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Building Science 2009

How Tight is Too Tight

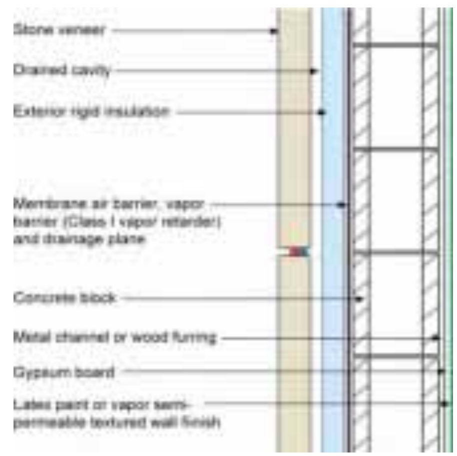
presented by www.buildingscience.com

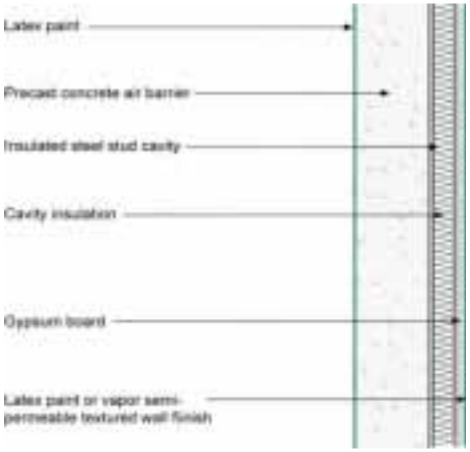
Air Barrier Specifications

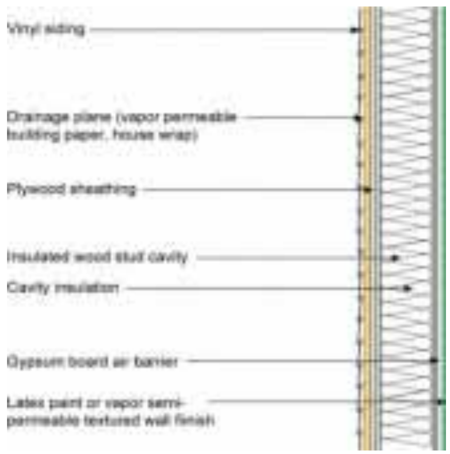
Air barrier system

Material	0.02 l/(s-m2)@75 Pa
Assembly	0.20 l/(s-m2)@75 Pa
Enclosure/Compartment	2.00 l/(s-m2)@75 Pa

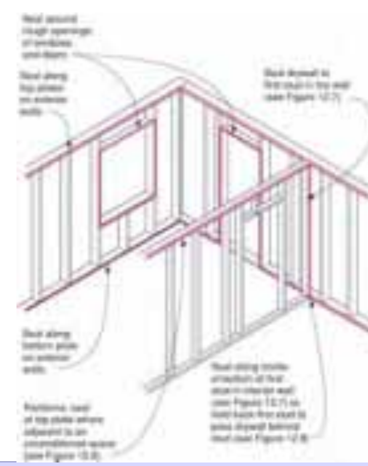
NORMALIZED AIR FLOW												LEAKAGE AREAS	
75 Pascals			50 Pascals			10 Pascals			4 Pascals			10 Pascal	4 Pascal
(l/s-m^2)	ft^3/min-ft^2	(m^3/h-m^2)	(l/s-m^2)	(ft^3/min-ft^2)	(m^3/h-m^2)	(l/s-m^2)	ft^3/min-ft^2	(m^3/h-m^2)	(l/s-m^2)	(ft^3/min-ft^2)	(m^3/h-m^2)	EqLA/100 ft^2	ELA/100 ft^2
2.000	0.394	7.200	1.537	0.303	5.532	0.540	0.106	1.943	0.298	0.059	1.071	3.136	1.670
0.200	0.039	0.720	0.154	0.030	0.553	0.054	0.011	0.194	0.030	0.006	0.107	0.314	0.167
0.020	0.004	0.072	0.015	0.003	0.055	0.005	0.001	0.019	0.003	0.001	0.011	0.031	0.017

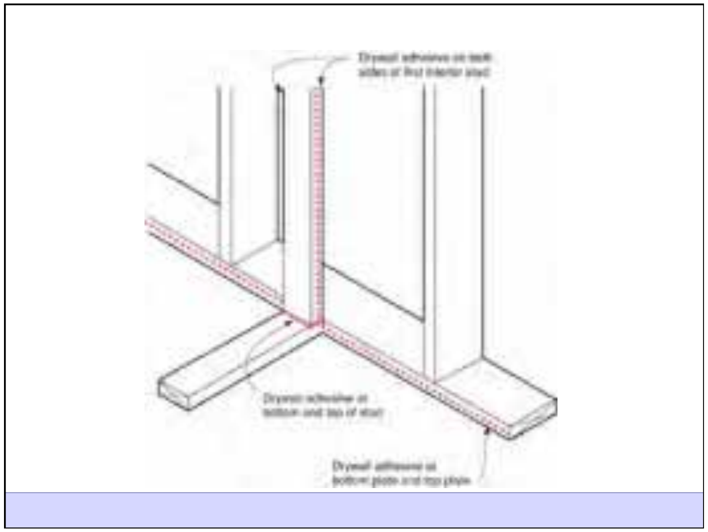


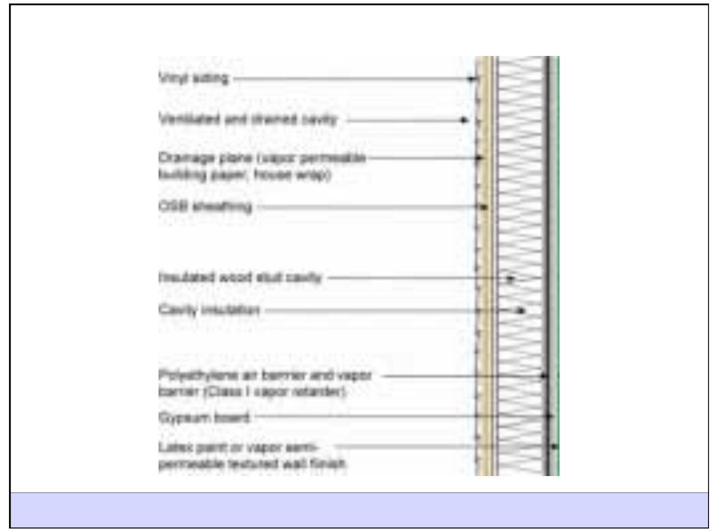

Latex paint
Precast concrete air barrier
Insulated steel stud cavity
Cavity insulation
Gypsum board
Latex paint or vapor semi-
permeable textured wall finish

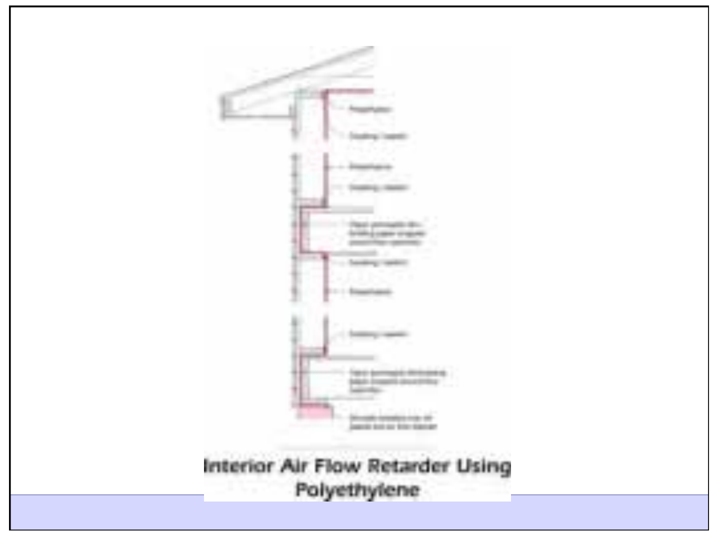


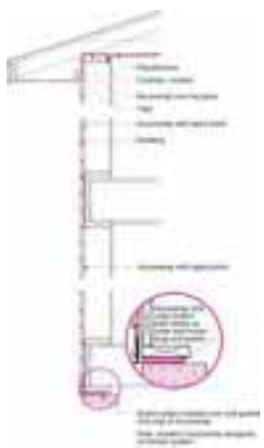
Interior Air Flow Retarder Using Drywall and Framing

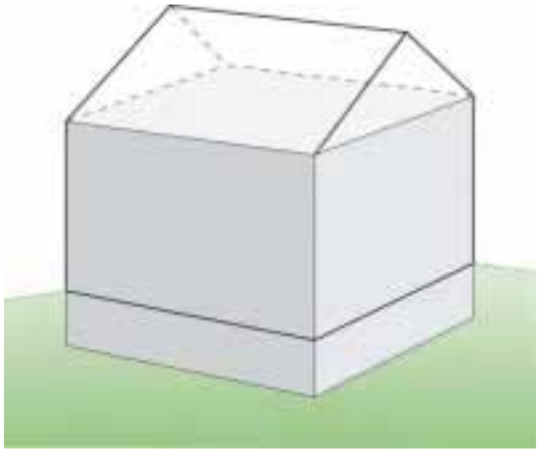


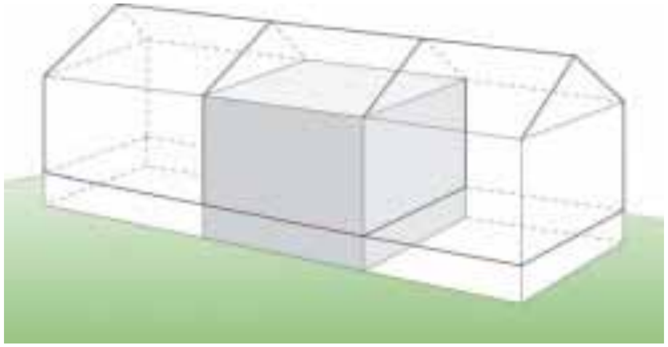

Drywall adhesive on both sides of first interior stud
Drywall adhesive at bottom and top of stud
Drywall adhesive at bottom plate and top plate

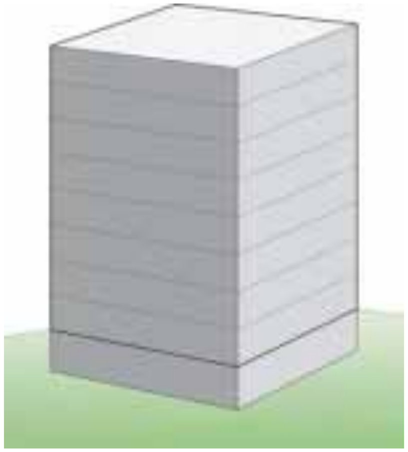

Vinyl siding
Ventilated and drained cavity
Drainage plane (vapor permeable building paper, house wrap)
OSB sheathing
Insulated wood stud cavity
Cavity insulation
Polyethylene air barrier and vapor barrier (Class I vapor retarder)
Gypsum board
Latex paint or vapor semi-permeable textured wall finish

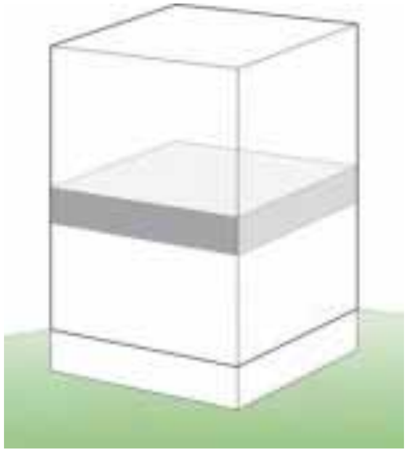

Interior Air Flow Retarder Using Polyethylene

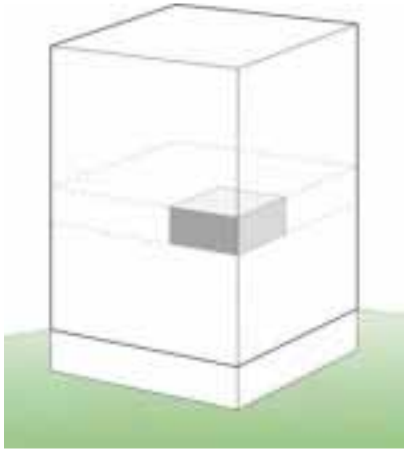


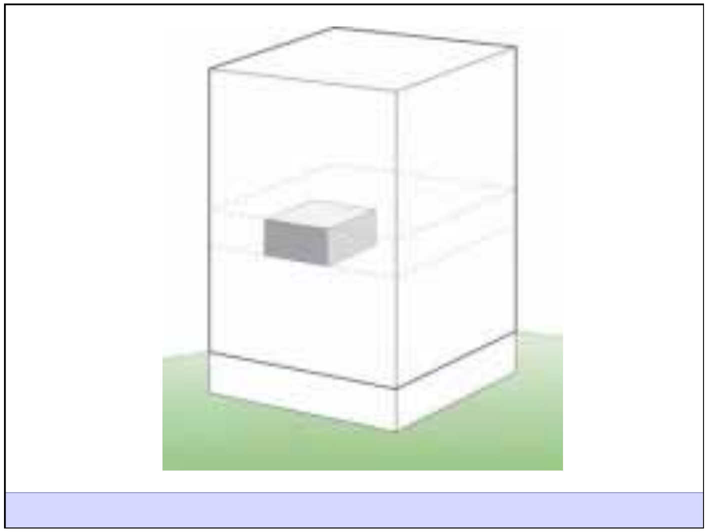


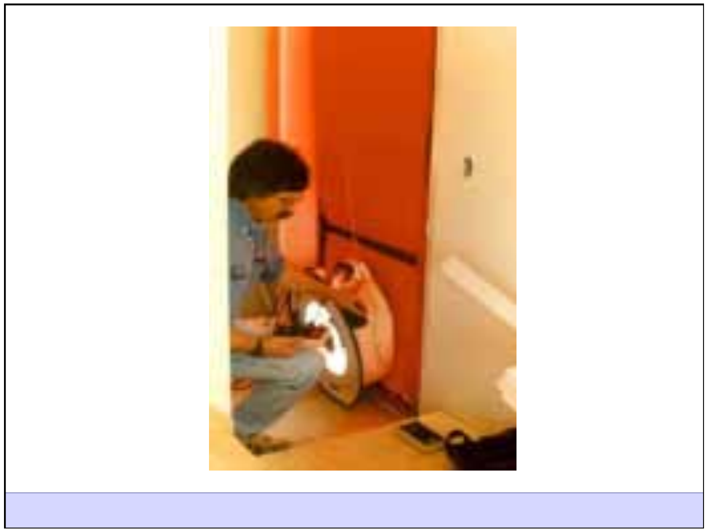


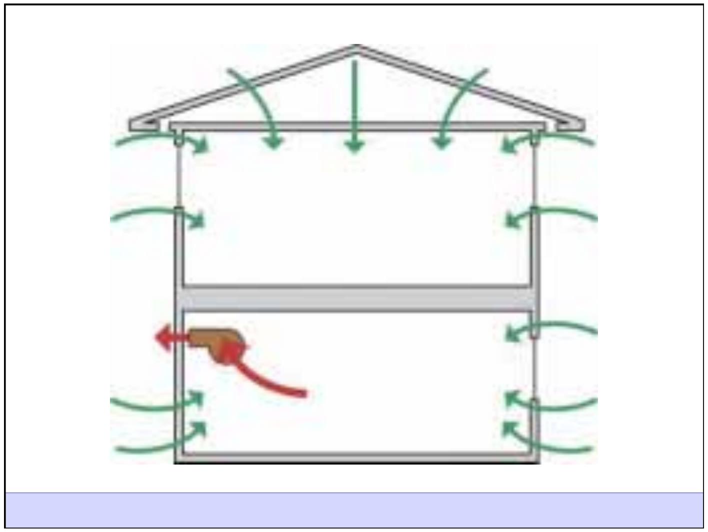


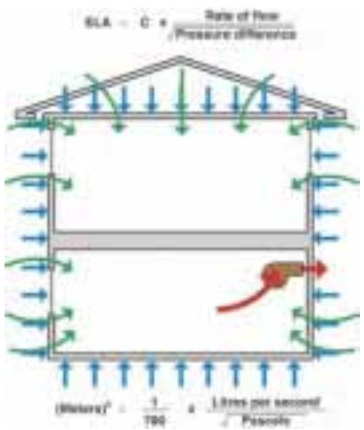


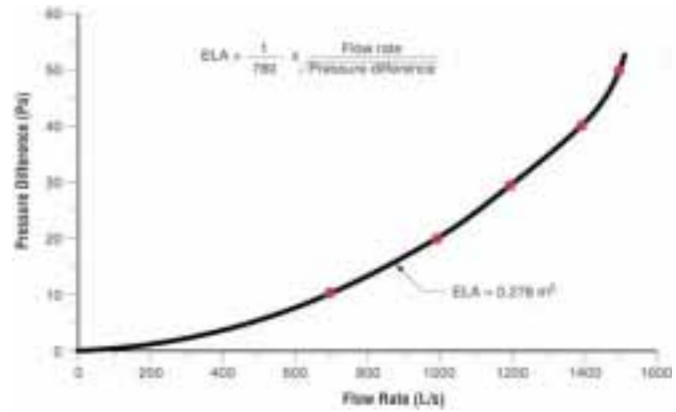












Stuff That Is Not Particularly Useful But Studied and Researched to Death

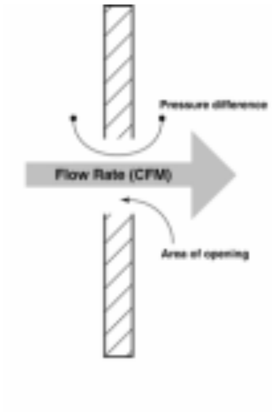
Stuff That Is Very Useful but Ignored by the Research Community

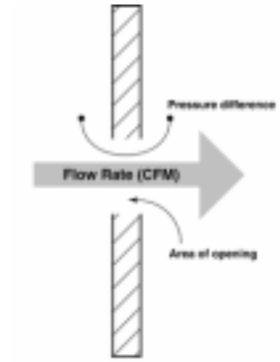
Stuff That Is Not Particularly Useful But Studied and Researched to Death

"this is called Physics"

Stuff That Is Very Useful but Ignored by the Research Community

"this is called Engineering"





“this is a lie”

Flow Through Orifices

Turbulent Flow - “inertial effects”

Flow Through Porous Media

Laminar Flow - “viscosity effects”

Flow Through Orifices

Turbulent Flow - “inertial effects”

Flow Through Porous Media

Laminar Flow - “viscosity effects”

“true but not useful”

$Q = A \Diamond C_D \frac{2}{}(P)^{\frac{1}{2}}$ Bernoulli

$Q = C_K —(P)$ Darcy

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$Q = A \Diamond C(P)^{\frac{1}{2}}$

$Q = C(P)$

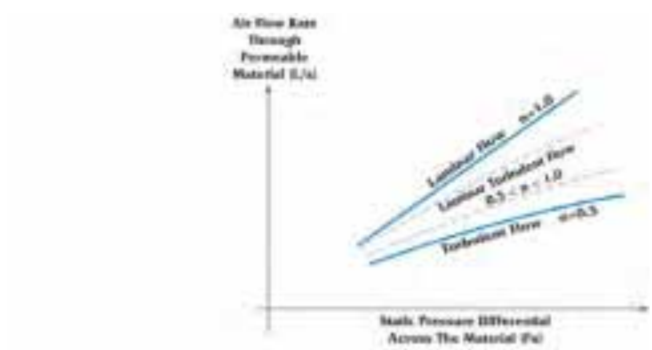
$Q = A \Diamond C_D \frac{2}{}(P)^{\frac{1}{2}}$ Bernoulli

$Q = C_K —(P)$ Darcy

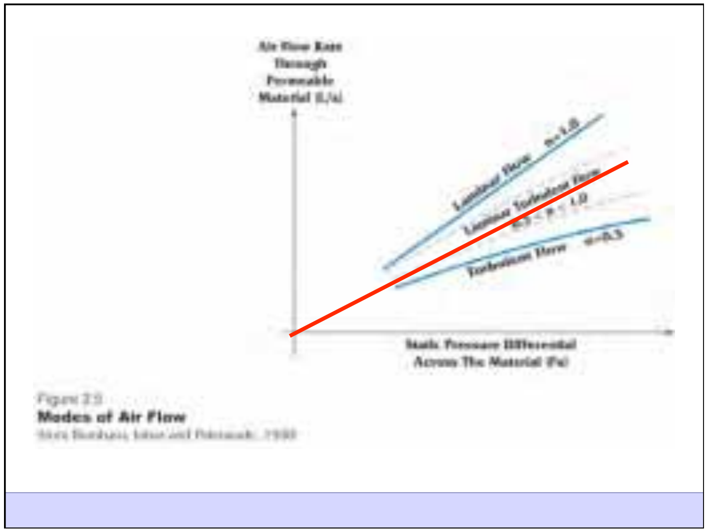
$Q = A \Diamond C(P)^{\frac{1}{2}}$

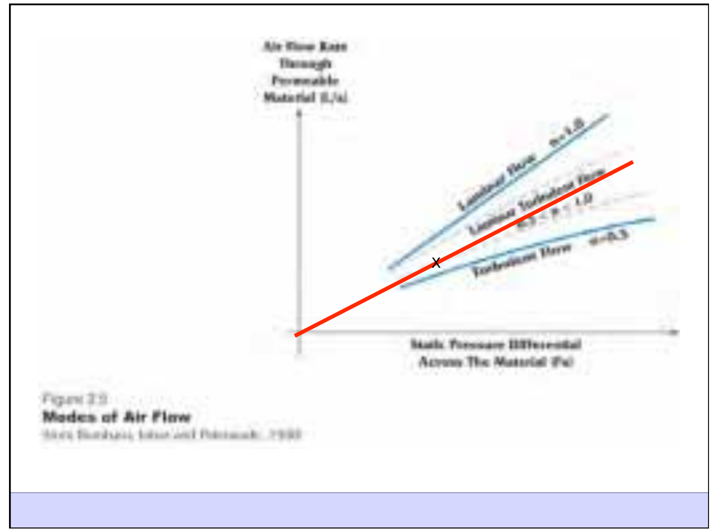
$Q = C(P)$

$Q = A \Diamond C(P)^n$ Kronval “an engineer”



Modes of Air Flow


Air Flow Rate
Through
Permeable
Material (L/s)
Laminar Flow
Laminar Turbulent Flow
Turbulent Flow
Static Pressure Differential
Across The Material (Pa)
Modes of Air Flow


Air Flow Rate
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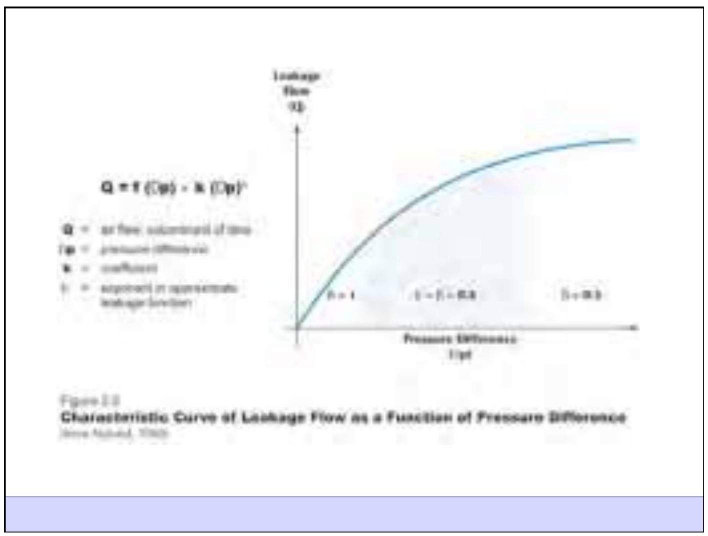
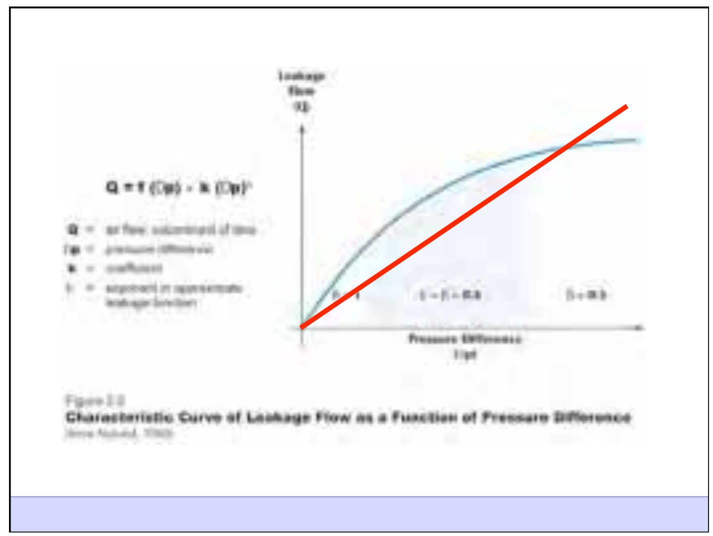
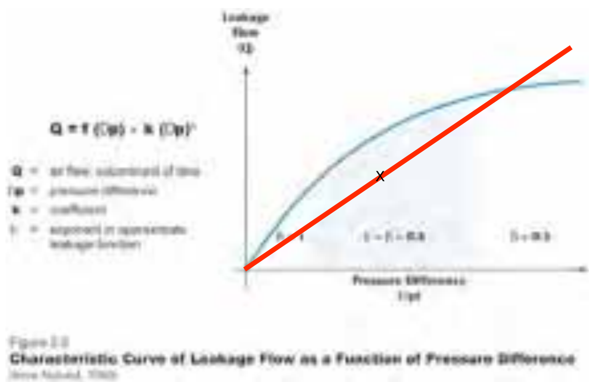
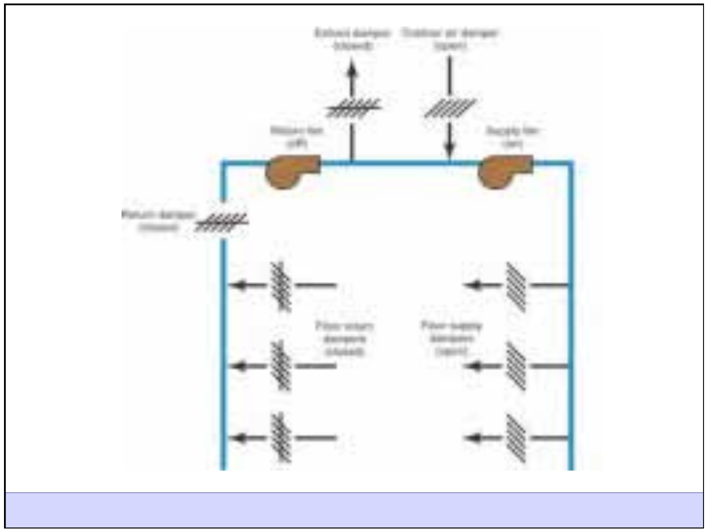
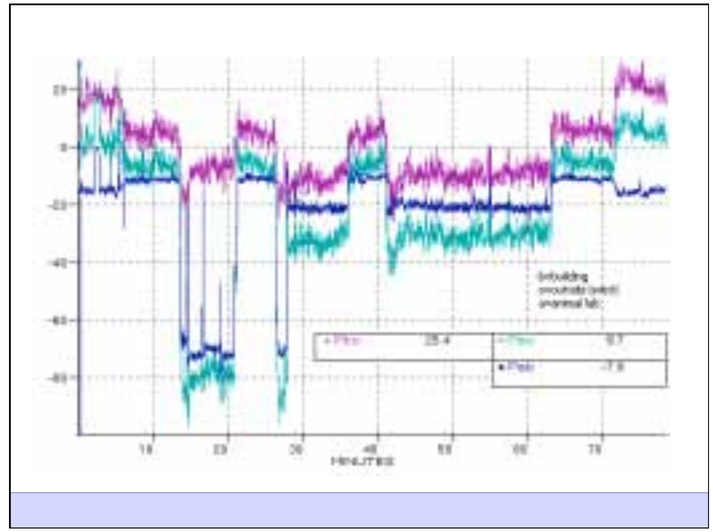
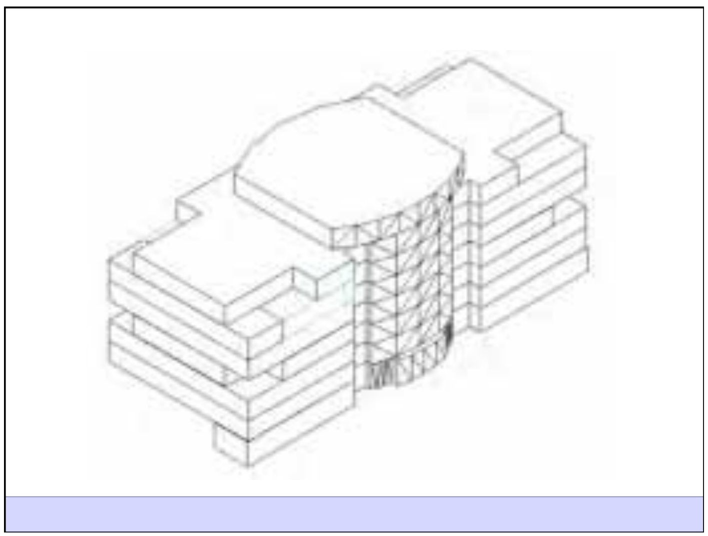

Leakage
Flow
(Q)
Pressure Difference
Characteristic Curve of Leakage Flow as a Function of Pressure Difference

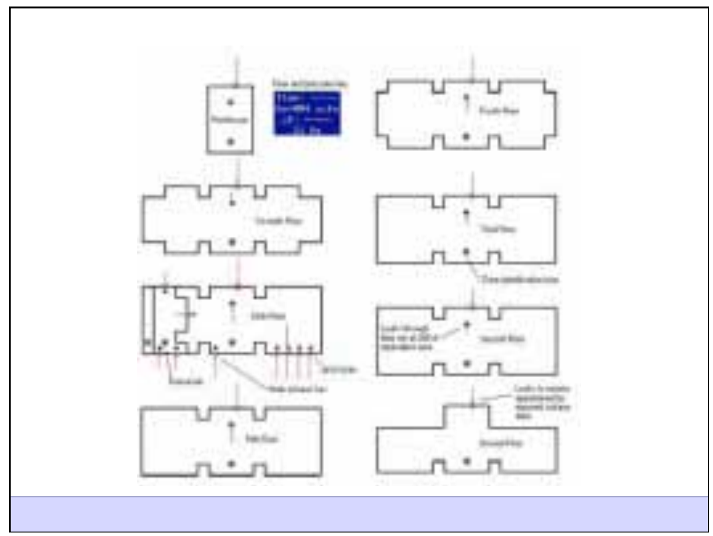

Leakage
Flow
(Q)
Pressure Difference
Characteristic Curve of Leakage Flow as a Function of Pressure Difference

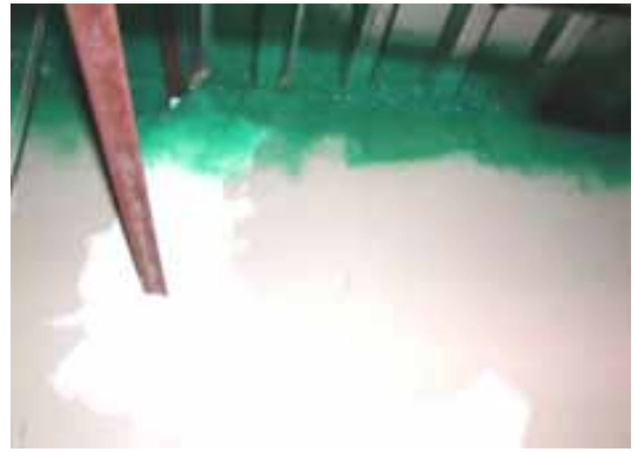

Leakage
Flow
(Q)
X
Pressure Difference
Characteristic Curve of Leakage Flow as a Function of Pressure Difference




MINUTES





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Thermo
ply
Thermo
ply


Thermo
ply

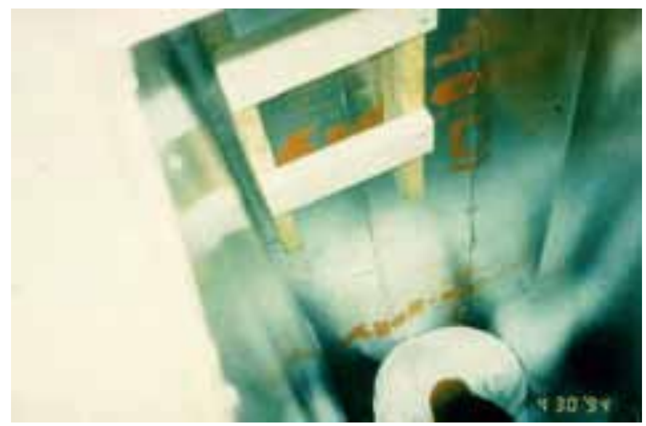

ermo-ply


GoldLine


Certai


Parallam
Parallam
MICRO-LAM
TIMBERSTRAND


BLOCK 2X6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