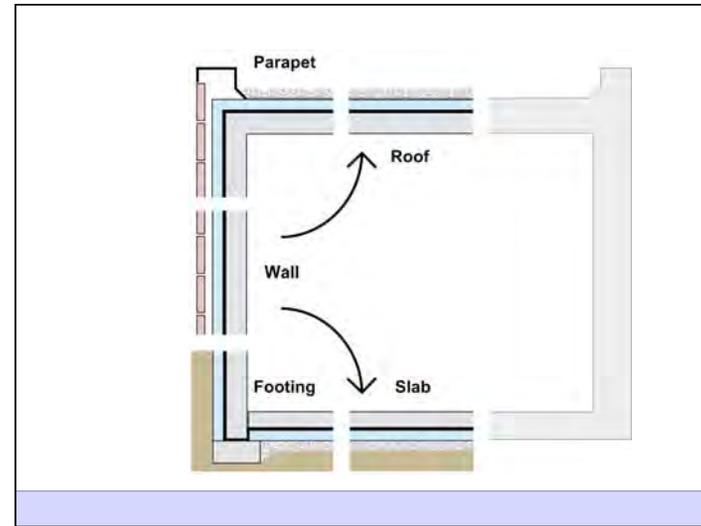
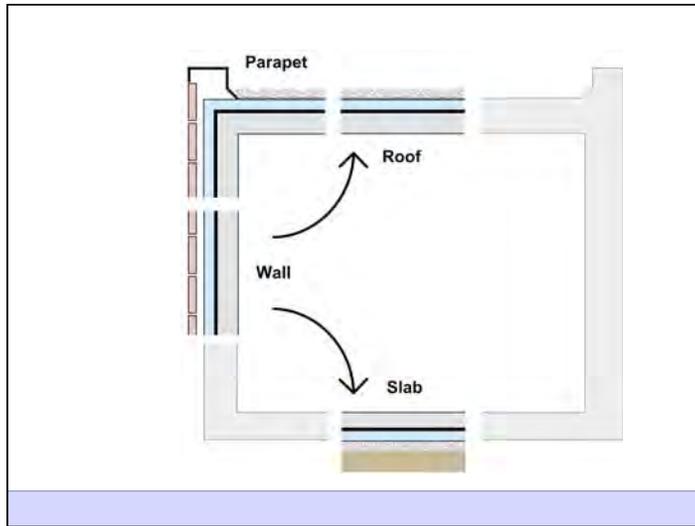
- Control heat flow
- Control airflow
- Control water vapor flow
- Control rain
- Control ground water
- Control light and solar radiation
- Control noise and vibrations
- Control contaminants, environmental hazards and odors
- Control insects, rodents and vermin
- Control fire
- Provide strength and rigidity
- Be durable
- Be aesthetically pleasing
- Be economical

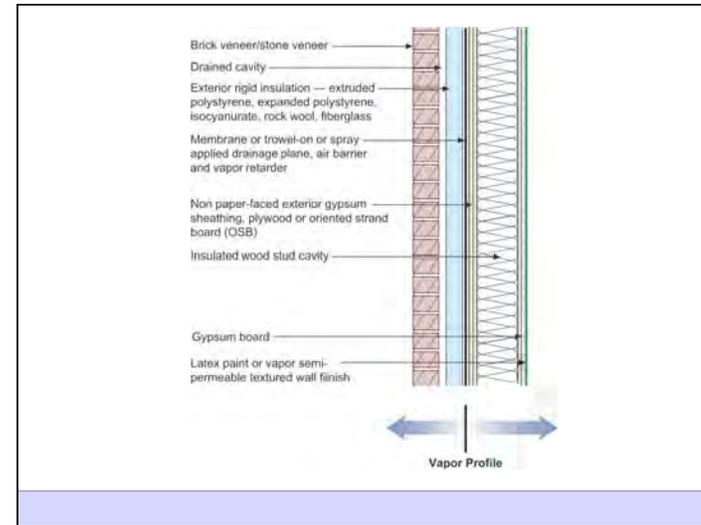
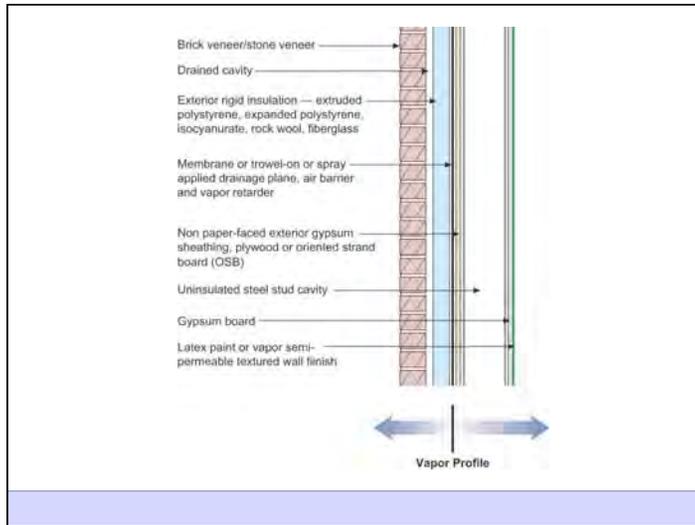
Heat Flow Is From Warm To Cold  
Moisture Flow Is From Warm To Cold  
Moisture Flow Is From More To Less  
Air Flow Is From A Higher Pressure to a  
Lower Pressure  
Gravity Acts Down

Water Control Layer  
Air Control Layer  
Vapor Control Layer  
Thermal Control Layer

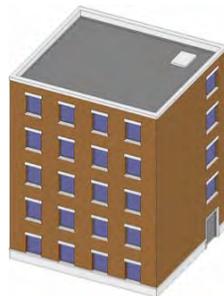




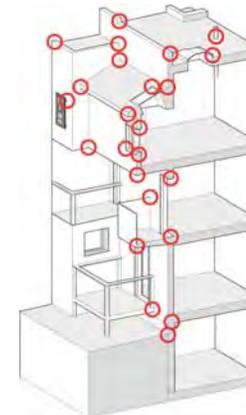


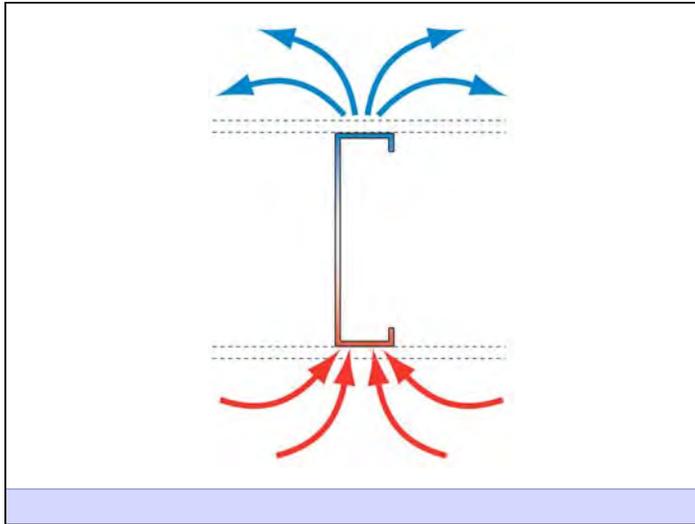


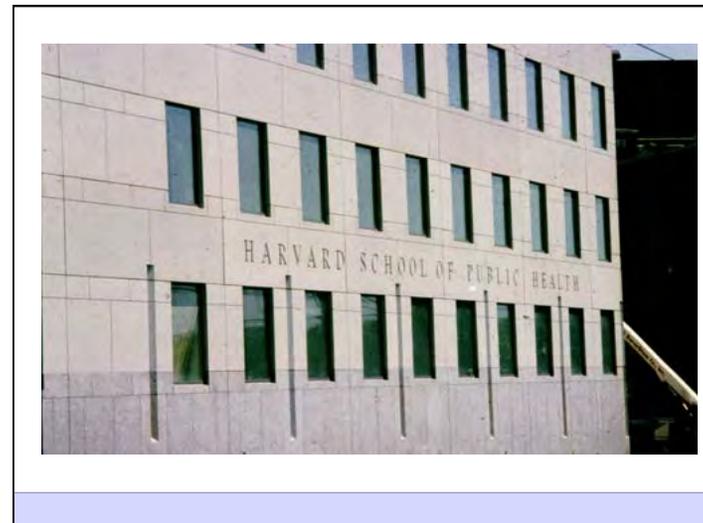
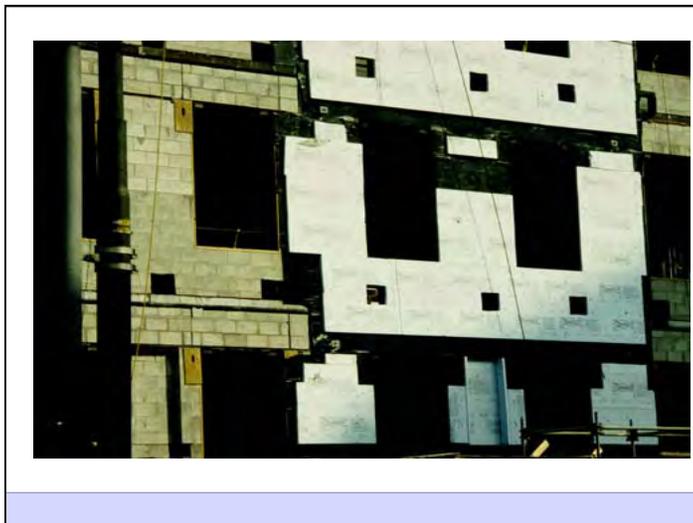
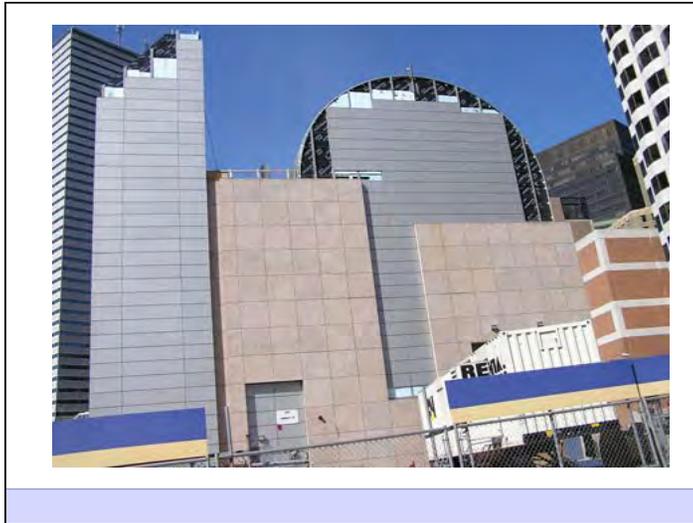
### Commercial Enclosure: Simple Layers

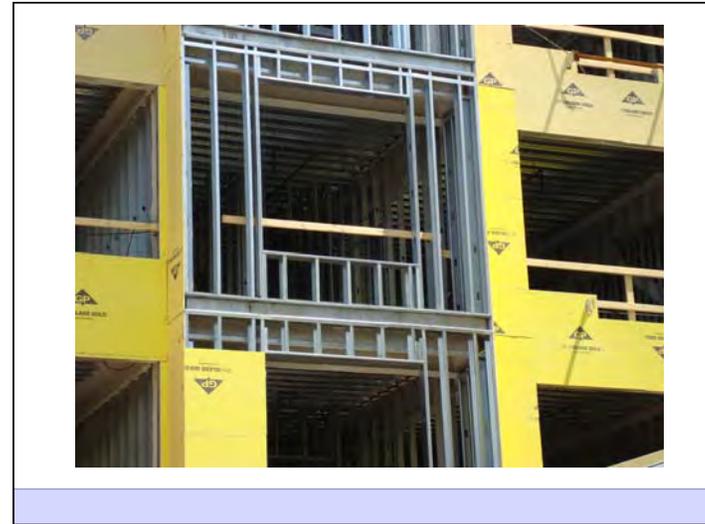


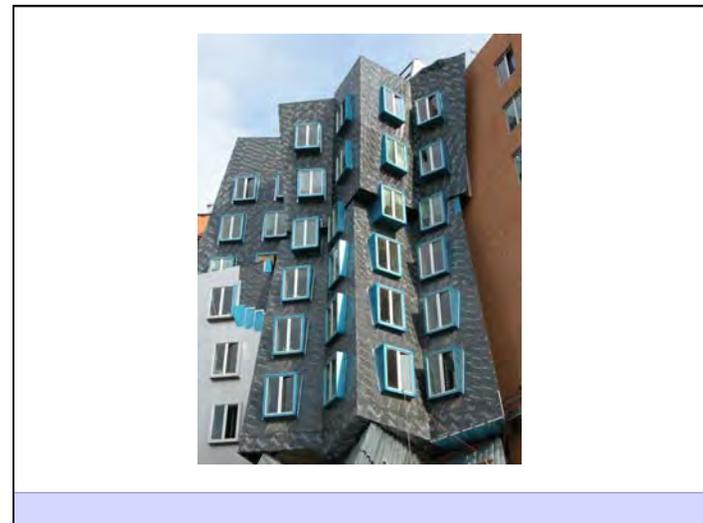
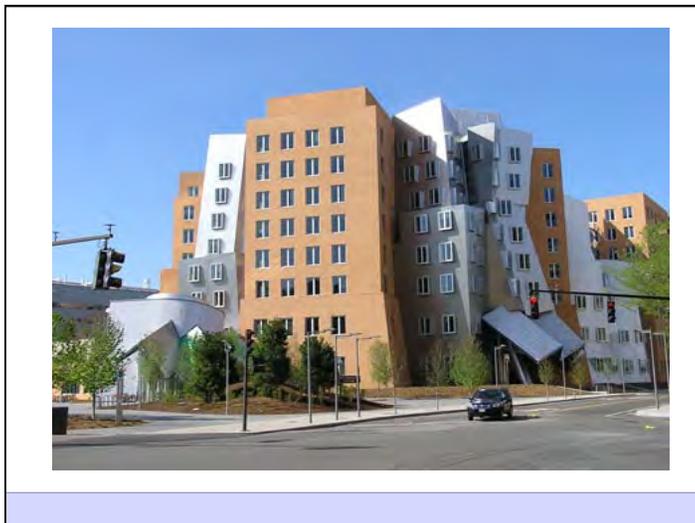
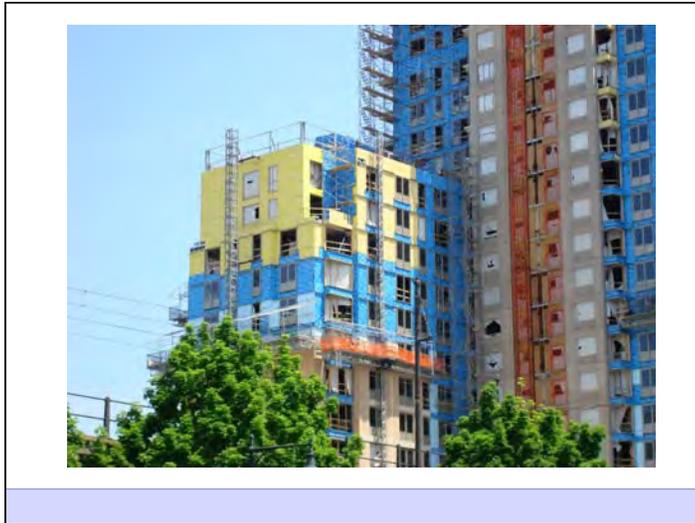
- Structure
- Rain/Air/Vapor
- Insulation
- Finish

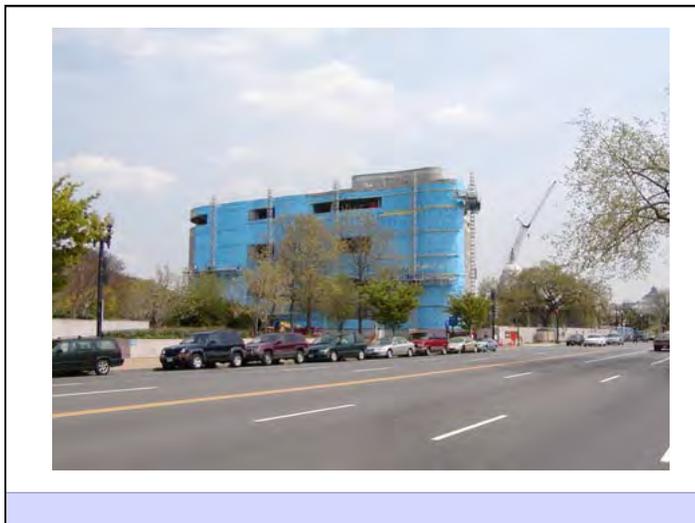


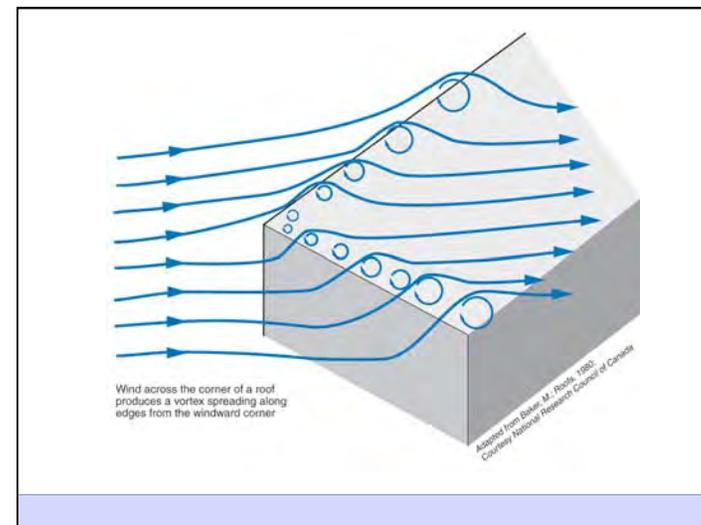
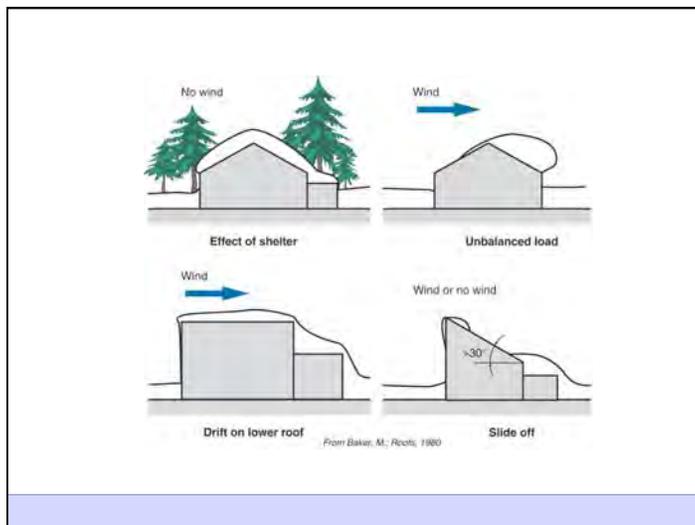
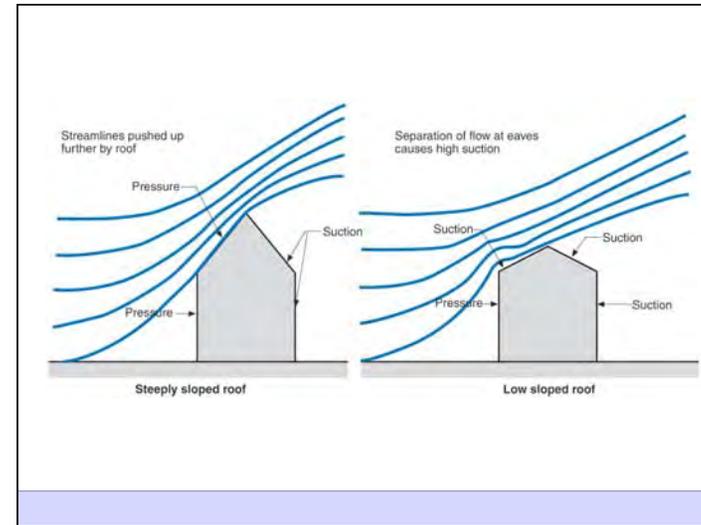
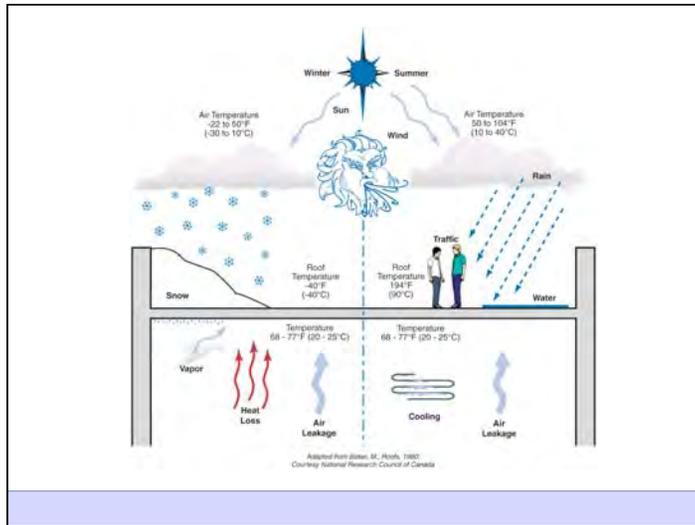


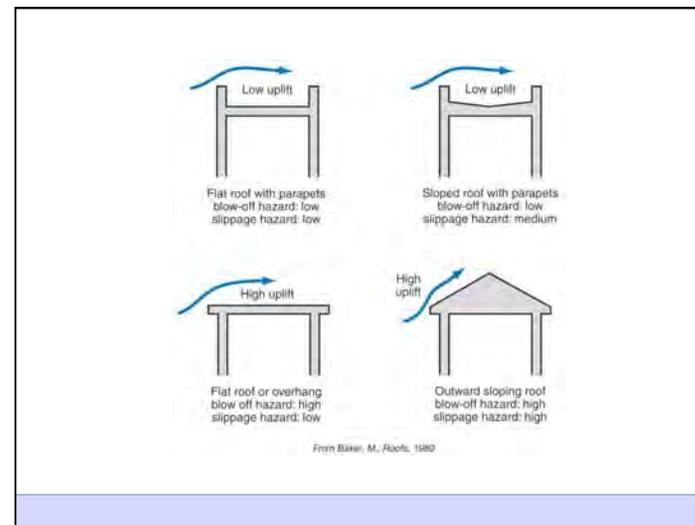
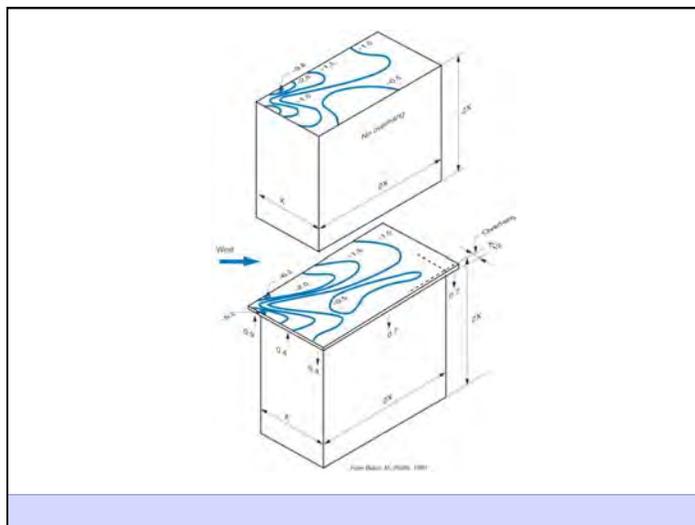
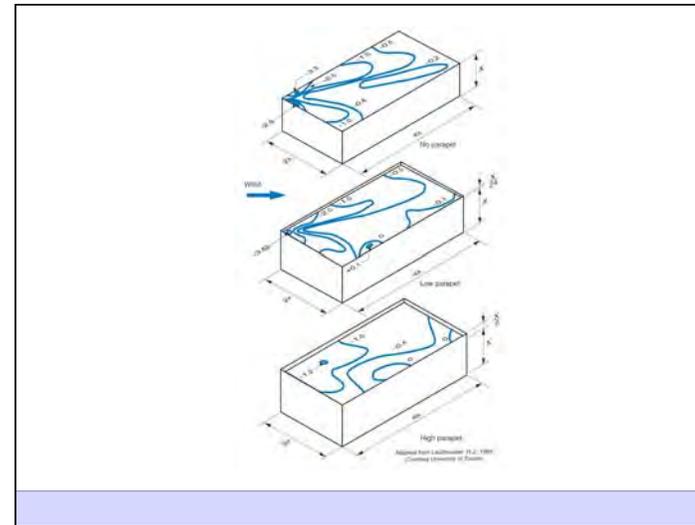
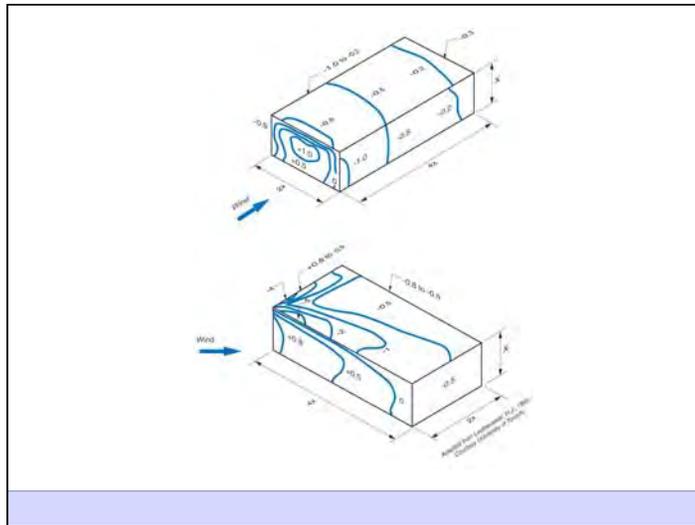


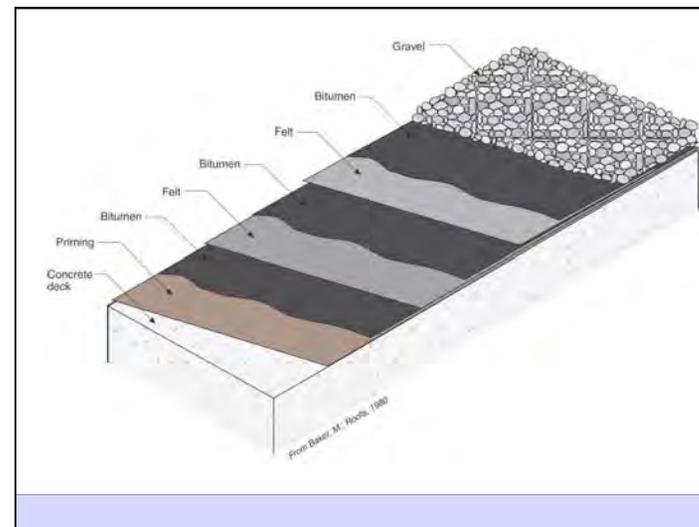
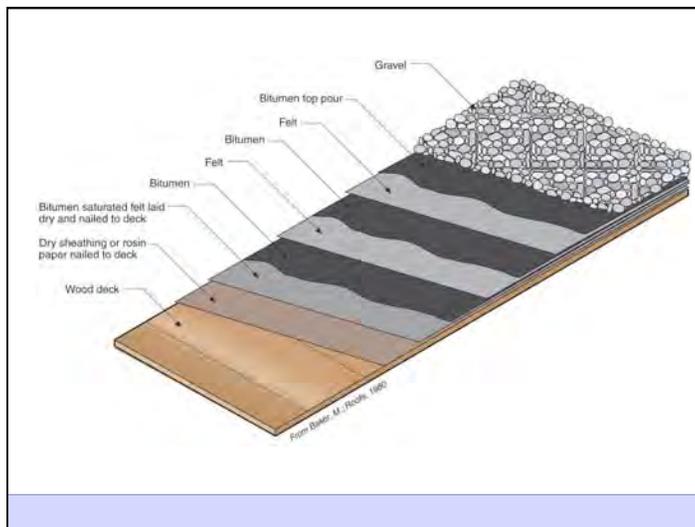
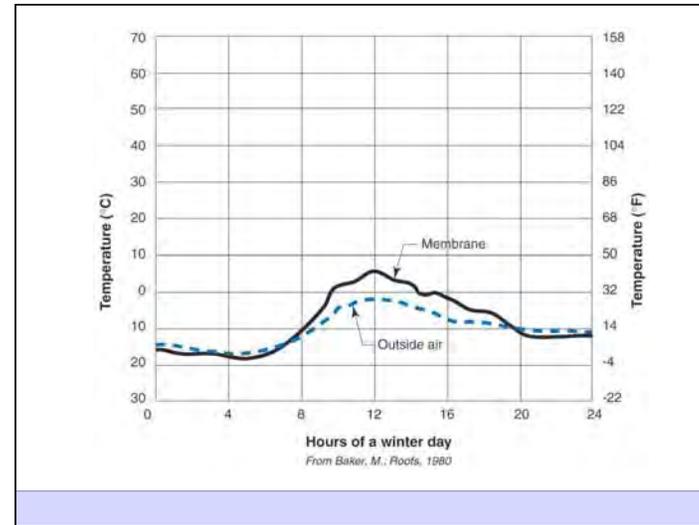
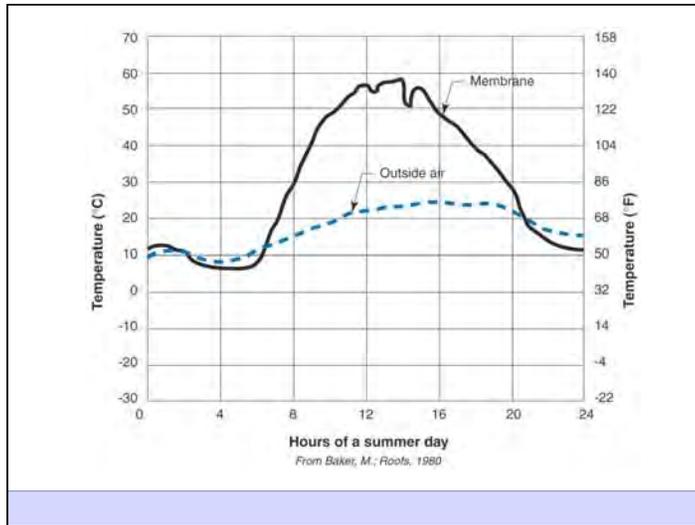


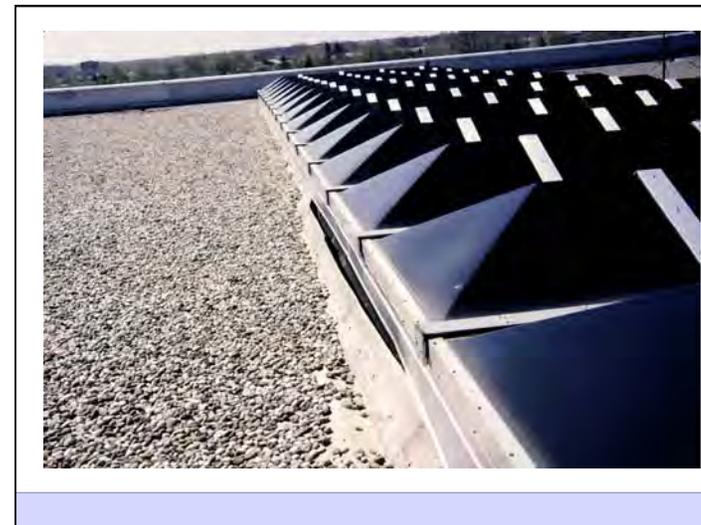
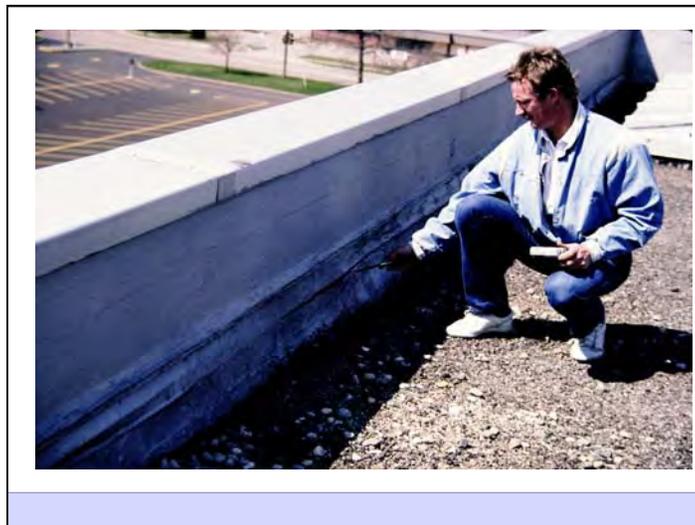
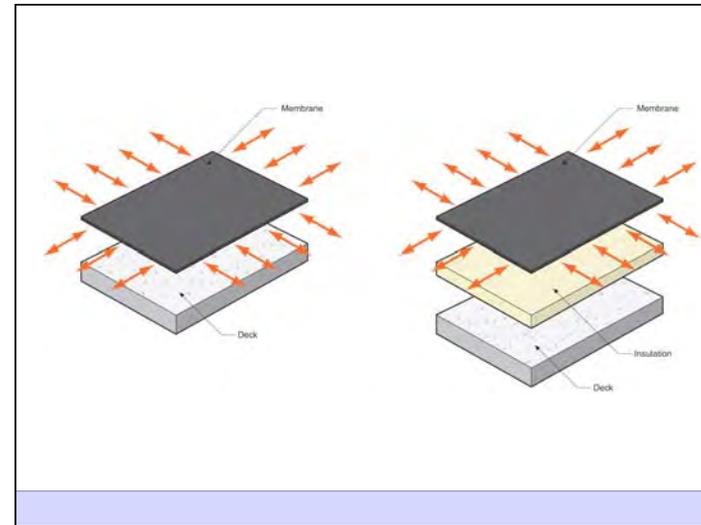
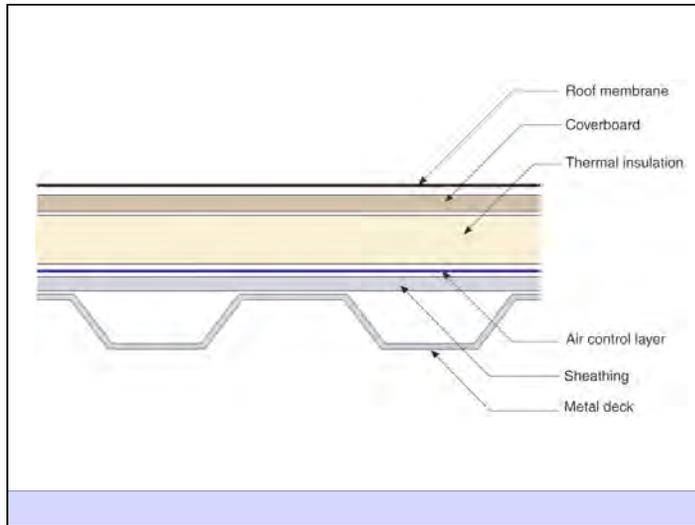


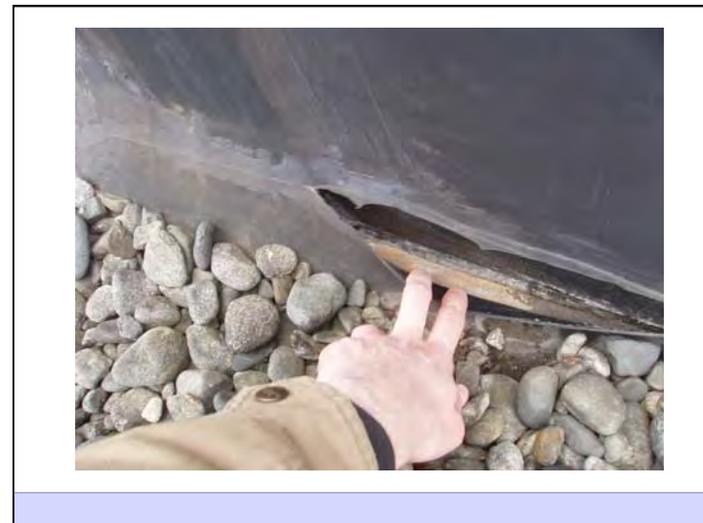
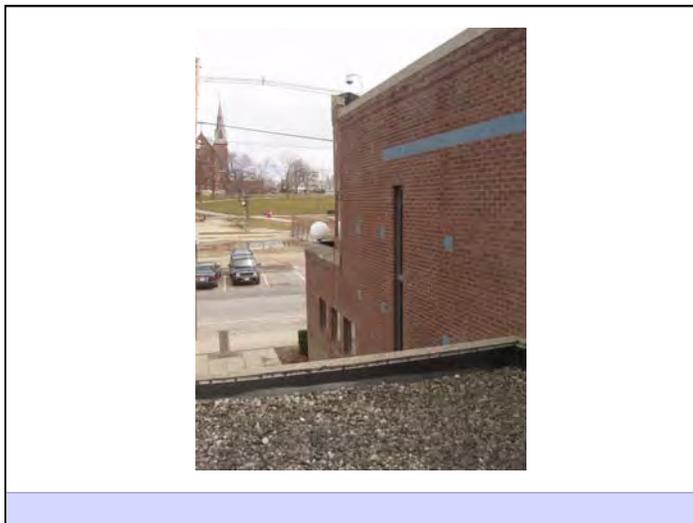
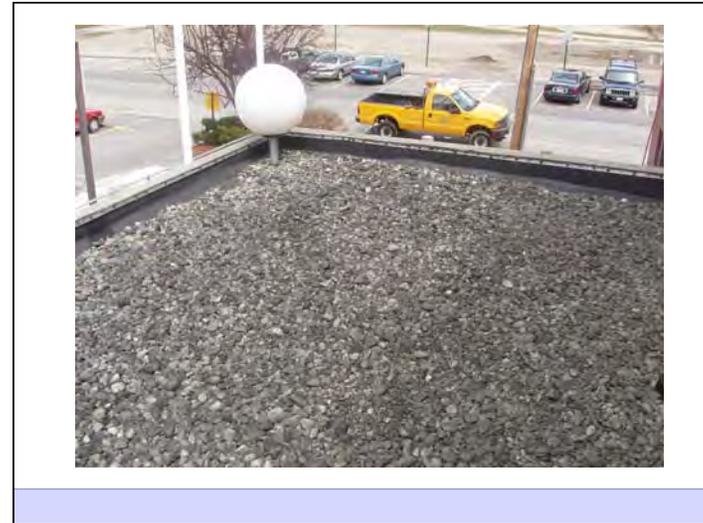
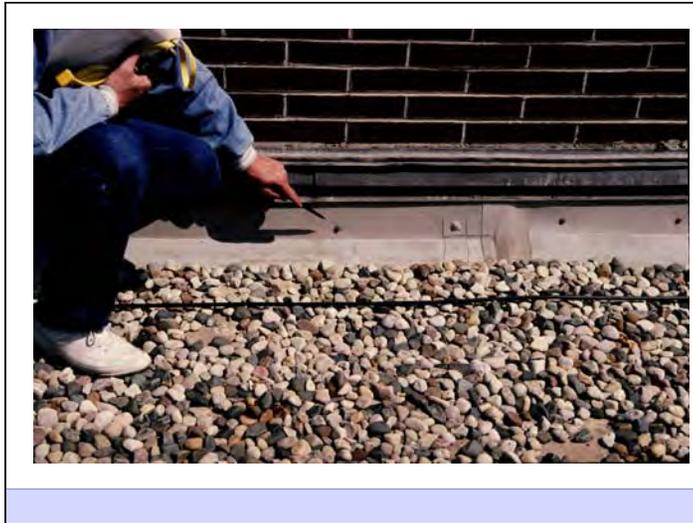


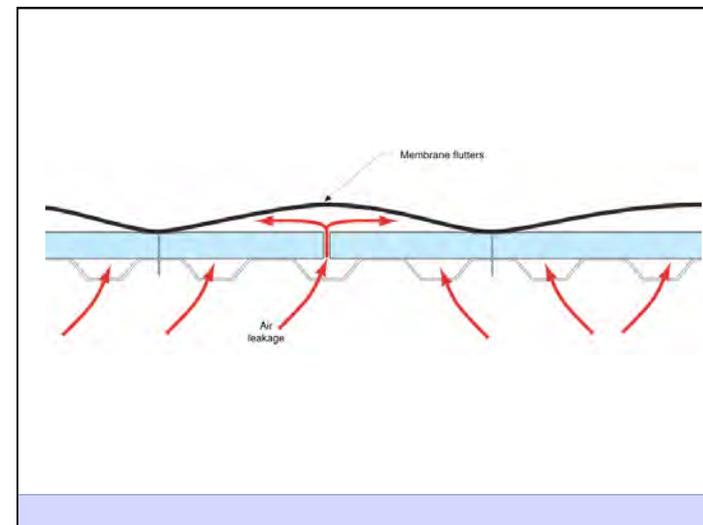
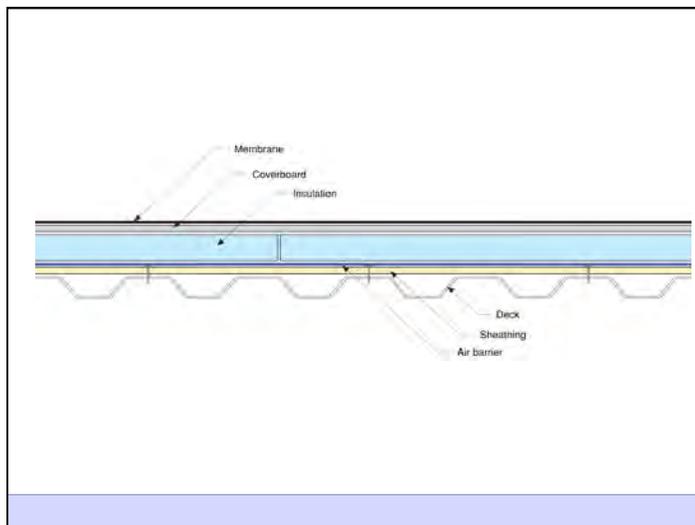
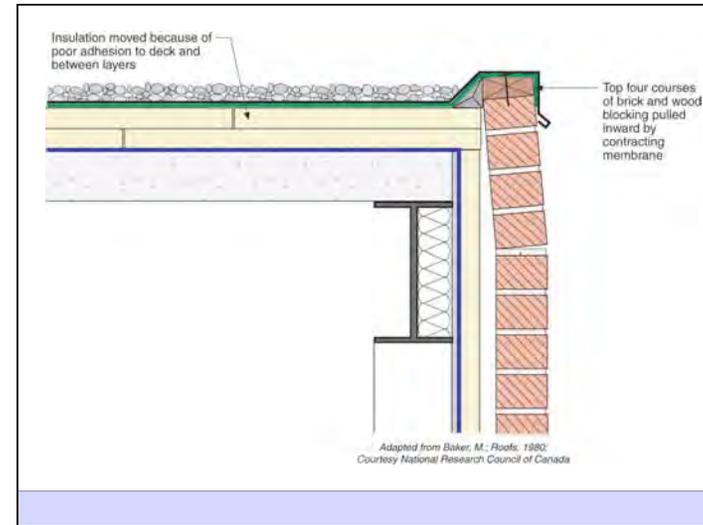
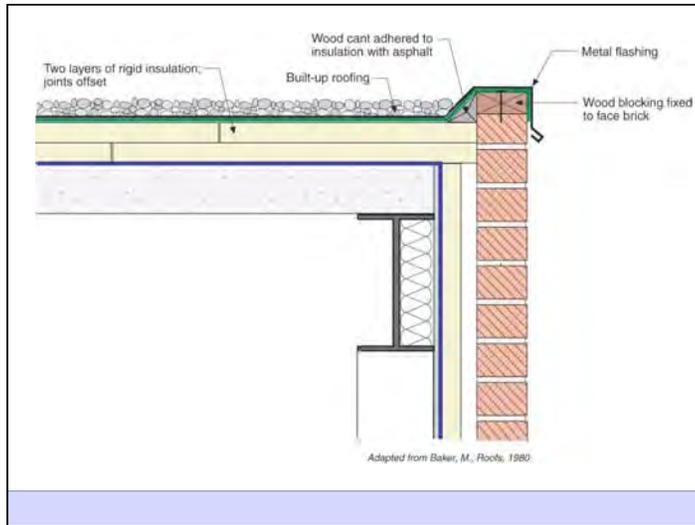


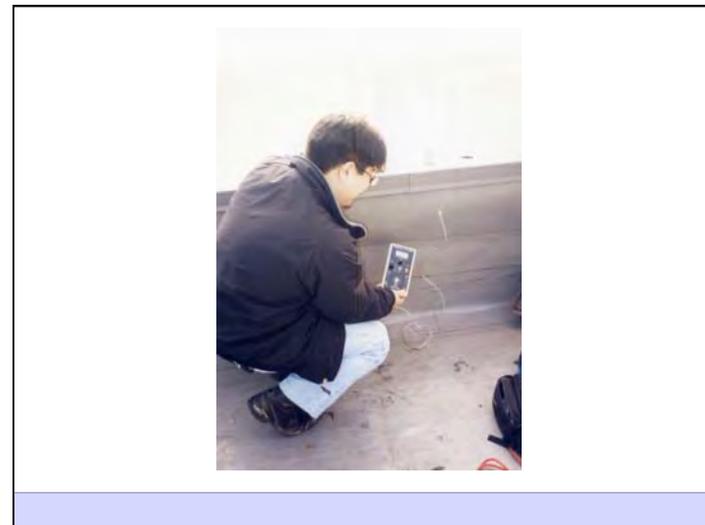
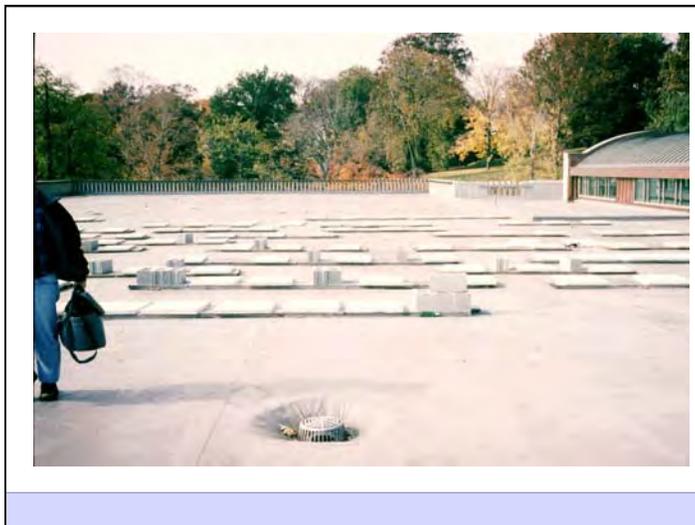


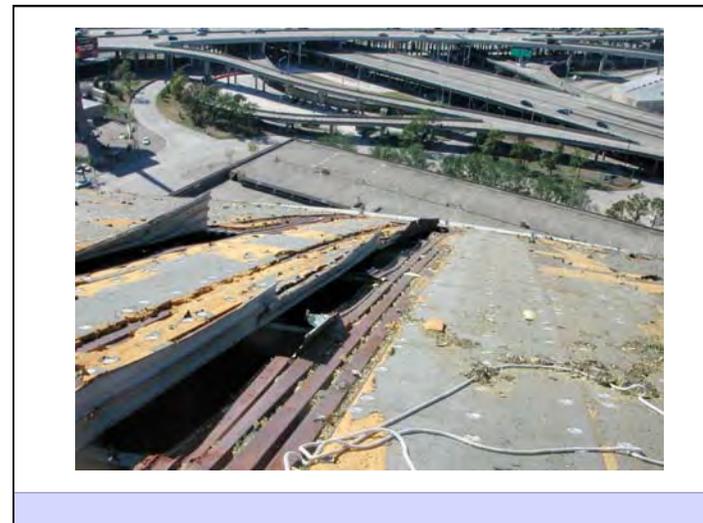
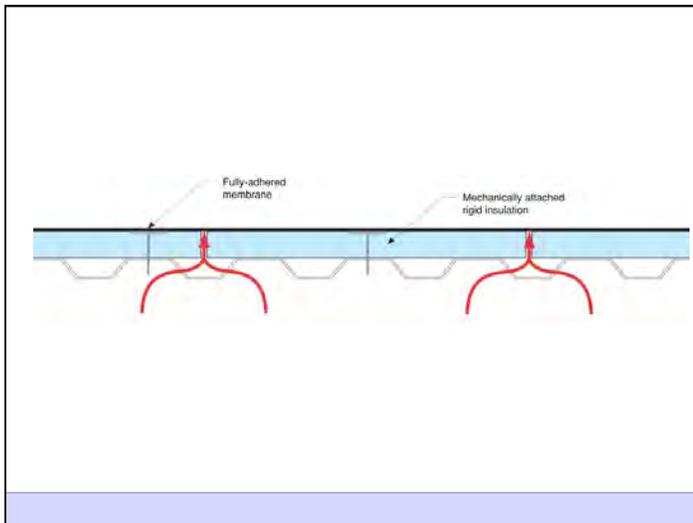
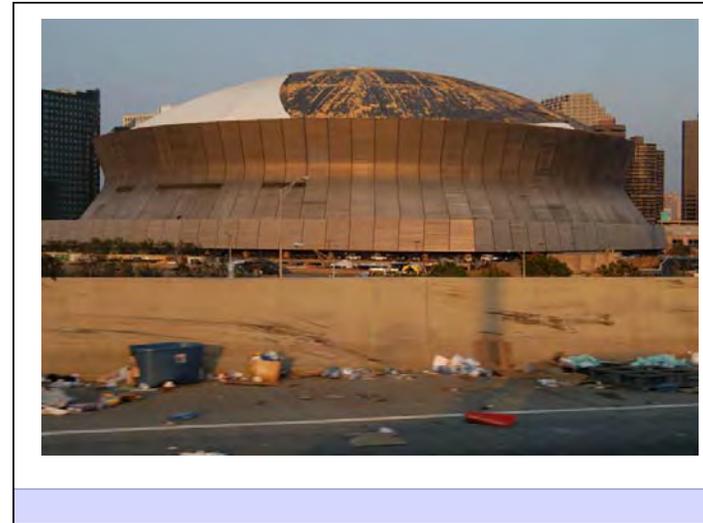


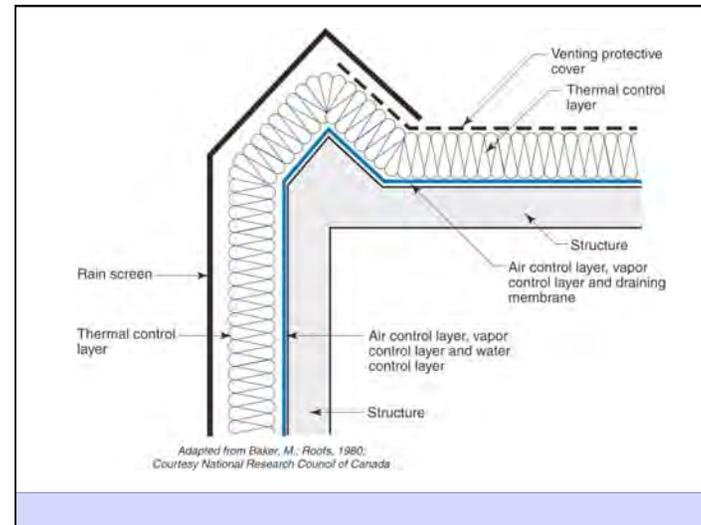
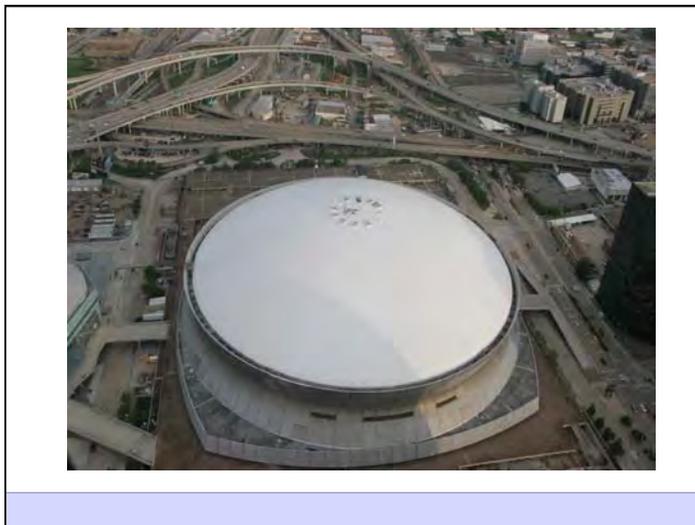
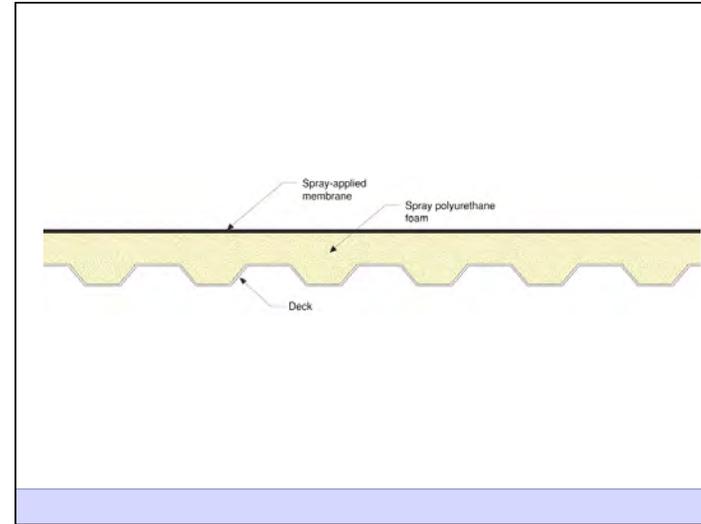
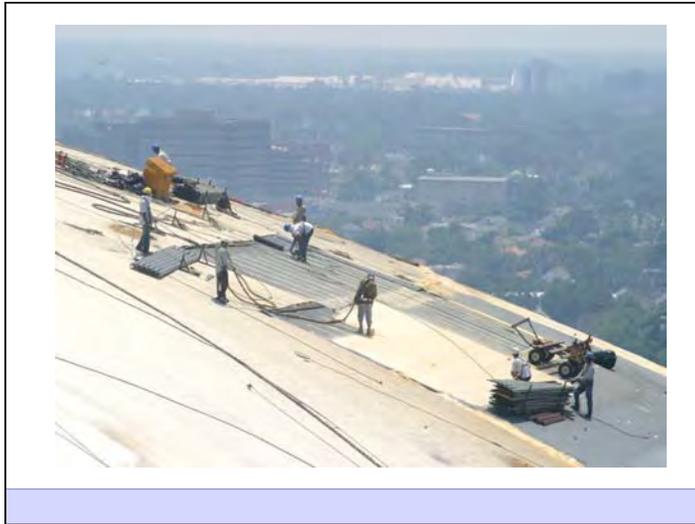


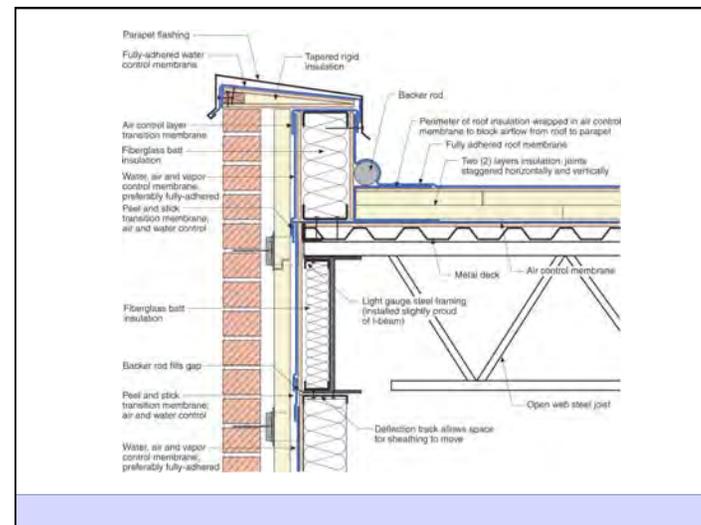
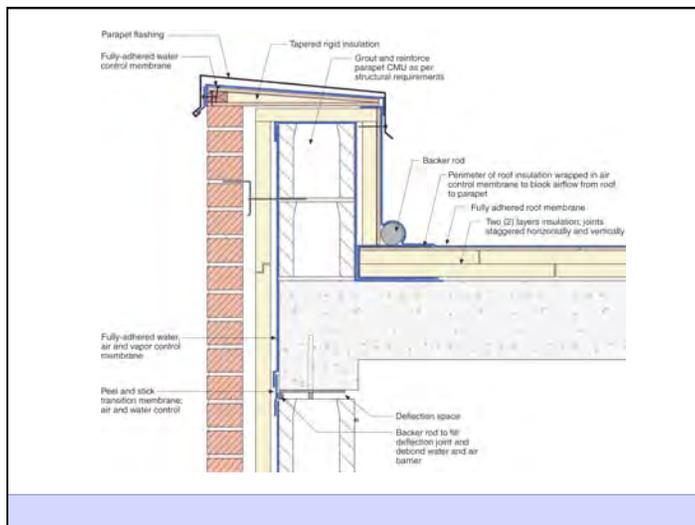
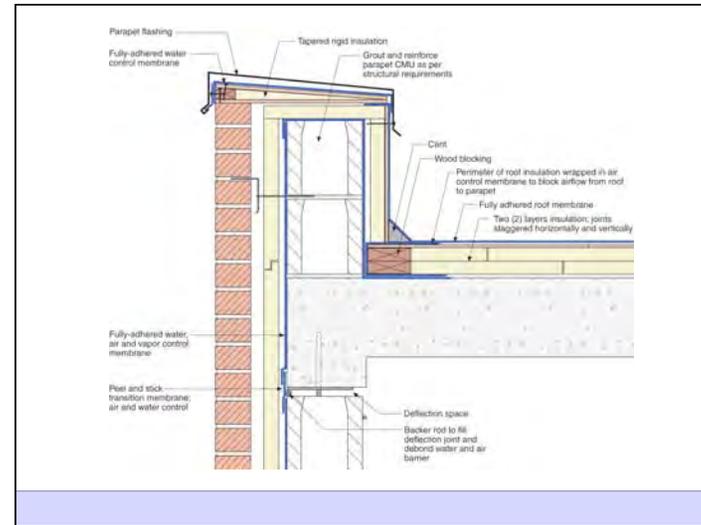
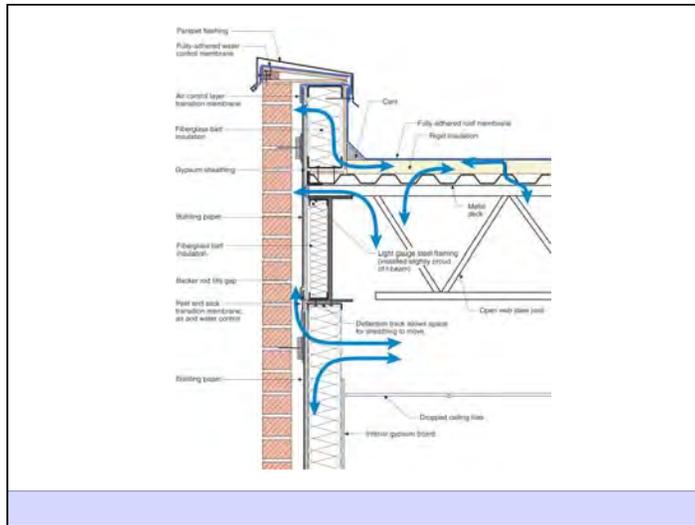


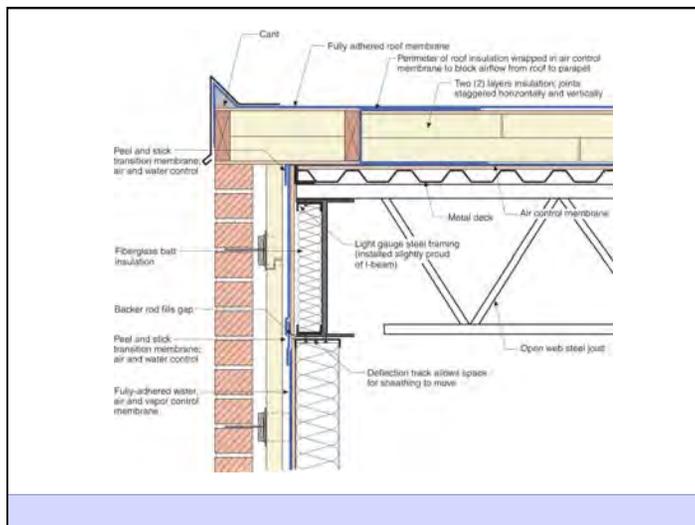
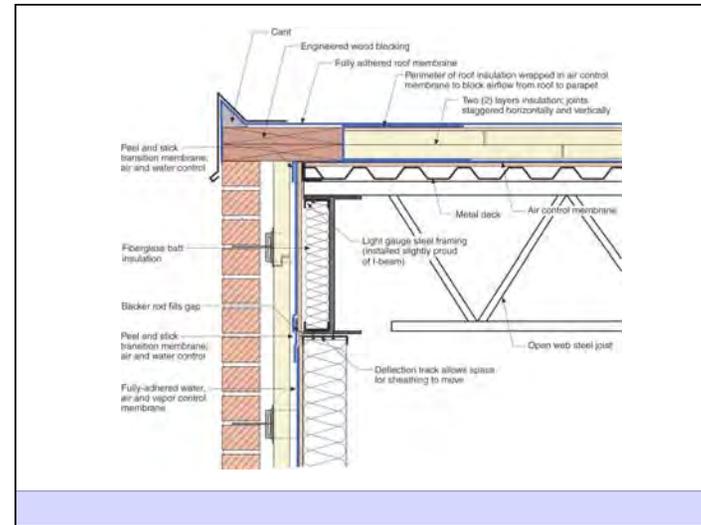
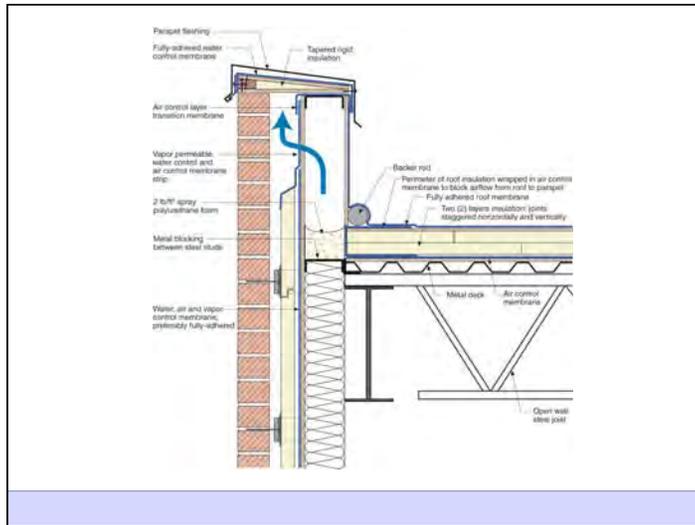










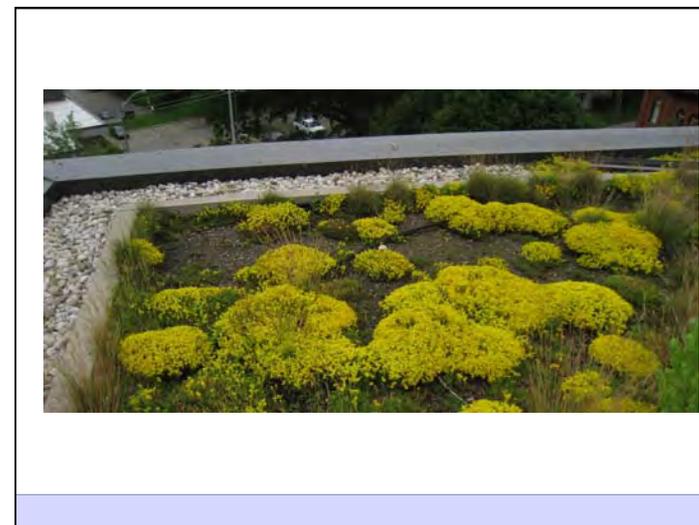
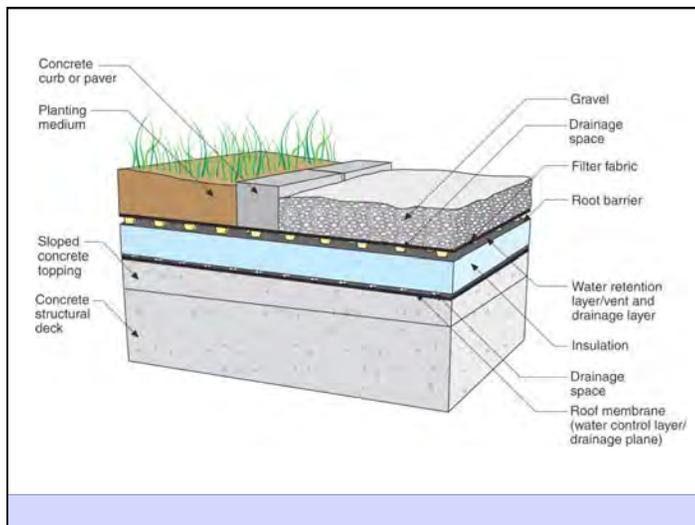
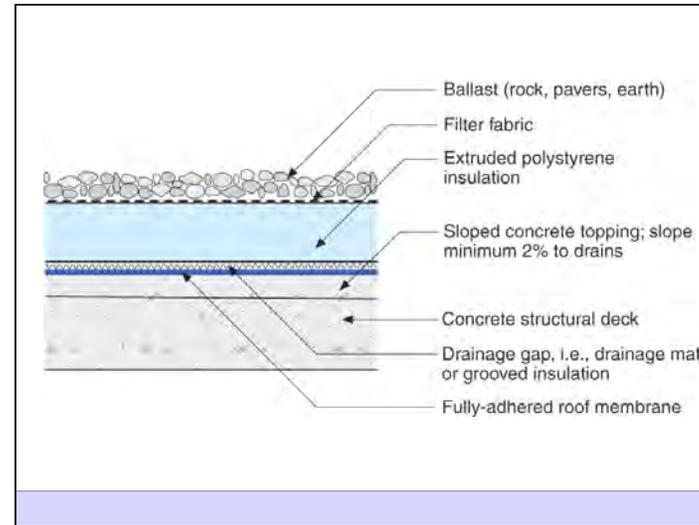


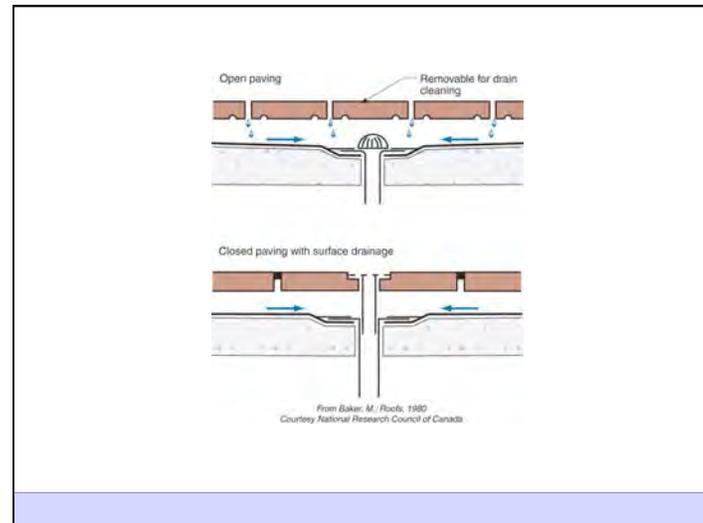
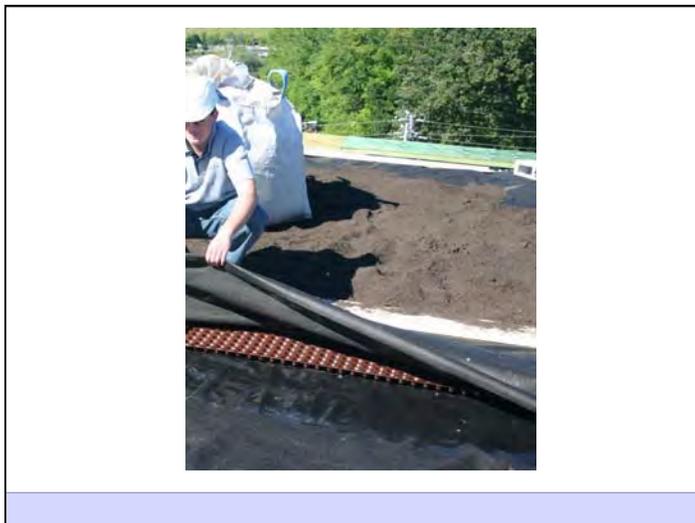
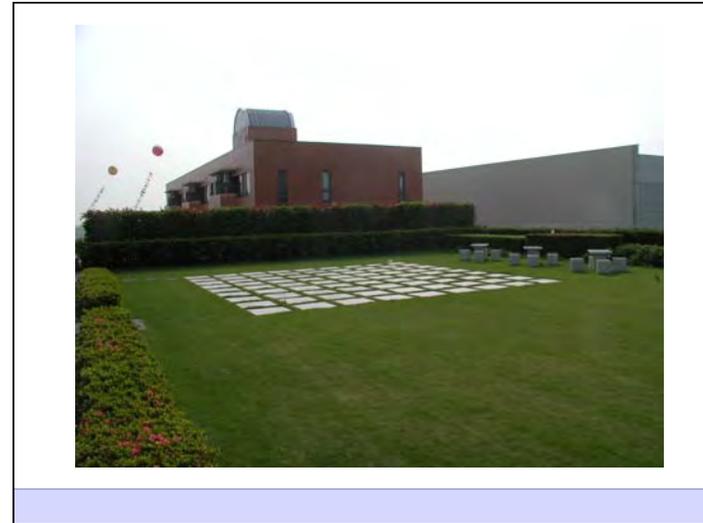
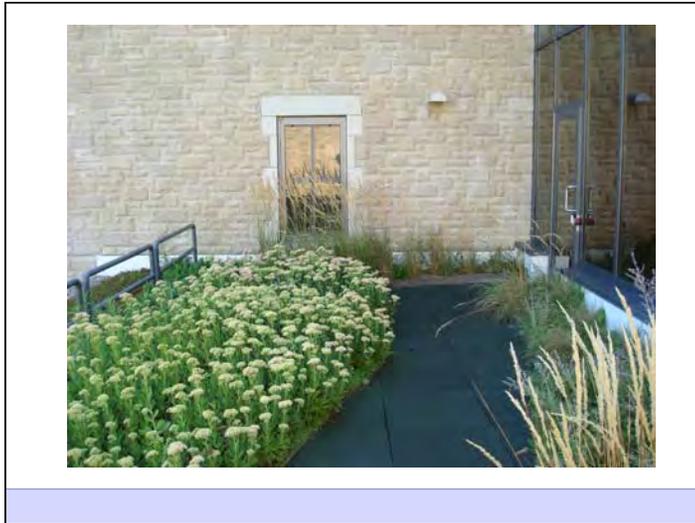
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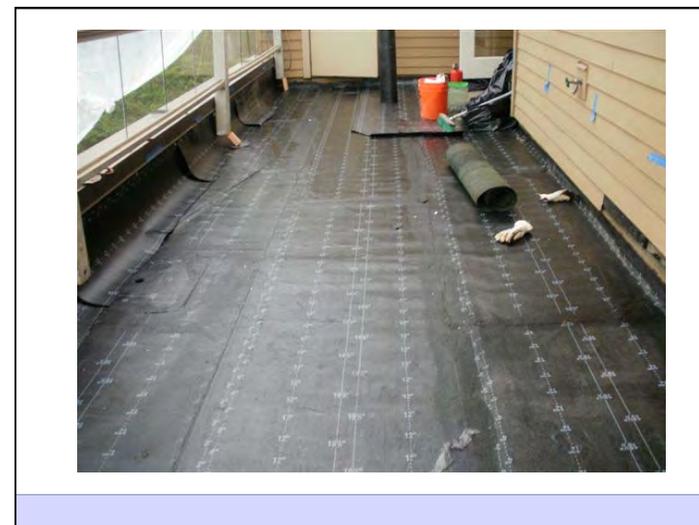
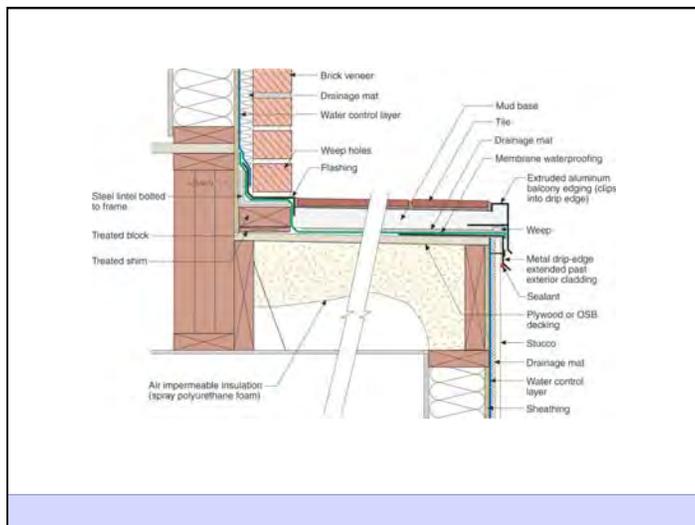
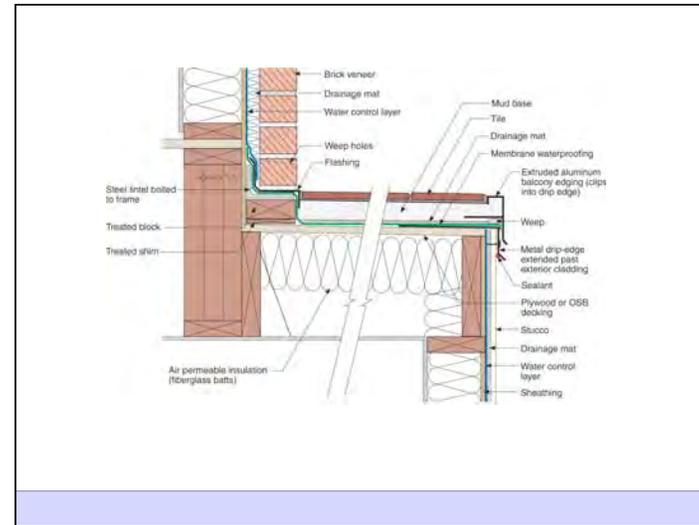
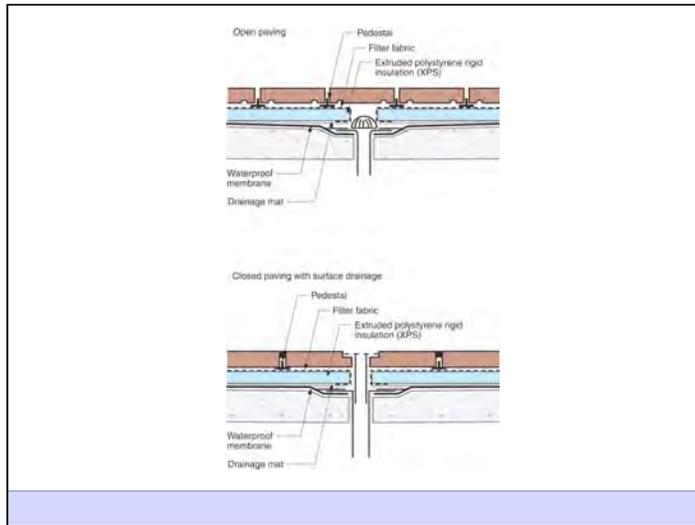
# Building Science

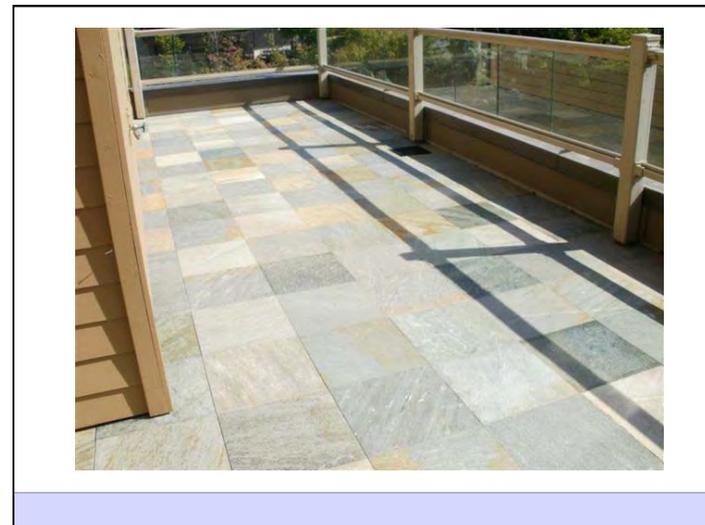
Adventures In Building Science

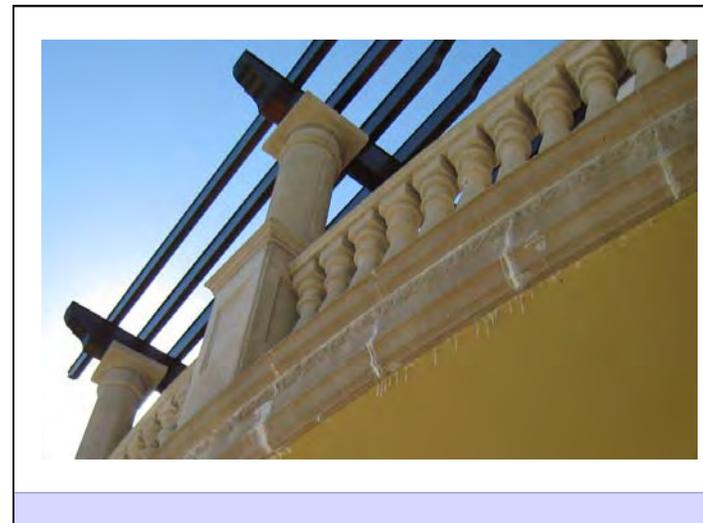
[www.buildingscience.com](http://www.buildingscience.com)

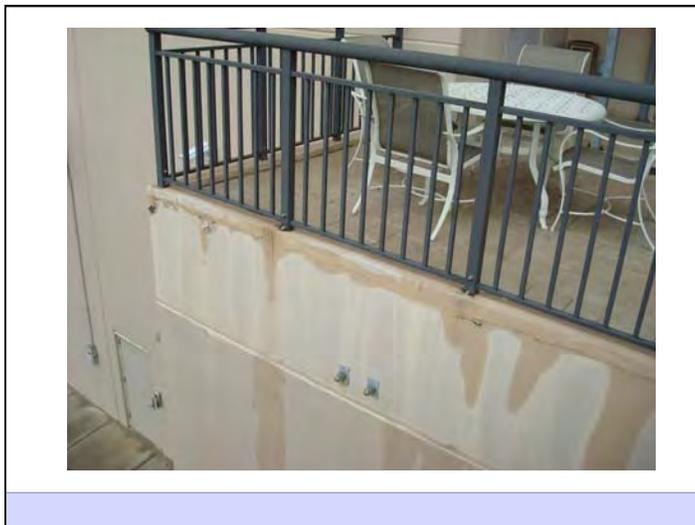
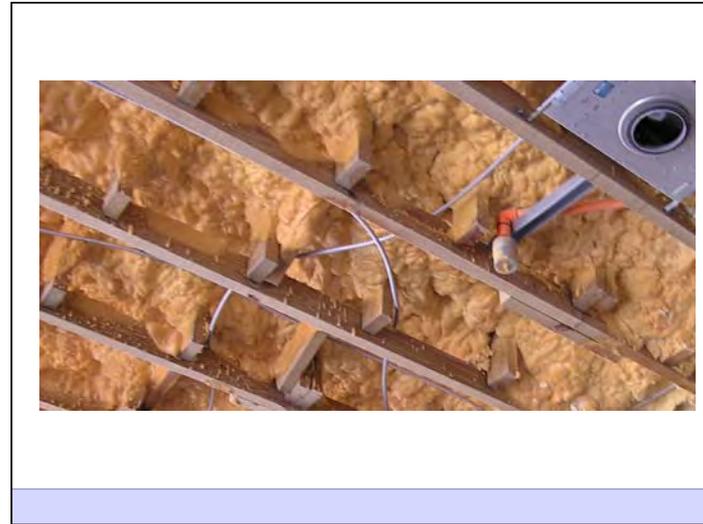


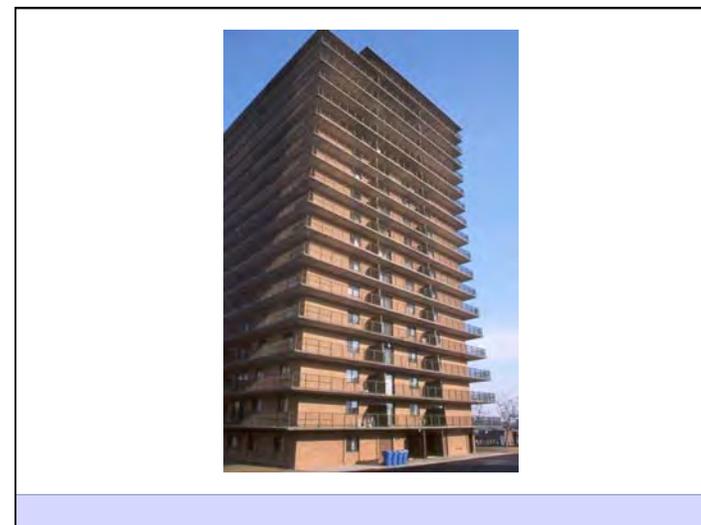
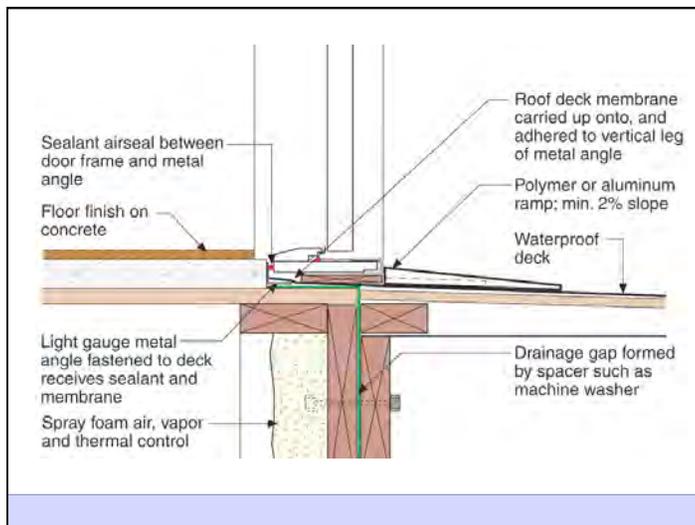
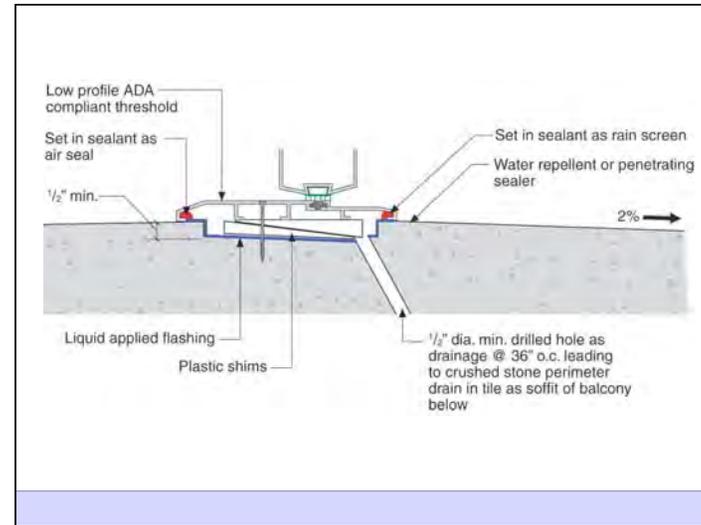
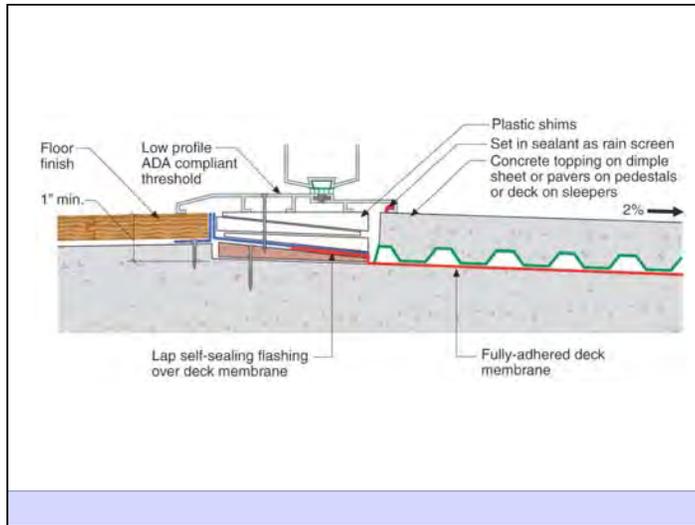


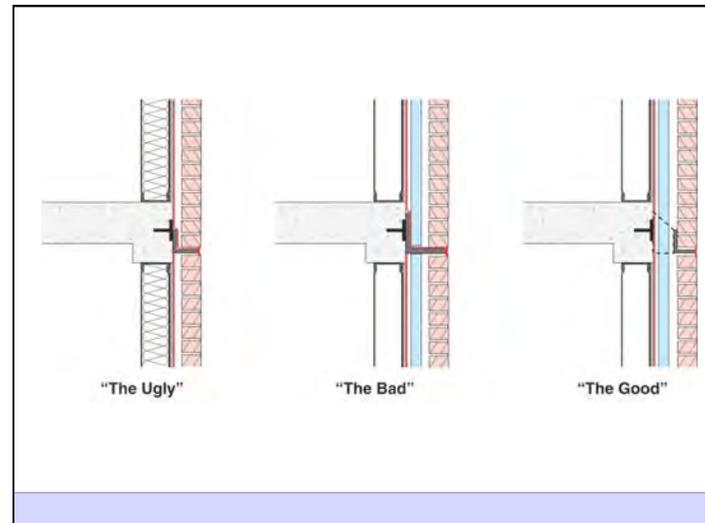
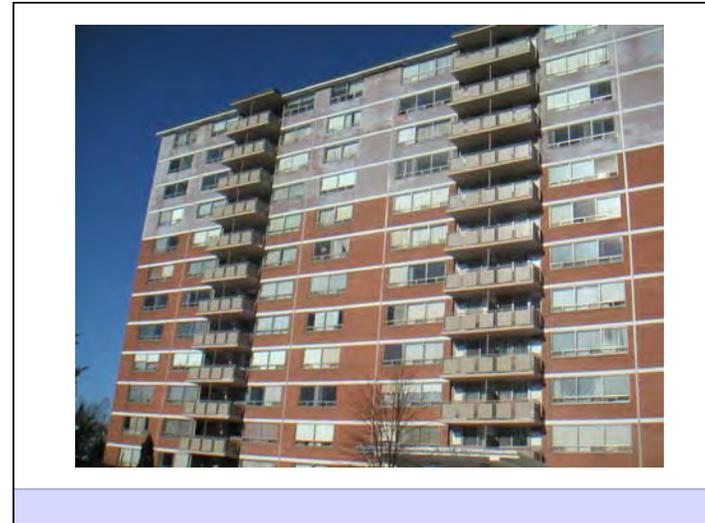


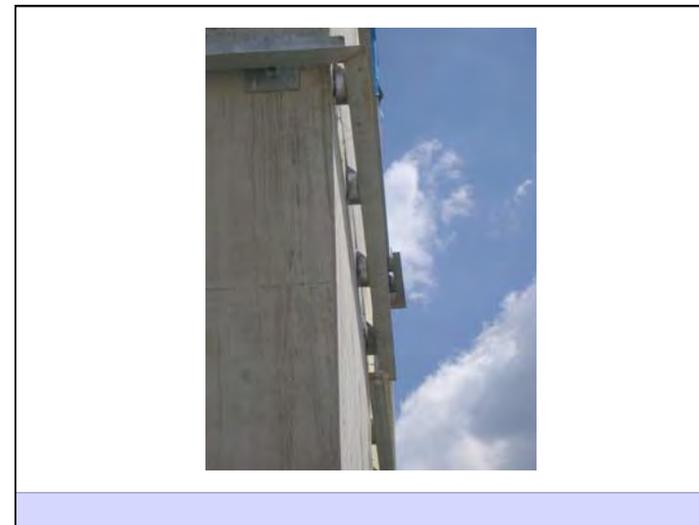
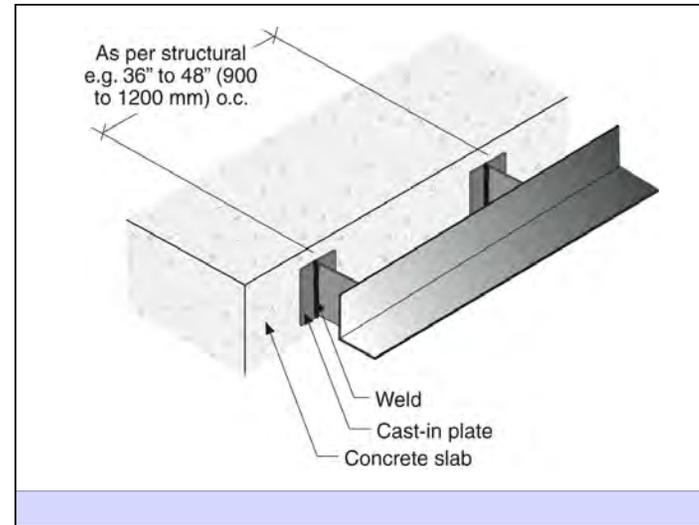
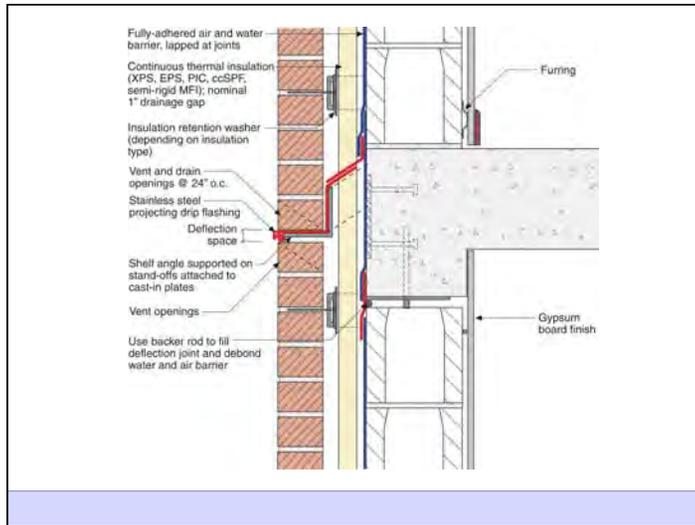


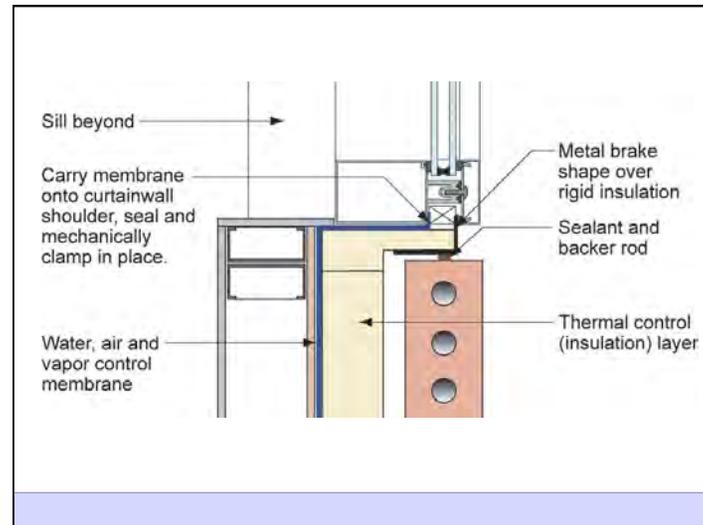
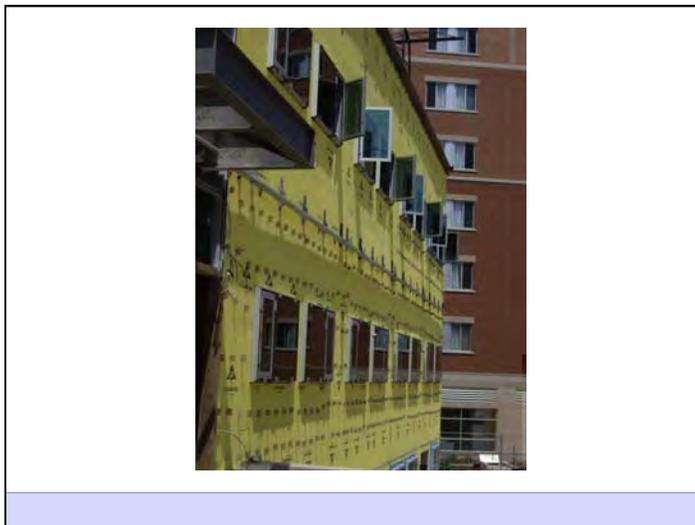
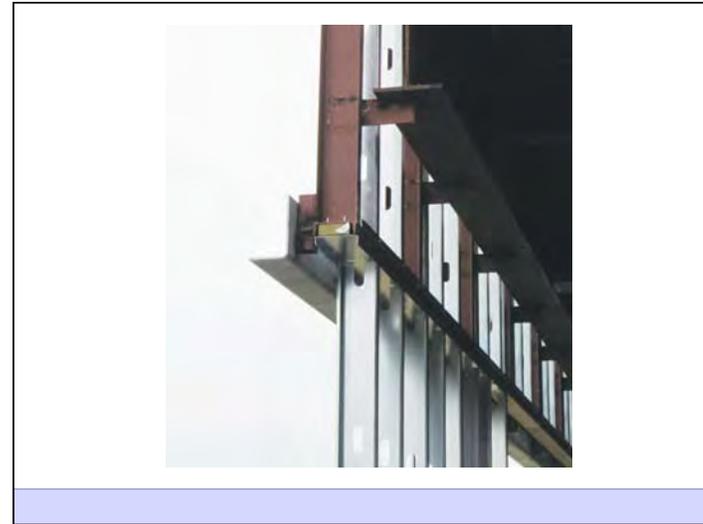


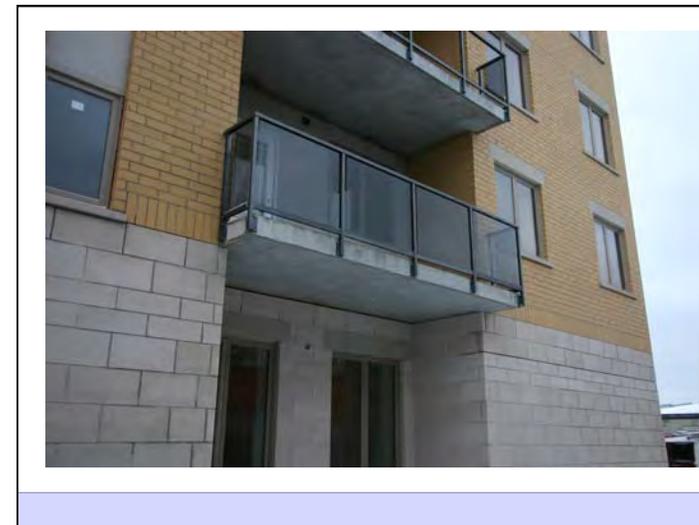
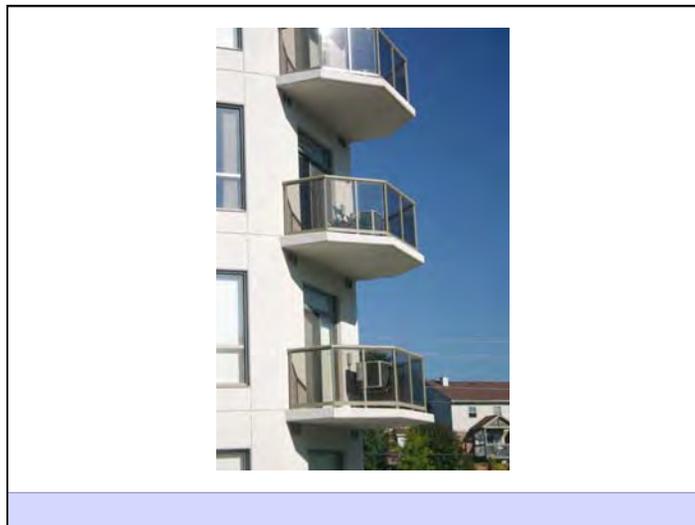
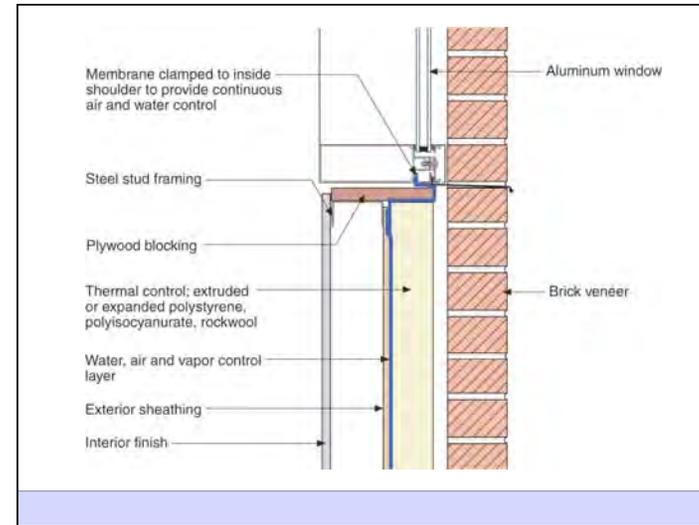
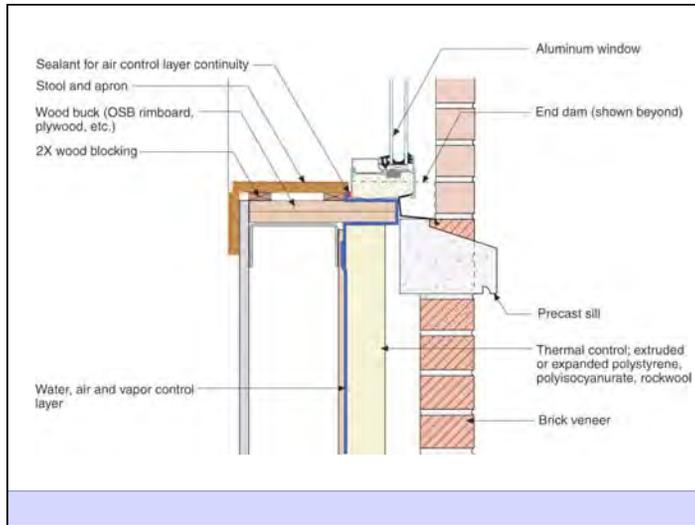


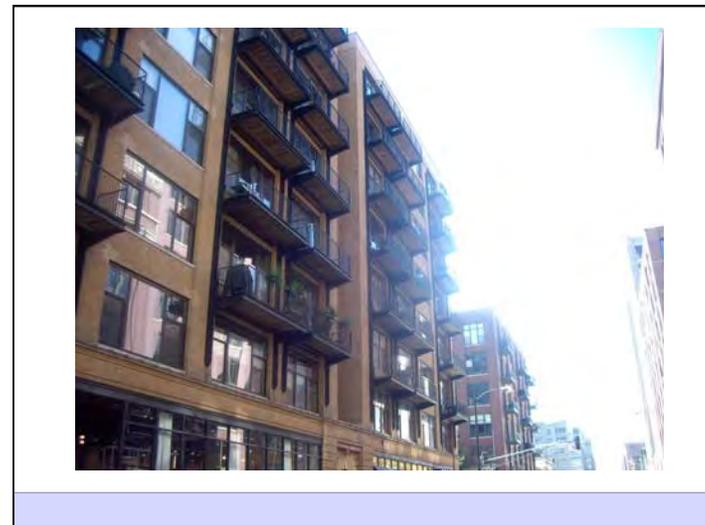
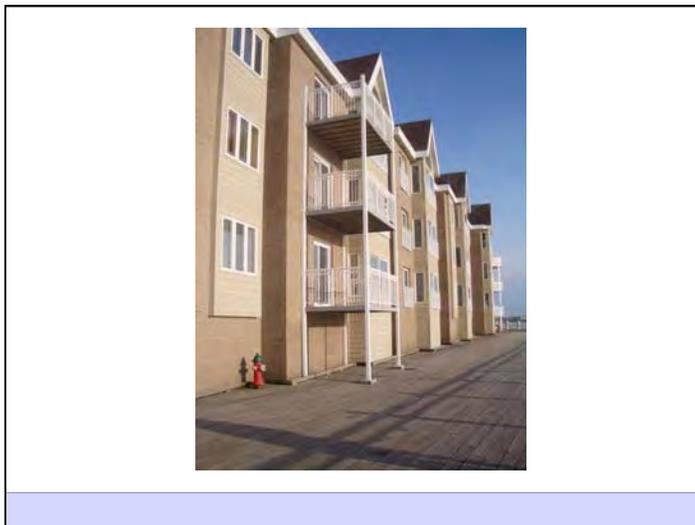


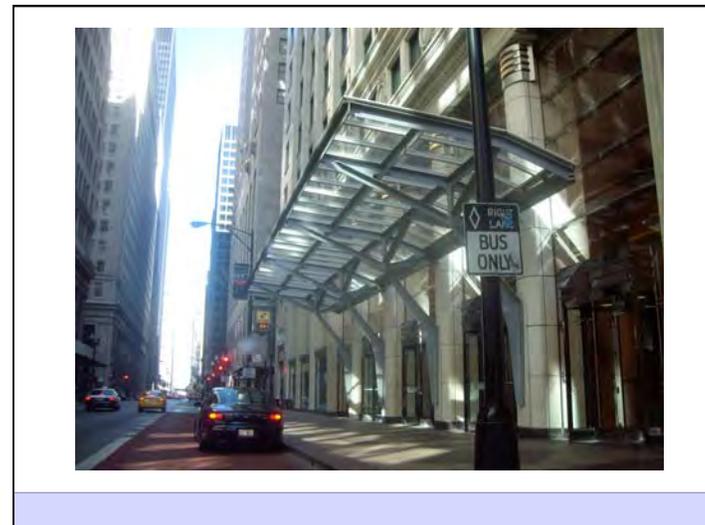
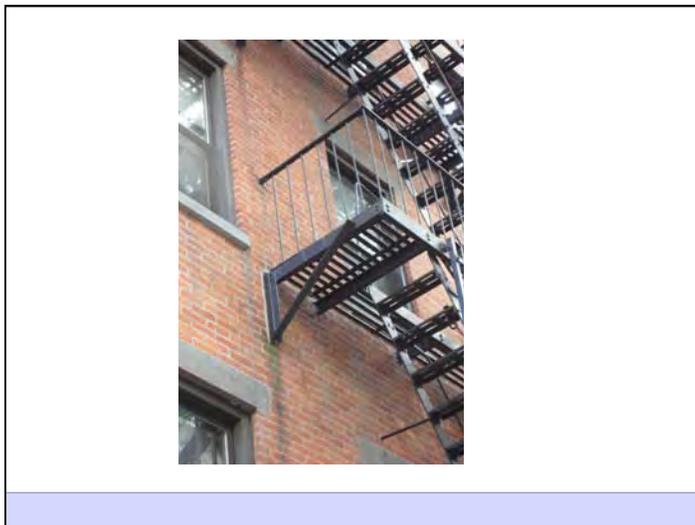
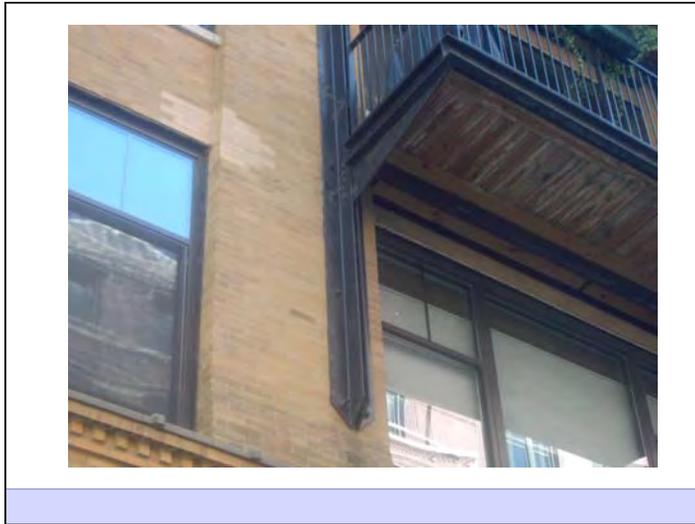


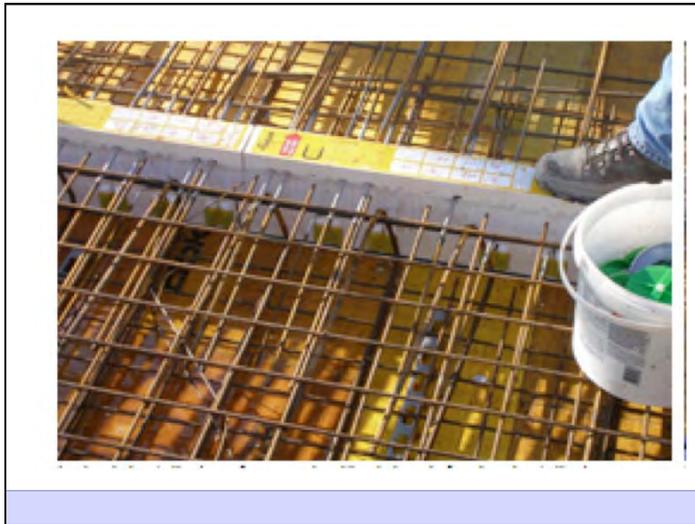


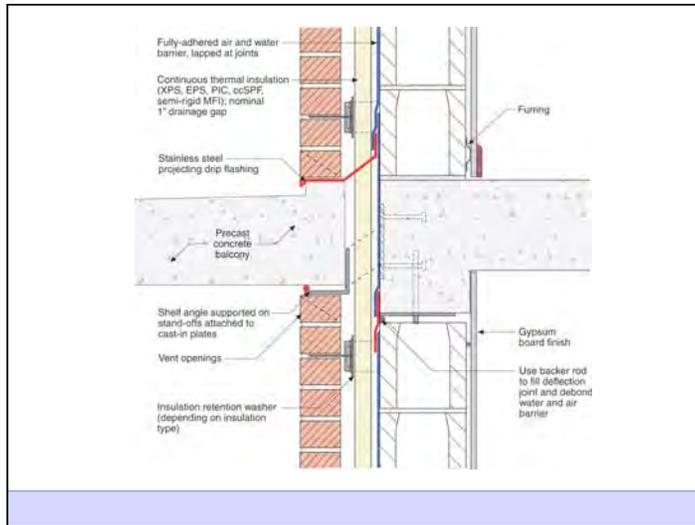












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