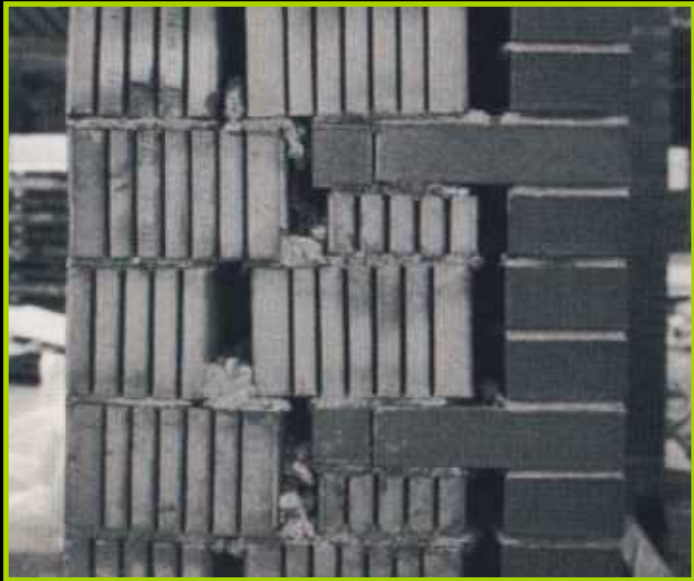
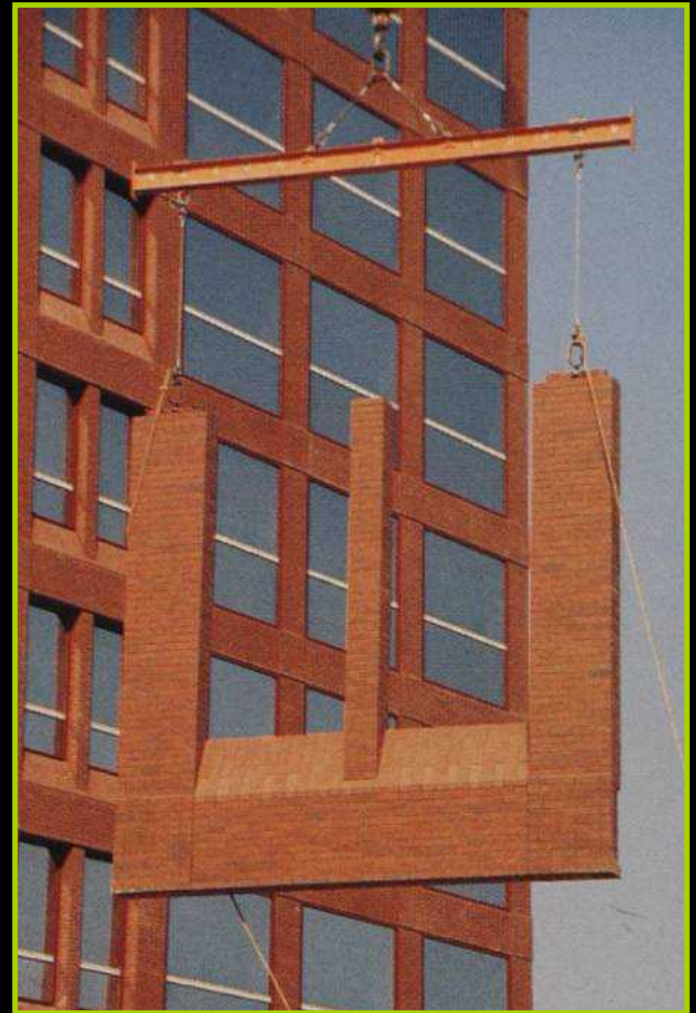


Construction Technology 1 (AES 24501)

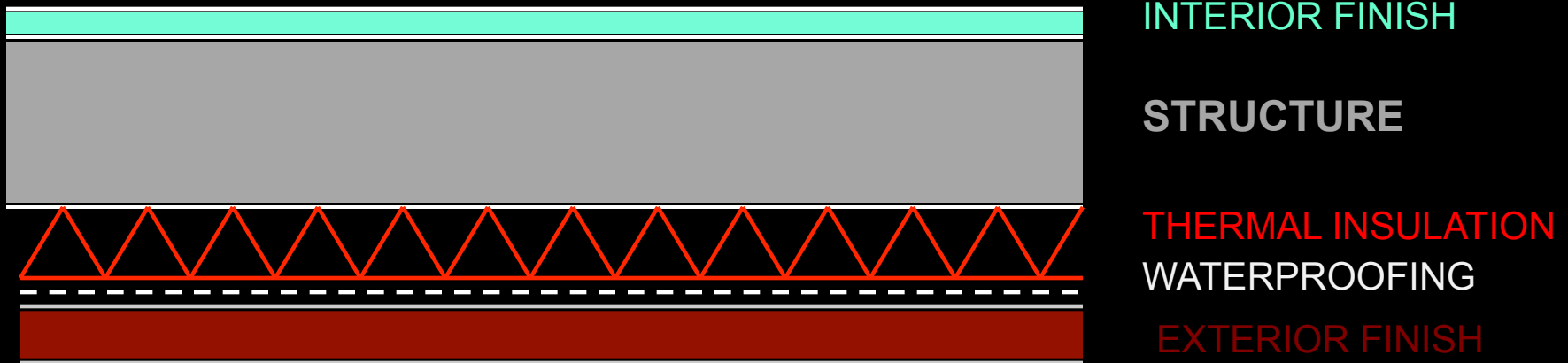
Intro to Basic Materials:



MASONRY WALL SYSTEMS



WALL ASSEMBLIES, CONTEMPORARY:



→ IN CONTEMPORARY CONSTRUCTION WE OFTEN DESIGN WALL ASSEMBLIES THAT ARE NOT HOMOGENOUS (+SOLID), BUT HETEROGENEOUS = **COMPOSED OF LAYERS**

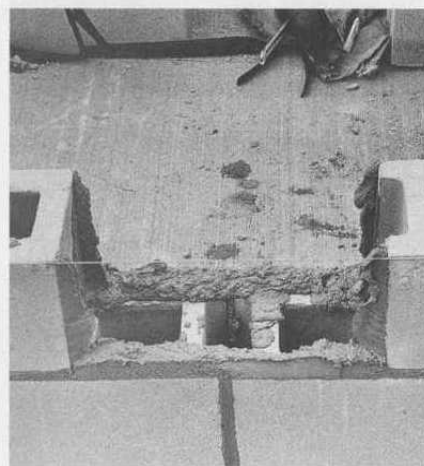
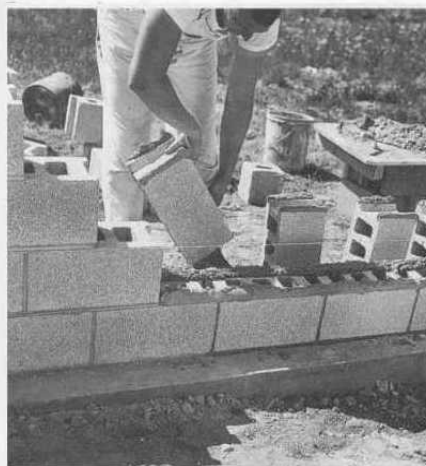
A close-up photograph of a person's hands holding a large, rectangular concrete masonry unit (CMU) block. The block is light gray and has two circular holes on its top surface. The person's hands are visible at the top corners of the block, gripping it. The background is a dark, out-of-focus surface.

CMU

CONCRETE MASONRY UNIT

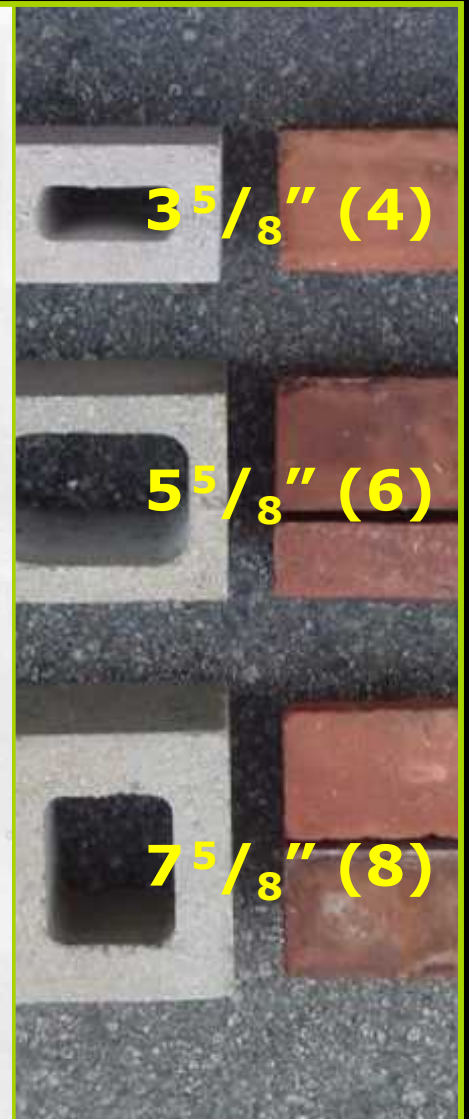
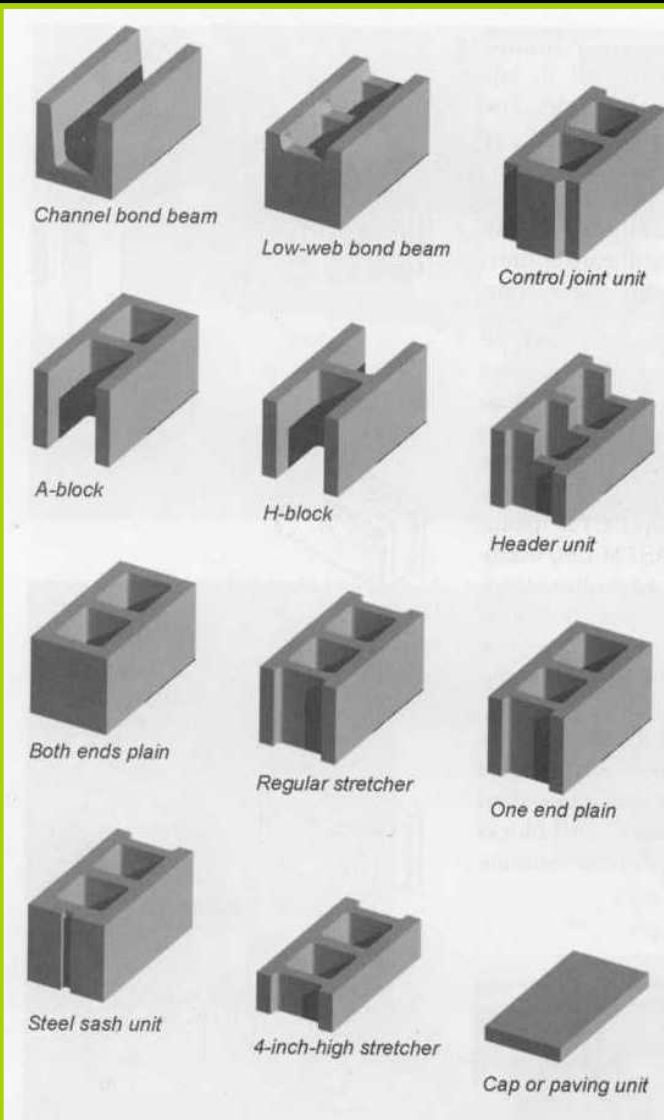
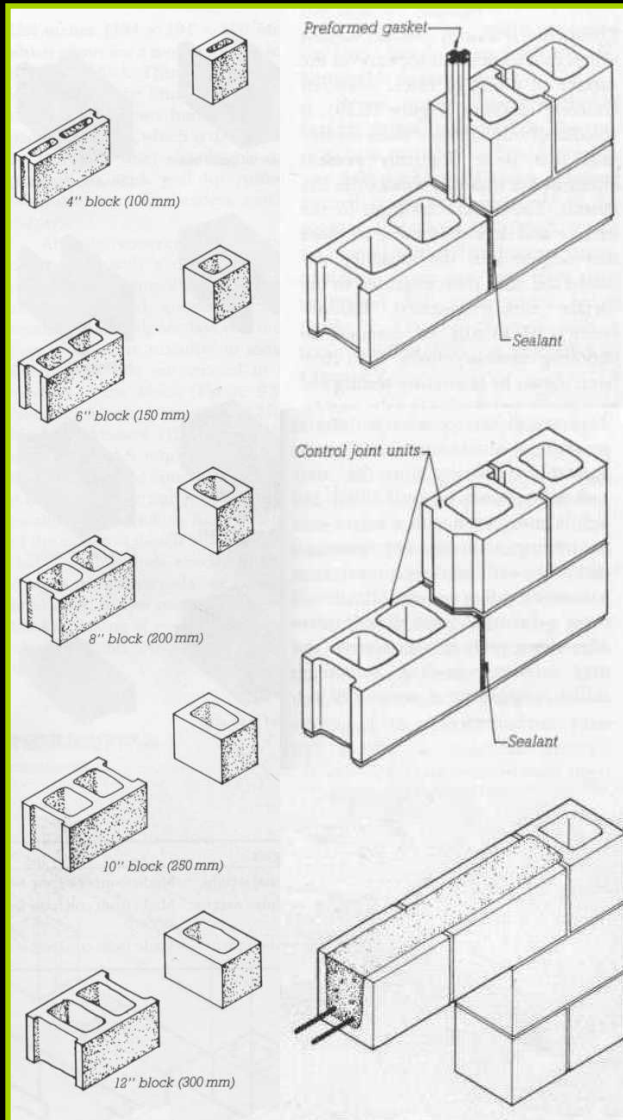
→ INSTALLATION:

- 'CONCRETE MASONRY UNIT' HELD WITH TWO HANDS!
- FOUNDATION MARKS; START 'LEADS' ON CORNERS, IN MORTAR BED.
- EACH COURSE MUST BE LEVEL, STRAIGHT, PLUMB.
- FILL-IN BETWEEN COMPLETED 'LEADS' W/ STRETCHED LINE.

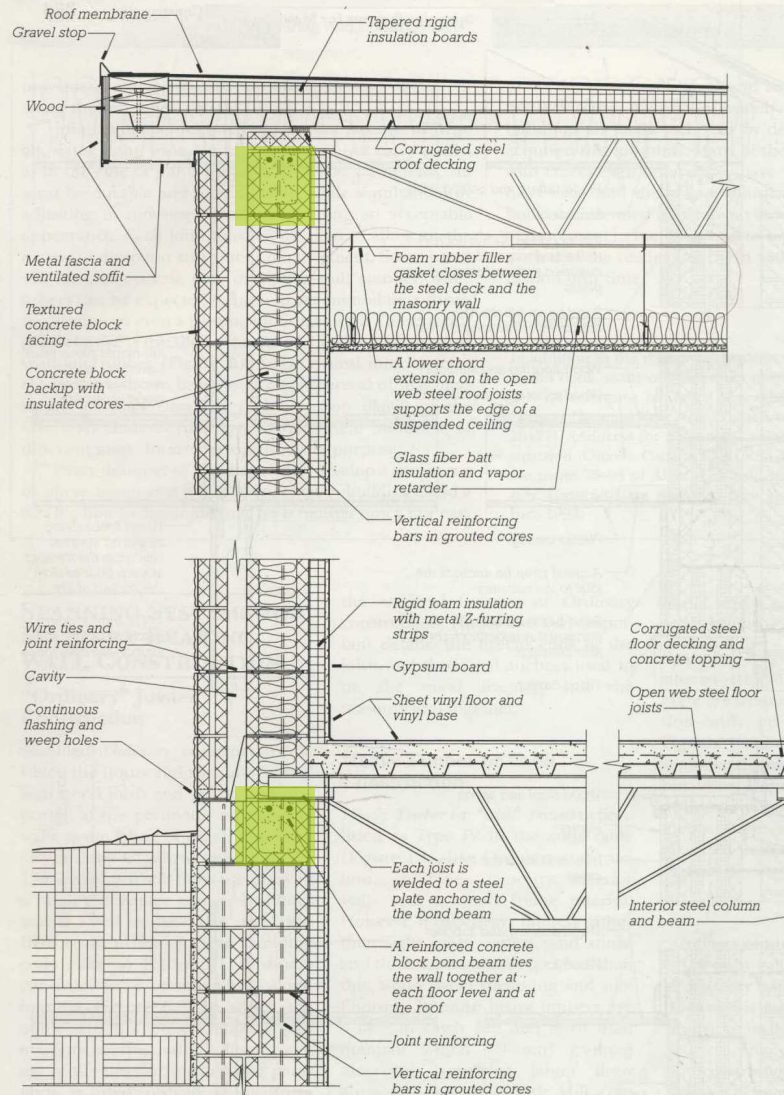
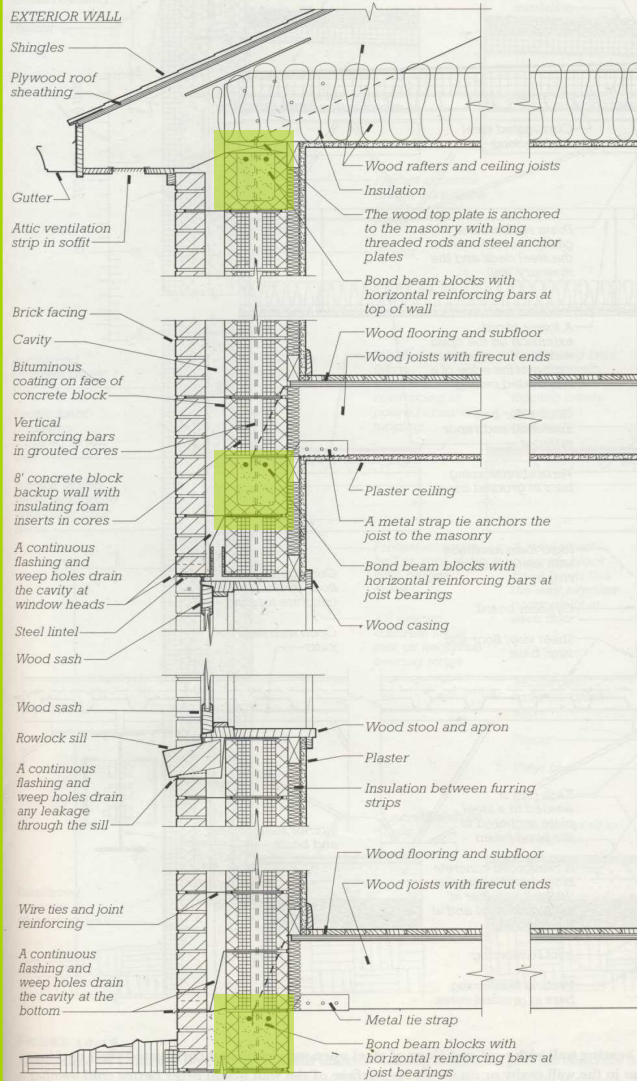


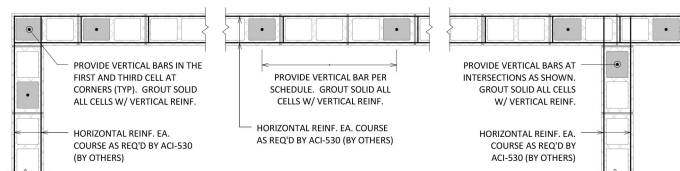
→ 'CMU' - TYPES:

CMU: $H=7\frac{5}{8}"$ (8), $L=15\frac{5}{8}"$ (16)



→ 'BOND BEAMS':

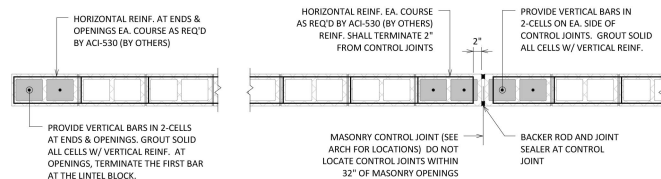




CORNERS

TYPICAL

INTERSECTIONS



ENDS & OPENINGS

WALL CONTROL JOINT

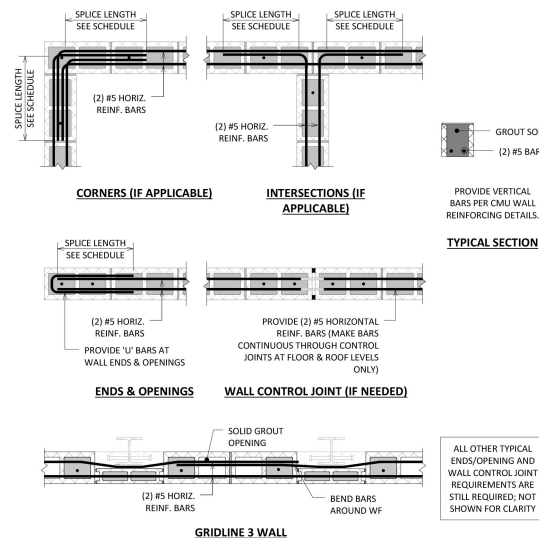
MINIMUM CMU WALL REINFORCING SCHEDULE			
WALL TYPE	WALL THICKNESS (NOMINAL)	VERTICAL REINF.	HORIZONTAL LADDER-TYPE REINF.
ALL LOAD-BEARING WALLS, ELEVATOR SHAFTS, EXTERIOR WALLS, STAIRWELLS (U.O.N.)	6"	#4 @ 32" O.C.	9 GA. LADDER @ 16" O.C.
	8"	#5 @ 32" O.C.	9 GA. LADDER @ 16" O.C.
	12"	#5 @ 24" O.C.	EXTRA-HEAVY 3/16" DIA @ 16" O.C.
ALL OTHER INTERIOR WALLS	ALL SIZES	N/A	9 GA. LADDER @ 16" O.C.
NOTE: ALL REINFORCING REQUIREMENTS INDICATED ON PLANS AND DRAWINGS SHALL TAKE PRECEDENCE OVER THIS TABLE			

MASONRY

- ALL MASONRY WORK, INCLUDING CURING, ERECTION, AND WEATHER PROTECTION, SHALL CONFORM TO THE NCMA AND ACI-530.1-99 REQUIREMENTS AND STANDARDS.
- ALL CONCRETE MASONRY UNITS SHALL CONFORM TO ASTM C-90, TYPE N-1, WITH THE STRENGTH OF UNITS AND MORTAR BEING SUCH THAT THE (f_m) VALUES INDICATED ARE SATISFIED.
- MINIMUM COMPRESSIVE STRENGTH OF CONCRETE MASONRY SHALL BE ($f_m = 1900$ PSI) U.O.N.
- ALL MORTAR USED SHALL CONFORM TO ASTM C-270 AND BE TYPE (M) OR (S) WITH A MINIMUM COMPRESSIVE STRENGTH OF 1800 PSI.
- ALL GROUT USED SHALL CONFORM TO ASTM C-476 AND HAVE A MINIMUM 28-DAY COMPRESSIVE STRENGTH OF 2500 PSI.
- HIGH LIFT GROUTING SHALL BE PERMITTED ONLY IF THE PROCEDURES OF ACI 530.1-99 (PART 3) ARE FOLLOWED, INCLUDING BUT NOT LIMITED TO CLEANOUTS AND POUR HEIGHT LIMITS.
- ALL REINFORCING STEEL SHALL CONFORM TO ASTM A613 WITH A MINIMUM YIELD STRENGTH OF 60 KSI (U.O.N.). ADD LADDER TYPE MORTAR JOINT REINFORCING EVERY TWO COURSES.
- SUBMIT REINFORCING STEEL SHOP DRAWINGS FOR REVIEW.
- PROVIDE GALVANIZED HORIZONTAL JOINT REINFORCEMENT AT 16" O.C. VERTICALLY (U.O.N.)
- PROVIDE A MINIMUM OF #3 CONTINUOUS BARS AT 48" O.C. VERTICAL REINFORCEMENT IN ALL CMU WALLS (TYP).
- PROVIDE MATCHING DOWELS INTO FOUNDATION WALLS AT ALL VERTICAL REINFORCEMENT LOCATIONS - SEE SECTIONS.
- PROVIDE ADDITIONAL VERTICAL REINFORCEMENT AT JAMBS OF ALL WALL OPENINGS, ENDS OF WALL, AND STEEL BEAM OR ANGLE BEARING LOCATIONS. MINIMUM REINFORCEMENT SHALL BE (2) #6 VERTICAL BARS (U.O.N.).
- LAP VERTICAL AND HORIZONTAL REINFORCEMENT (48" DIAMETERS MINIMUM).
- PROVIDE CONTINUOUS BOND BEAMS WITH (2) #3 BARS SET IN GROUT AT TOP OF ALL CMU WALLS (U.O.N.).
- PROVIDE ADDITIONAL BOND BEAMS WITH (2) #3 BARS CONTINUOUS MIDWAY BETWEEN EACH FLOOR LEVEL, OR AT 8'-0" O.C. MAXIMUM SPACING VERTICALLY (TYP).
- SEE STRUCTURAL DRAWINGS FOR MASONRY UNTEL SCHEDULE AND NOTES.
- ALL MASONRY WORK SHALL BE CONTINUOUSLY MONITORED AND INSPECTED BY AN INDEPENDENT TESTING AGENCY. SUBMIT FIELD REPORTS FOR REVIEW. PROVIDE "LEVEL C" QUALITY ASSURANCE, INCLUDING ALL REQUIRED PRISM TESTS, PER ACI 530.1-99 SECTION 1.6.

TYP. MASONRY WALL REINF

3/4" = 1'-0"



TYP. MASONRY BOND BEAM DETAILS AT EACH FLOOR AND MID HEIGHT OF FLOORS (6FT MAX SPACING)

3/4" = 1'-0"

→ 'CMU' - WALLS: *STRUCTURAL: DEMISING WALLS*



→ *LATERAL FORCES*

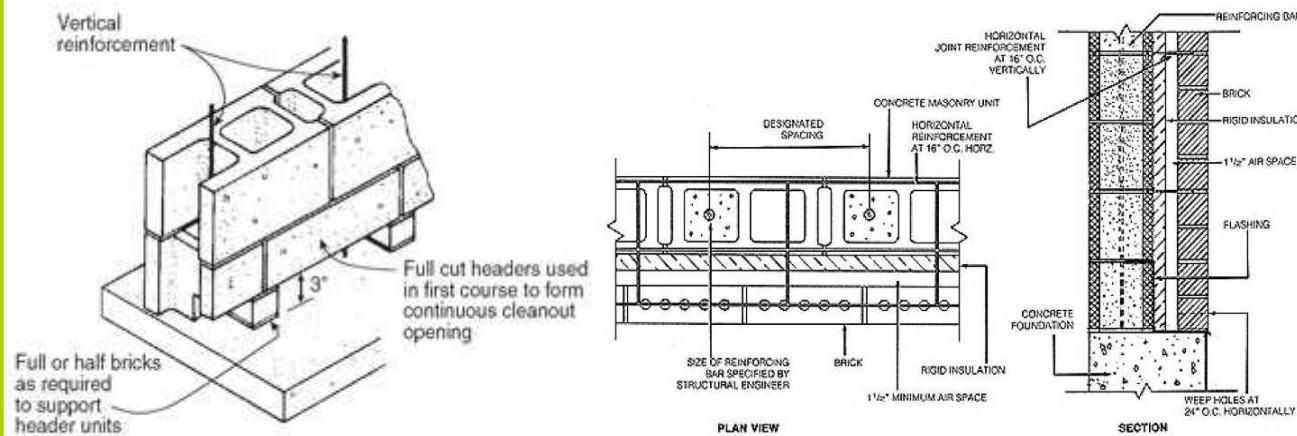
EARTHQUAKES



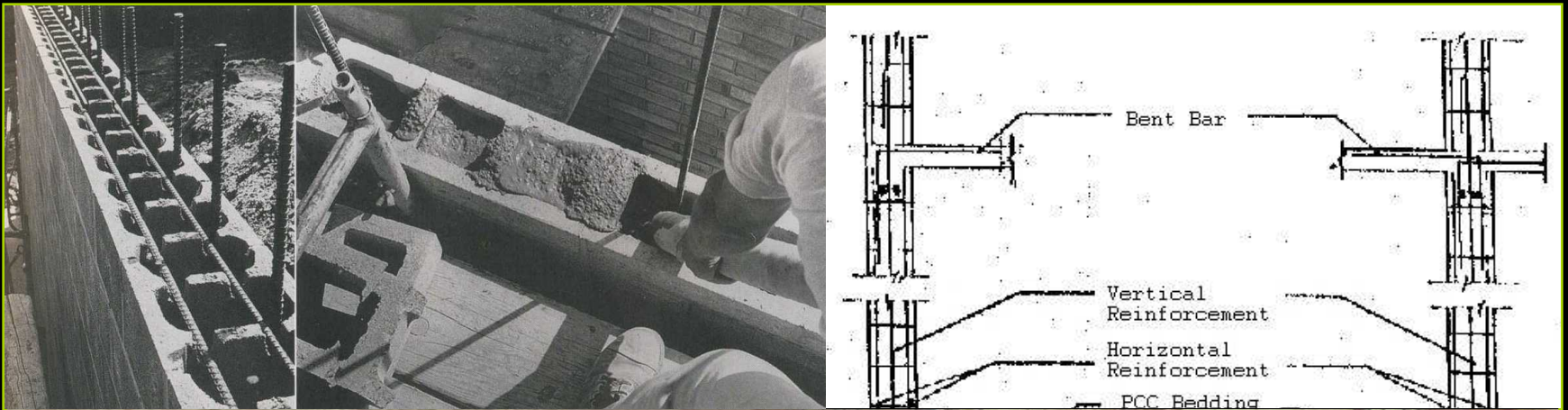
→ *VERTICAL REINFORCEMENT*



→ 'CMU' - WALLS: STRUCTURAL: DEMISING WALLS



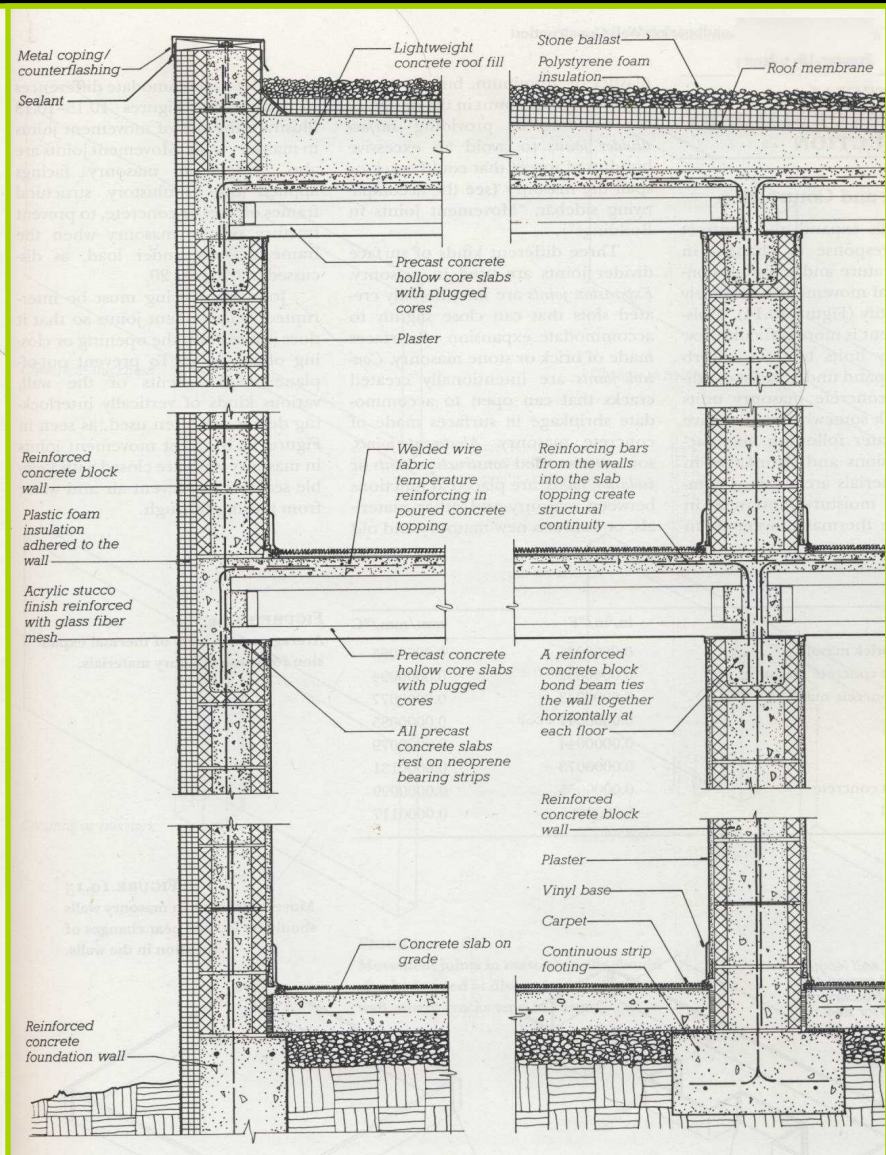
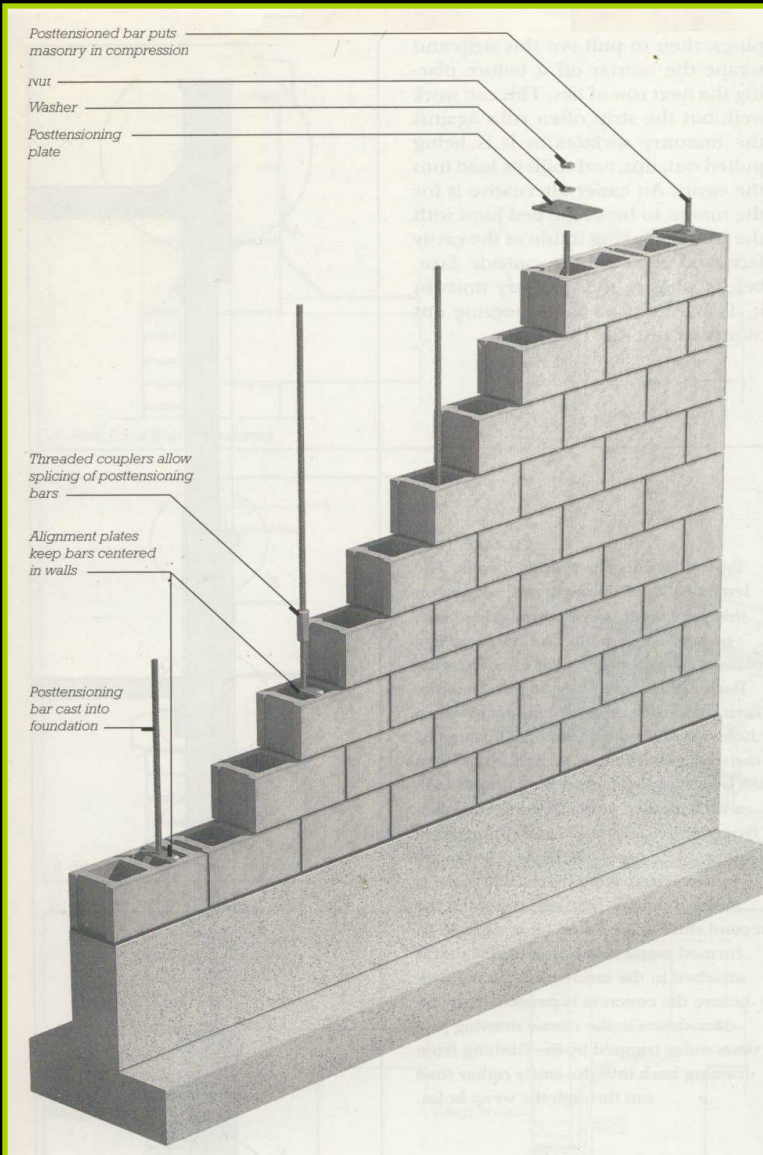
→ 'CMU' - WALLS: REINFORCED



● **RESISTANCE TO TENSILE FORCES**

- HIGHER RESISTANCE TO **LATERAL FORCES**
(WINDS, HURRICANES, TORNADOES, EARTHQUAKES)
- HIGHER RESISTANCE TO **OVERALL FORCES**
(CODE: 'UNBRACED HEIGHT' = WIDTH FACTOR;
UNREINFORCED WALL 12" = CA. UP TO 18' -0"
REINFORCED WALL 12" = CA. UP TO 36' -0")
- REINFORCING STEEL MUST BE ABLE OF BEING STRESSED:
GROUT INFILL IN REINFORCED MASONRY CELLS

→ 'CMU' - WALLS: REINFORCED SYSTEMS



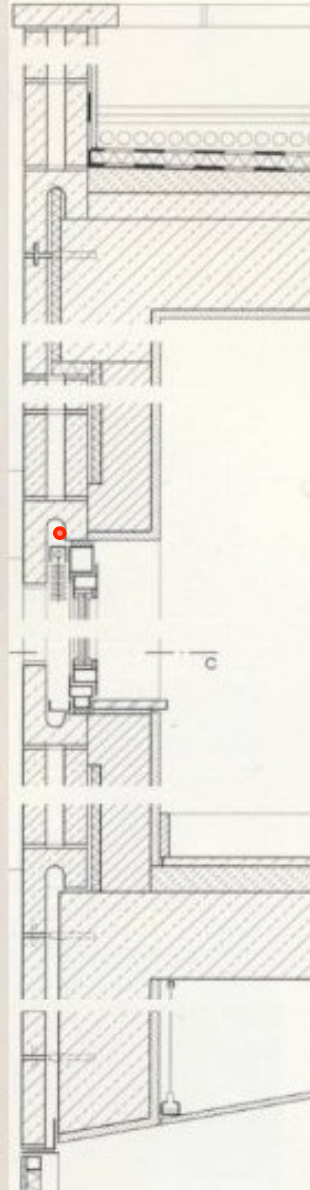
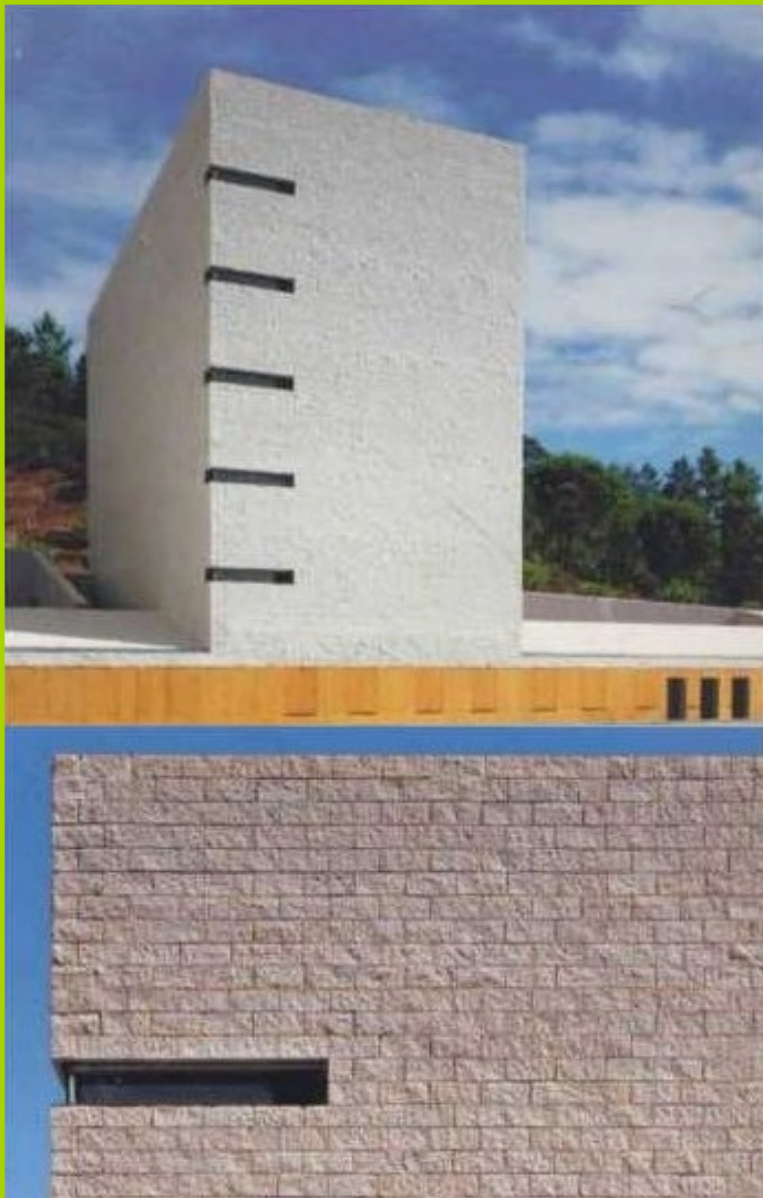
→ 'CMU' - WALLS: STRUCTURAL: REINFORCED TYPE



→ 'CMU' - BUILDINGS:



→ 'CMU' - BUILDINGS:



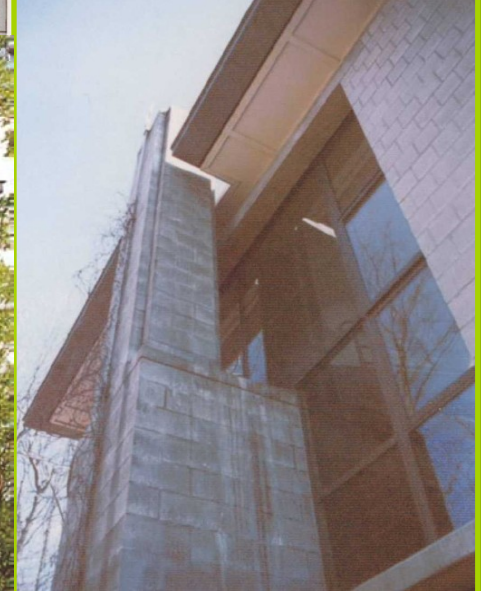
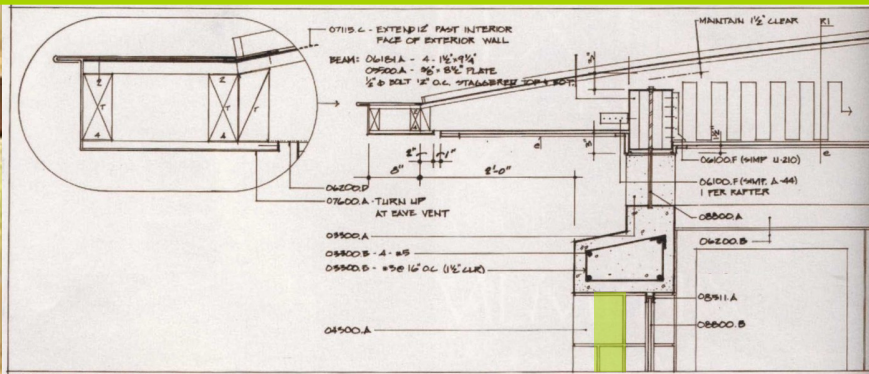
INTERIOR FINISH

STRUCTURE

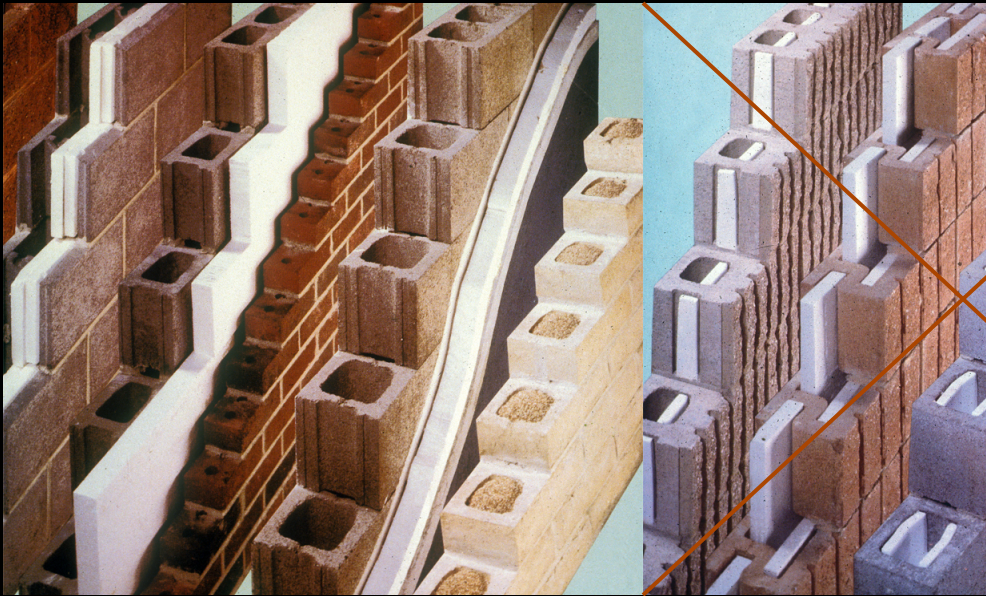
THERMAL INSULATION

WATERPROOFING

EXTERIOR FINISH



→ CASE STUDY: WHERE IS THE INSULATION?

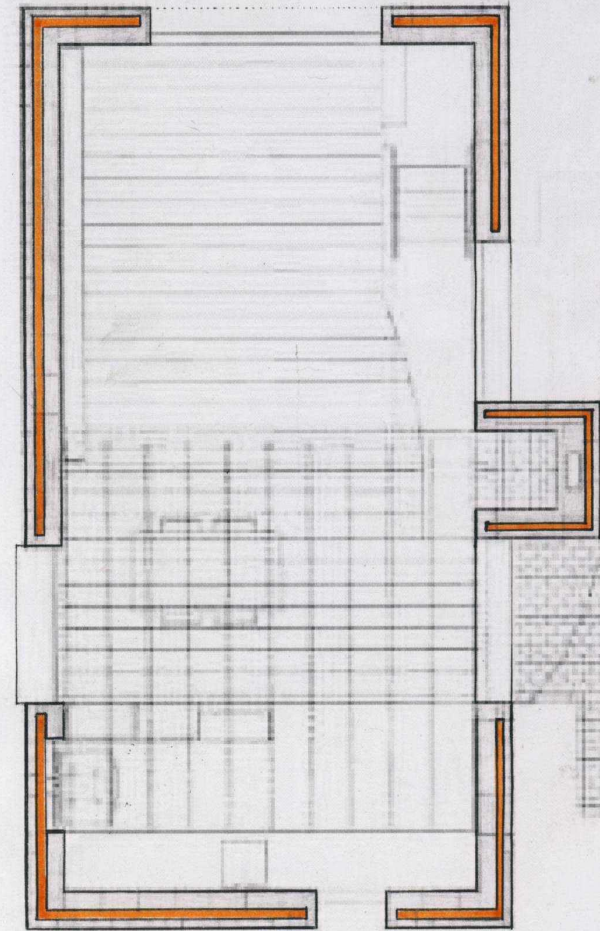


ENERGY EFFICIENCY: AVOIDANCE OF 'THERMAL BRIDGES'

- MORE EVEN TEMPERATURE IN BUILDING STRUCTURE
- AVOIDANCE OF CRACKS, MATERIAL FATIGUE / DAMAGE
- AVOIDANCE OF CONDENSATION / MOULD / DISCOMFORT
- HEATING/COOLING SAVINGS; HIGHER THERMAL COMFORT

CHECK PRODUCTS + KEY DETAILS:

- CONTINUOUS INSULATION 'LINE' IN PLANS + SECTIONS
- WINDOWS ARE PART OF THE INSULATION 'LINE'
- CHECK 'SPECIAL CASES':
 - a) BASEMENT / FOUNDATION
 - b) WINDOW / WALL
 - c) FLOOR SLABS / WALL
 - d) WALL / ROOF



Floor Plan – Intermediate Level

→ THERMAL BRIDGES:

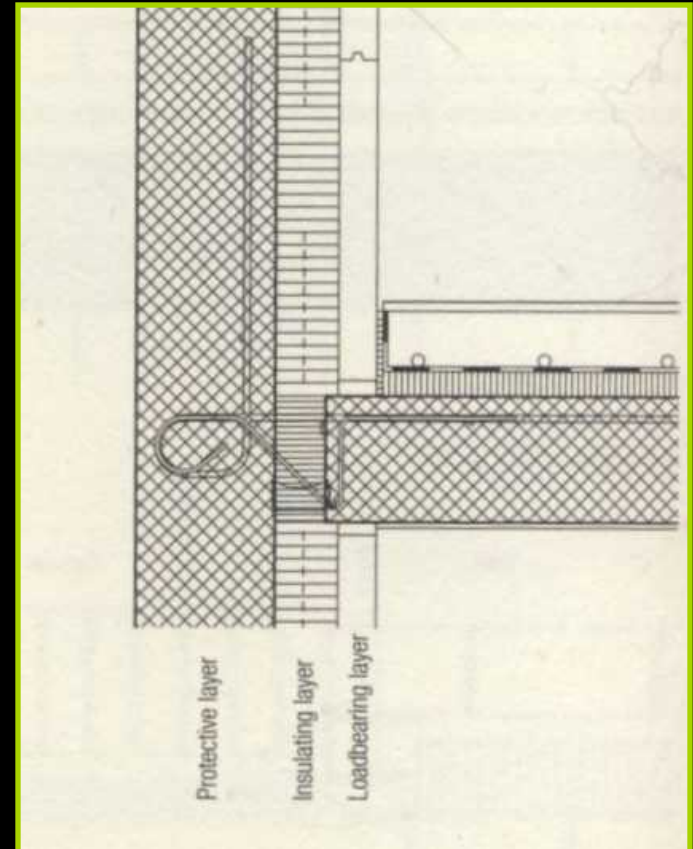
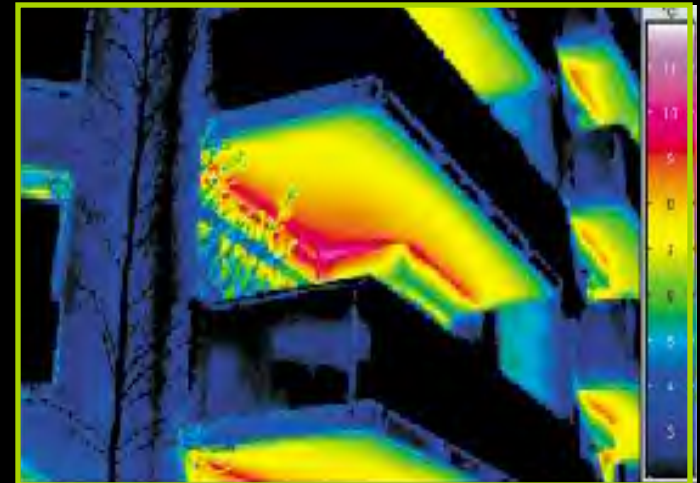
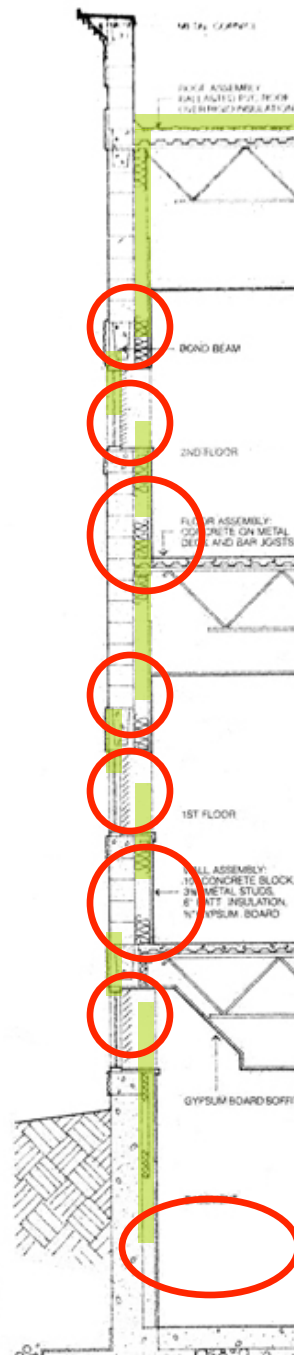
R-Value Table

Insulation Values For Selected Materials

R-Value Table

Material	R/ Inch	R/ Thickness
Insulation Materials		
Fiberglass Batt	3.14	
Fiberglass Blown (attic)	2.20	
Fiberglass Blown (wall)	3.20	
Rock Wool Batt	3.14	
Rock Wool Blown (attic)	3.10	
Rock Wool Blown (wall)	3.03	
Cellulose Blown (attic)	3.13	
Cellulose Blown (wall)	3.70	
Vermiculite	2.13	
Autoclaved Aerated Concrete	3.90	
Urea Terpolymer Foam	4.48	
Rigid Fiberglass (> 4lb/ft ³)	4.00	
Expanded Polystyrene (beadboard)	4.00	
Extruded Polystyrene	5.00	
Polyurethane (foamed-in-place)	6.25	
Polyisocyanurate (foil-faced)	7.20	
Construction Materials		
Concrete Block 4"		0.80
Concrete Block 8"		1.11
Concrete Block 12"		1.28
Brick 4" common		0.80
Brick 4" face		0.44
Poured Concrete	0.08	
Soft Wood Lumber	1.25	
2" nominal (1 1/2")		1.88
2x4 (3 1/2")		4.38
2x6 (5 1/2")		6.88
Cedar Logs and Lumber	1.33	

ive Architecture 10.83



A tall, modern building with a dark, grid-like facade, likely a skyscraper, viewed from a low angle. The building has many windows and a distinctive curved top. It is surrounded by other buildings and trees in an urban setting.



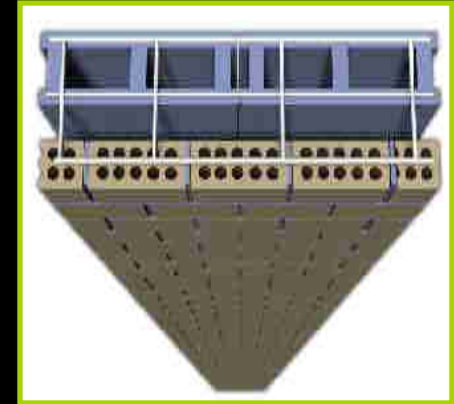
→ *REASONS FOR LAYERED CONSTRUCTION:*

→ **INSULATION PERFORMANCE**

‘THERMAL’ (+ ‘ACOUSTICAL’)

→ **WATERPROOFING BARRIER**

(2nd LINE OF DEFENSE → DRAINAGE CONCEPT)
(NEGATIVE PRESSURE ZONE → EVAPORATION)



→ **STRUCTURAL PERFORMANCE ↔ AESTHETICS** (COSTS)

→ **DIFFERENT MATERIAL LIFE CYCLES**

(MAINTENANCE/REPAIR/RENOVATION EFFORT)

→ **REDUCTION OF MATERIAL FATIGUE**

(INTERIOR ↔ EXTERIOR CLIMATE)

→ **ECONOMIC CONSIDERATIONS → MATERIAL SAVINGS**

(VENEERS, LIGHT-WEIGHT STRUCTURES)

→ **WEIGHT SAVINGS** (STRUCTURAL MEMBER DIMENSIONING)

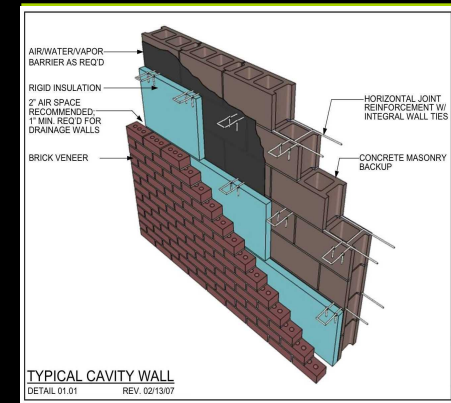
→ **COST SAVINGS**

→ 'CAVITY WALL'

- 2 'WYTHS' OF MASONRY, CONNECTED W/ TIES
- CAVITY BETWEEN → DRAINAGE AND VENTILATION

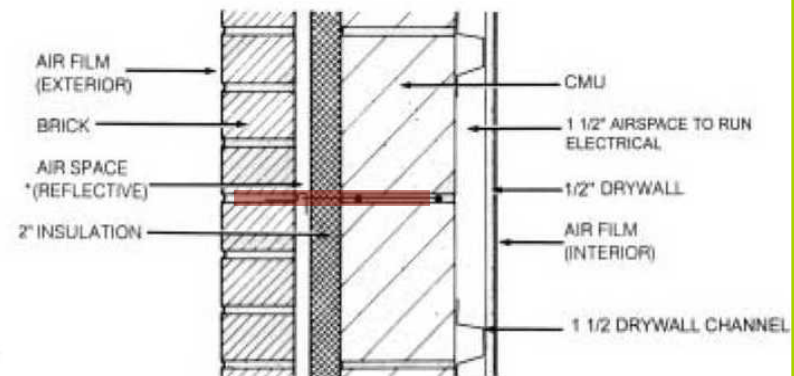
PROPERTIES:

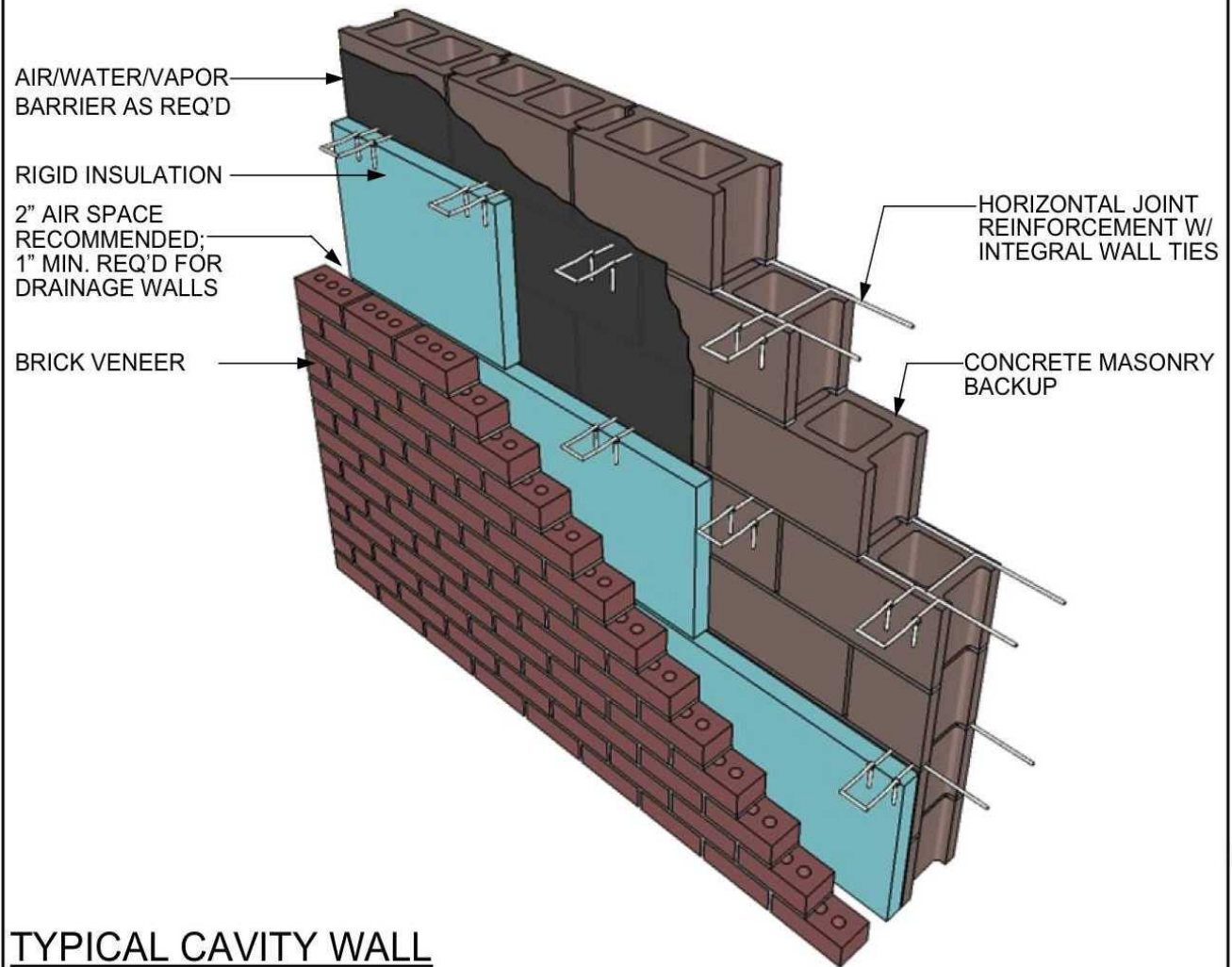
- SUPERIOR RESISTANCE TO RAIN PENETRATION
- INCREASE IN THERMAL PROPERTIES
- GREAT RESISTANCE TO SOUND TRANSMISSION
- HIGH RESISTANCE TO FIRE



Insulation type	thickness (inches)	1/2"	1"	1 1/2"	2"	2 1/2"	3"
Polyisocyanurate (foil face) Dow Tuff R™ / Thermax™	4.0	8	12	16	18	21.6	
Extruded Polystyrene Dow, Owens Corning	-	5	7.5	10	12.5	15	

Exterior air film.	0.17
4" Brick	0.44
R of the reflective air space	2.80
R of 2" Dow, Tuff R-C, polyisocyanurate insulation. . . .	16.0
6" CMU	1.34
1 1/2" air space	0.97
1 1/2" Drywall	0.45
Interior Air Film	0.68
	22.85

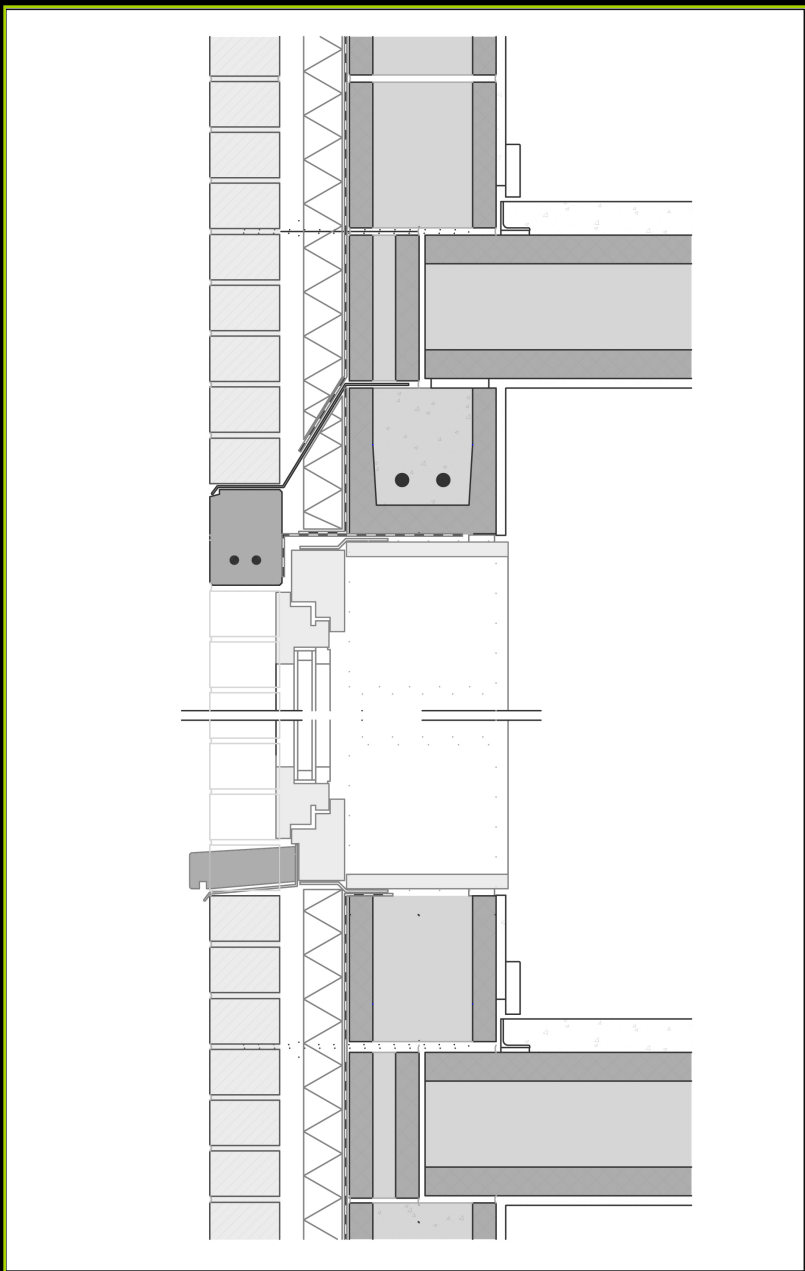
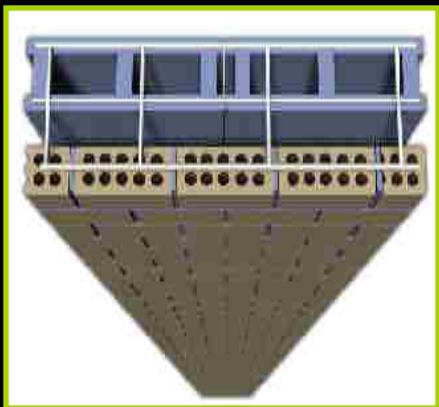


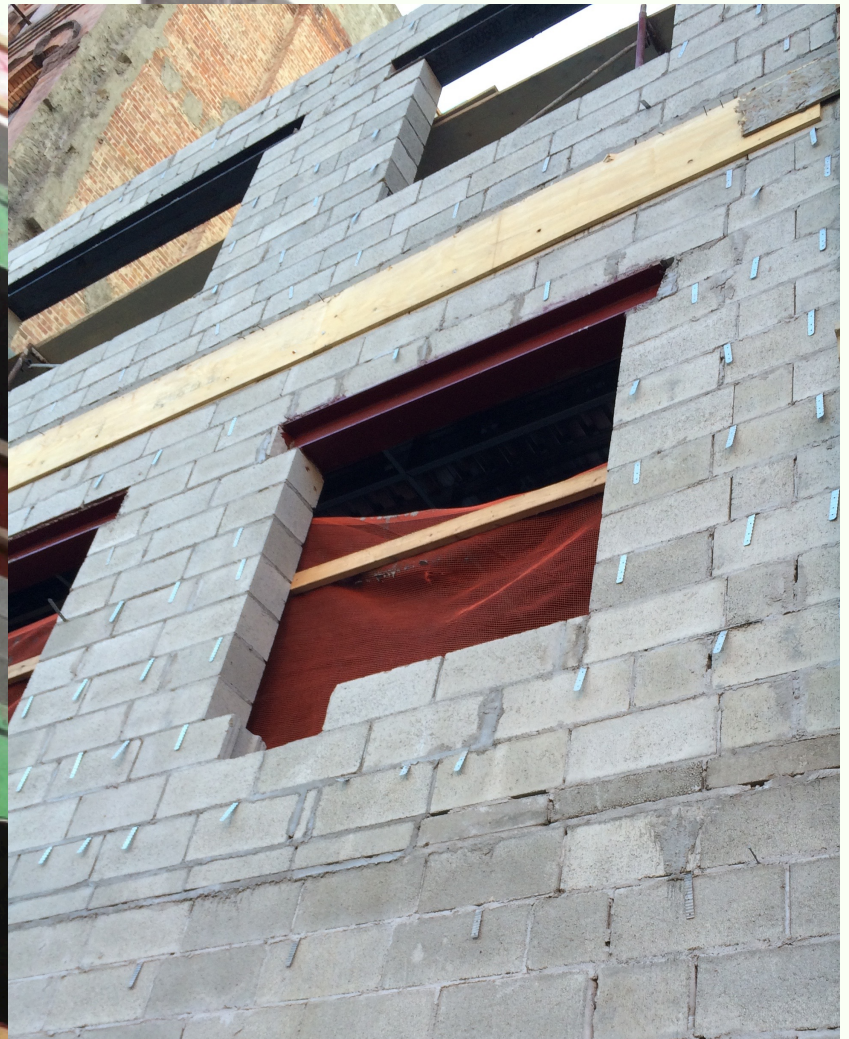


TYPICAL CAVITY WALL

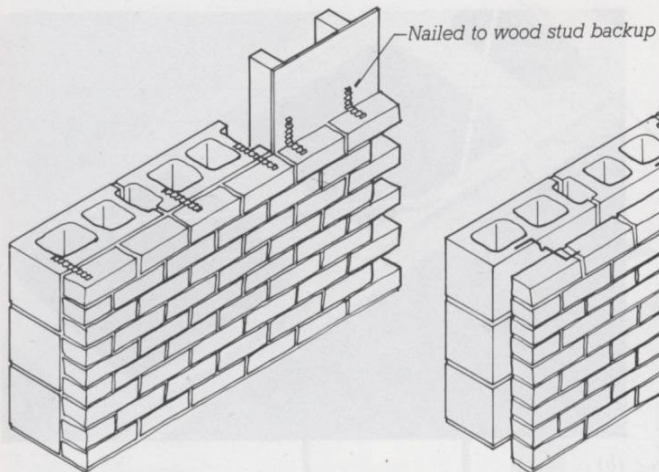
DETAIL 01.01

REV. 02/13/07

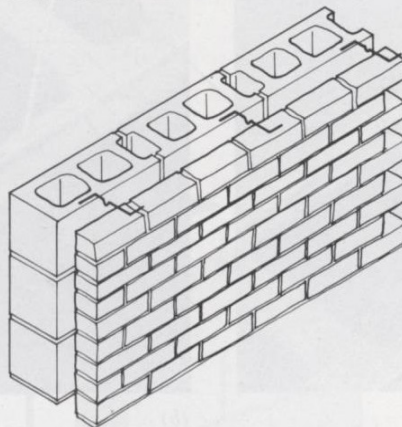




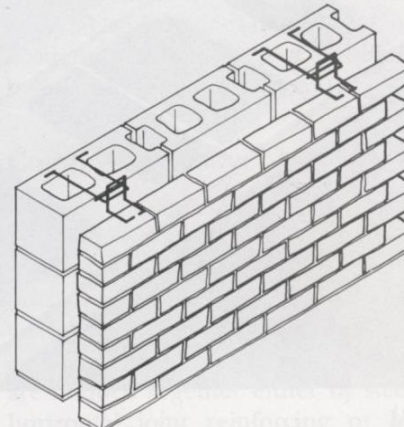
→ MASONRY TIES:



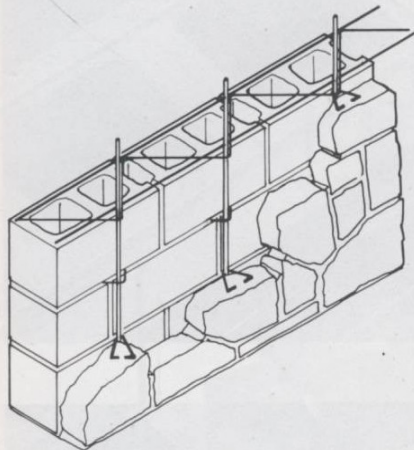
A. Corrugated Tie



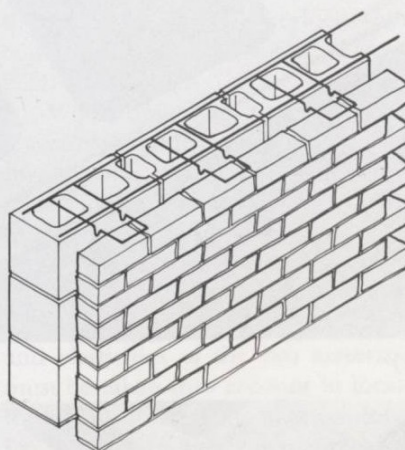
B. Z-Tie



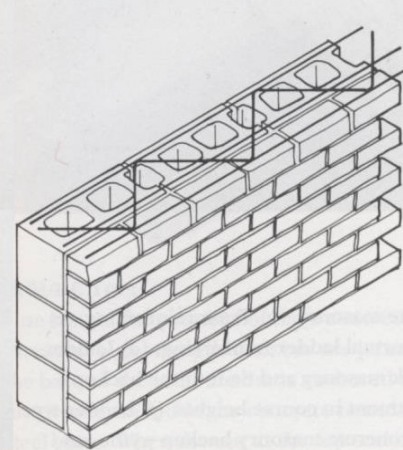
C. Adjustable Tie



D. Adjustable Stone Tie



E. Ladder Loop Tie



F. Three-Wire Truss Tie



D/A 310 TRUSS



D/A 310 TR TRI-ROD

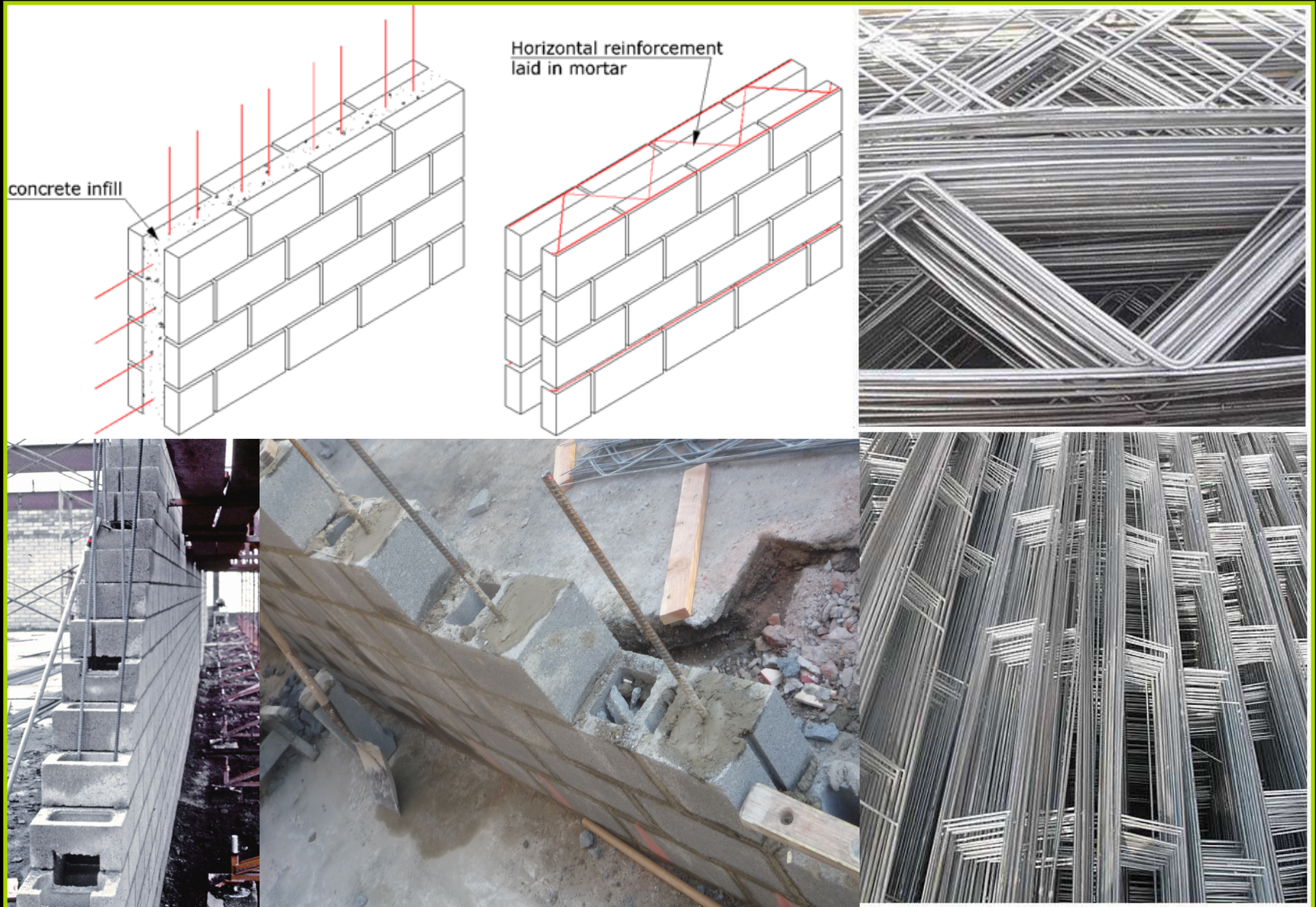


D/A 370 DUR-O-EYE

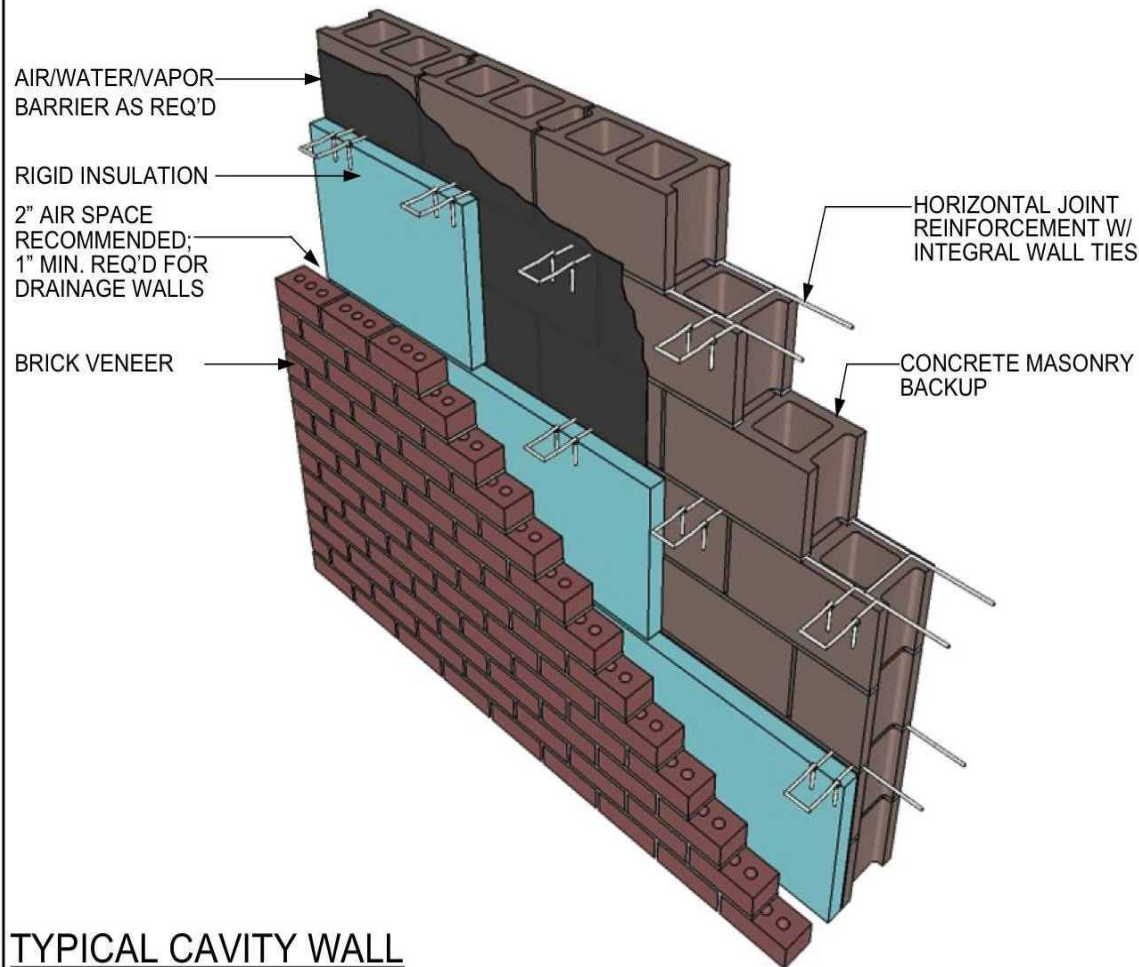


D/A 370 S SEISMIC DUR-O-EYE

→ 'CMU' - WALLS: REINFORCED SYSTEMS



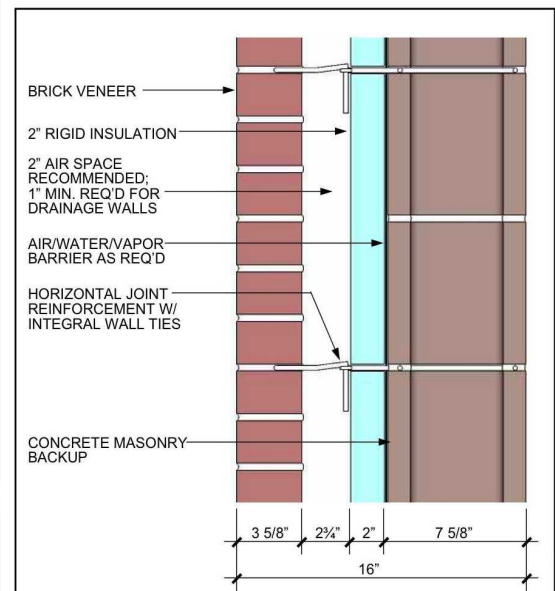
→ 'CAVITY WALL'



TYPICAL CAVITY WALL

DETAIL 01.01

REV. 02/13/07



→ CAUTION: THERMAL RENOVATION OF CAVITY WALLS



SYSTEMS WHERE INSULATION IS BLOWN INTO CAVITY:

...

→ PHYSICAL CONNECTION BETWEEN EXTERIOR AND STRUCTURAL WYTHER

→ WATER TRANSFER TO INNER WYTHER ... AND SUBSEQUENTLY TO INTERIOR

(IF NO PROPER MOISTURE BARRIER EXISTS...)

→ *MOISTURE + CONDENSATION*

THE PHENOMENON OF VAPOR DIFFUSION:

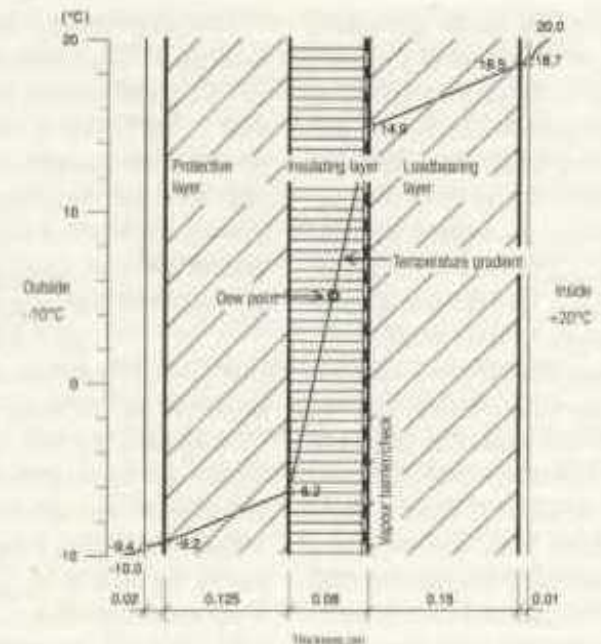
- 1) COLD AIR IS ONLY ABLE TO CONTAIN LITTLE WATER VAPOR (OUTSIDE - DRY AIR)
 - 2) WARM AIR CONTAINS CONSIDERABLE WATER VAPOR (INSIDE - HIGHER HUMIDITY)
- WHEN HUMID HOT AIR MEETS COLD AIR, OR IS QUICKLY COOLED → CONDENSATION : REL. HUMIDITY MEETS 100% (DUE POINT)

- **ROTTING** (WOOD CONSTRUCTION)
- **CORROSION** (I.E. 'BAD' WALL TIES)
- **MOULD GROWTH** (SURFACE CHANGES)
- **DISRUPTION OF LOADBEARING STRUCTURE**
- **DAMP THERMAL INSULATION**
BECOMES USELESS !
(WATER CONDUCTS HEAT OPTIMALLY !)



Concrete Insulation/Void Fill

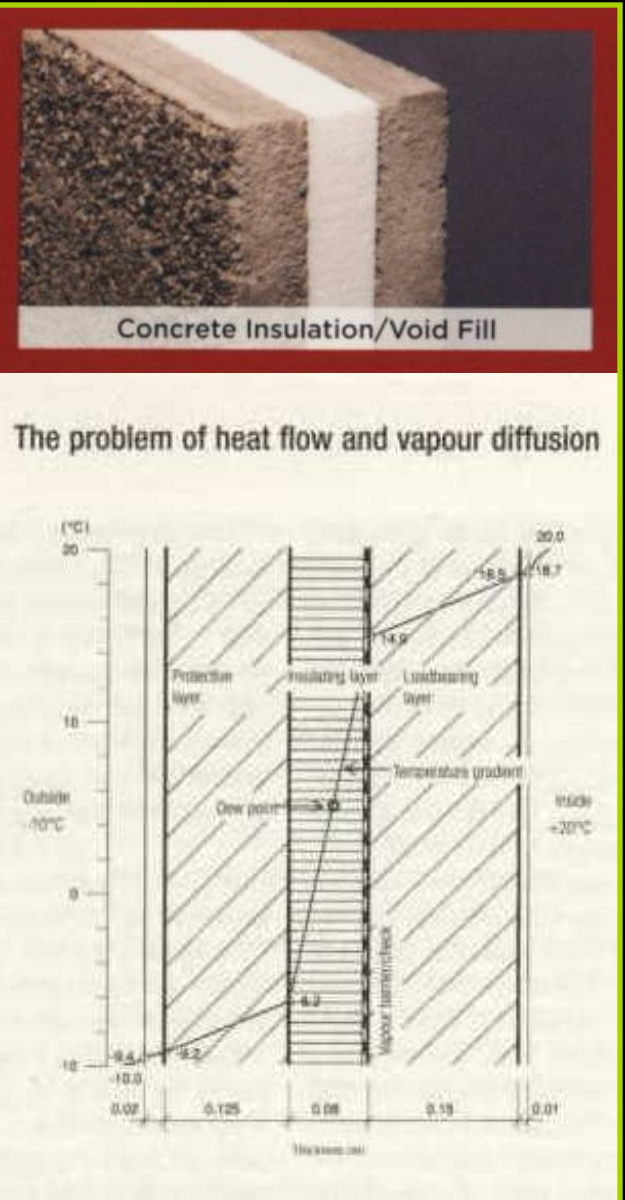
The problem of heat flow and vapour diffusion



→ VAPOR BARRIER / AIR BARRIER

BASIC PRINCIPLES:

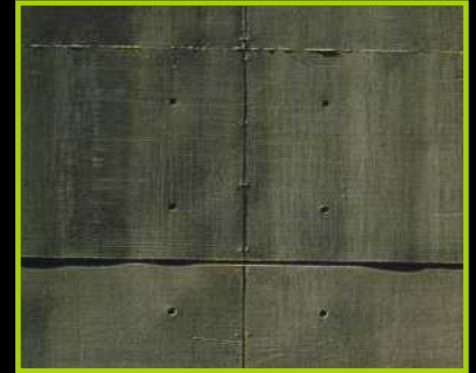
- VAPOR BARRIER MUST BE ATTACHED TO THE WARM SIDE (INSIDE) PRIOR TO FIXING THE THERMAL INSULATION
 - AVOIDANCE OF JOINT LEAKS
 - THE IMPERVIOUSNESS (TO VAPOR) OF THE MATERIALS MUST DECREASE FROM INSIDE TO OUTSIDE :
 - INSIDE: 'SEALED' LOADBEARING LAYER
 - OUTSIDE: 'PERMEABLE' PROTECTIVE LAYER
- WATER RESISTANCE OF INSULATION ALSO DECISIVE !



→ 4 DIFFERENT MEASURES:

→ 1 INTERNAL LOADBEARING WALL MADE FROM VAPOR-TIGHT MATERIAL:

- I.E. - ON-SITE CONCRETE W/ HIGH DENSITY
- CUSTOM GLUED SANDWICH PANELS (TIMBER)



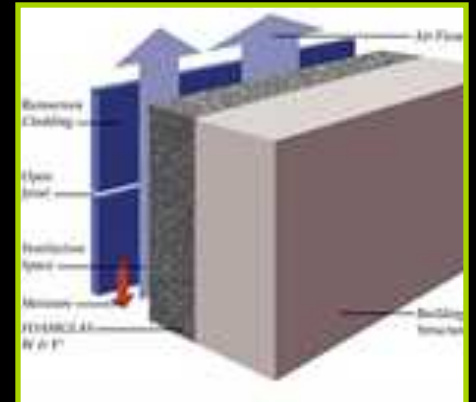
→ 2 THERMAL BARRIER MADE FROM A VAPOR-TIGHT INSULATING MATERIAL

- I.E. - CELLULAR GLASS (FOAMGLAS)



→ 3 VAPOR BARRIER MEMBRANE ATTACHED TO THE WARM SIDE, IN FRONT OF THE THERMAL INSULATION

→ 4 VENTILATED CAVITY BETWEEN INSULATING LAYER AND PROTECTIVE LAYER



→ DEPENDING ON CLIMATIC CONDITIONS:

Vapor Barrier Placement By Geographical Location

In most cold climates, vapor barriers should be placed on the interior (warm-in-winter) side of walls. However, the map

shows that in some southern climates, the vapor barrier should

be omitted, while in hot and humid climates, such as along the Gulf coast and in Florida, the vapor barrier should be placed on the exterior of the wall.



Perm Ratings of Different Materials (Rating of 1 or less qualifies as a vapor barrier)

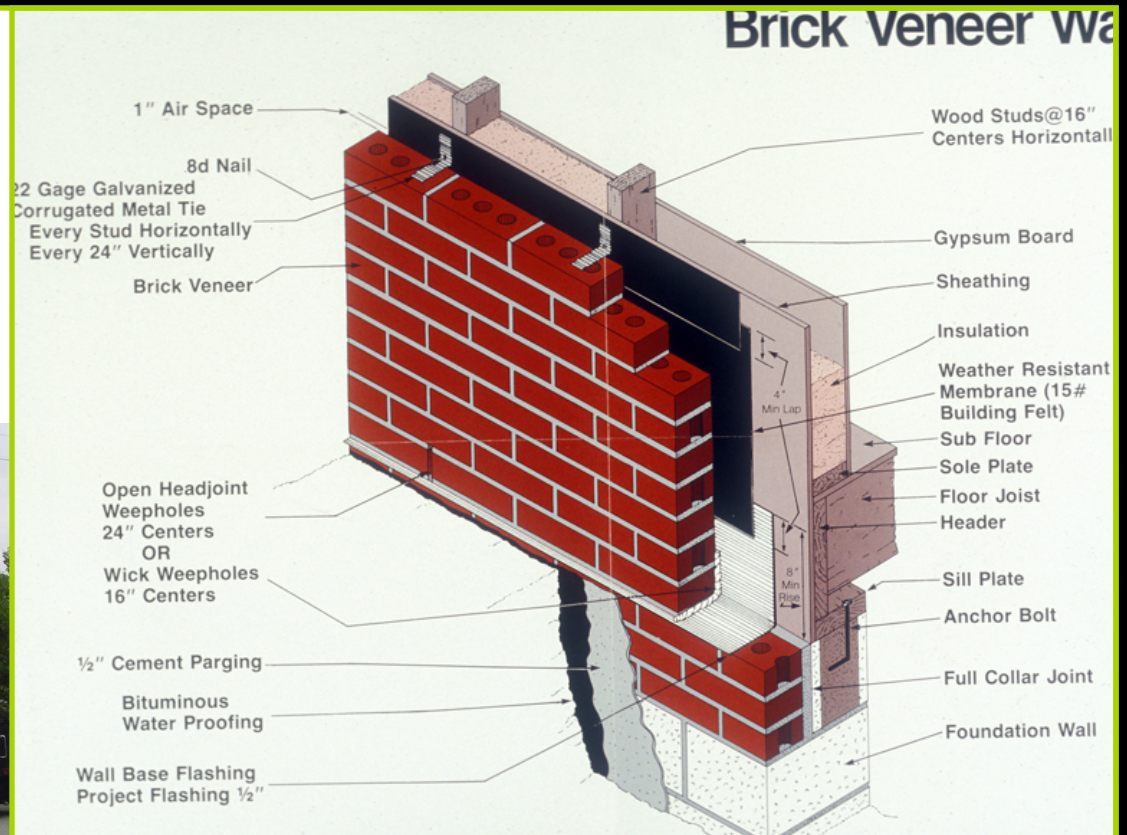
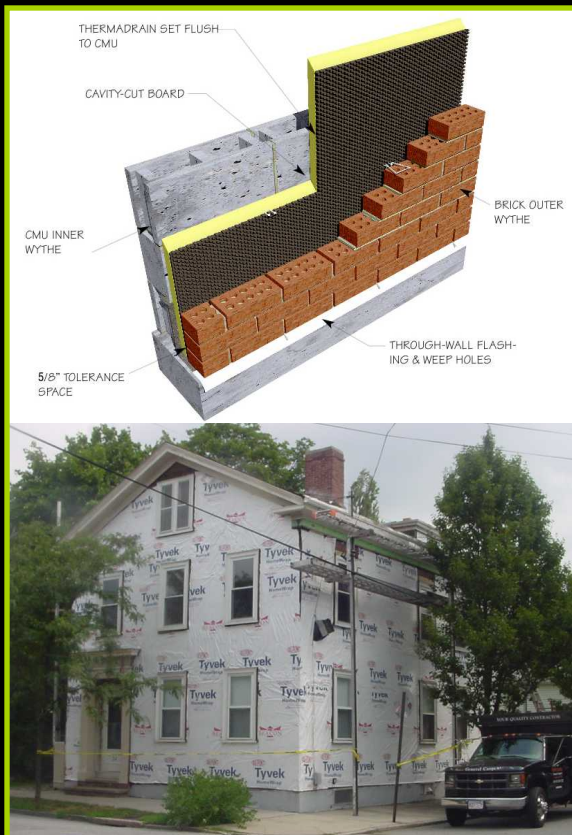
Asphalt-coated paper backing on insulation	0.40
Polyethylene plastic (6 mil)	0.06
Plywood with exterior glue	0.70
Plastic-coated insulated foam sheathing	0.4 to 1.2
Aluminum foil (.35 mil)	0.05
Vapor barrier paint or primer	0.45
Drywall (unpainted)	5.0
Drywall (painted - latex paint)	2-3

→ **WATERPROOF MEMBRANE:** → AGAINST EXTERIOR MOISTURE

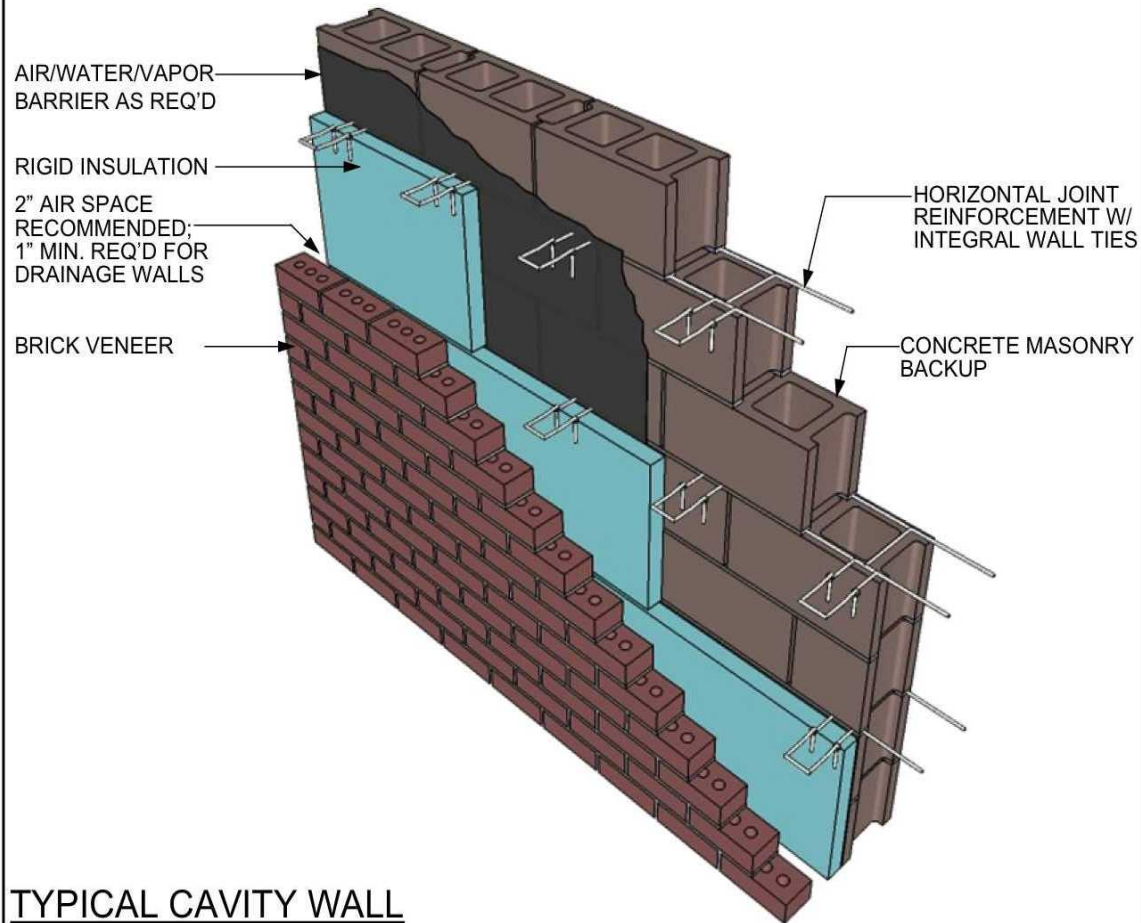
BASICS: - FACE BRICK WATER PERMEABLE; INSULATION WATER ABSORBENT; STRUCTURE SUSCEPTIBLE TO DAMAGE ...

→ MEMBRANE @ EXTERIOR SIDE OF INSULATION

→ CAVITY: VENTILATION/EVAPORATION/DRAINAGE ('2nd line of defense')



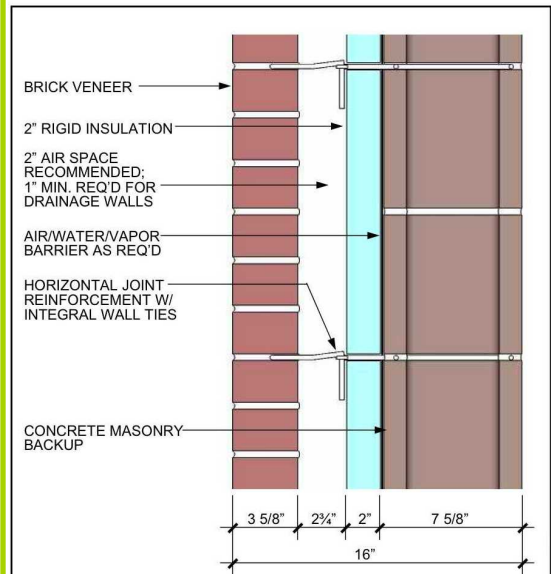
→ 'CAVITY WALL'



TYPICAL CAVITY WALL

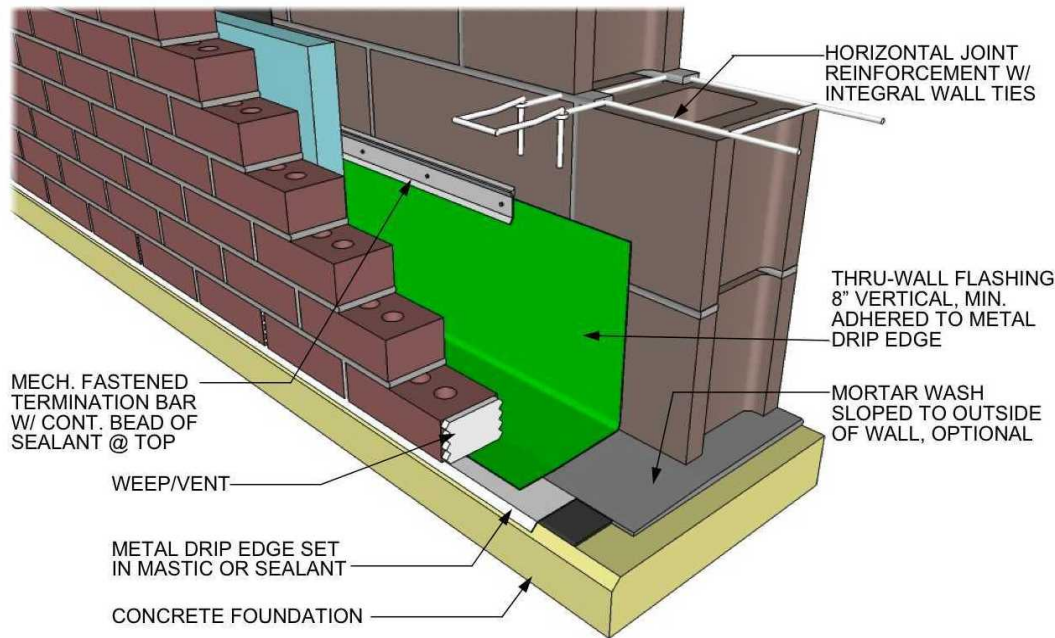
DETAIL 01.01

REV. 02/13/07



→ DRAINAGE / VENTILATION: 'WEEPHOLES'

- 24" (BRICK) TO 32" (CMU) APART
- 1/4" DIAMETER MINIMUM



BASE FLASHING w/ TERMINATION BAR

DETAIL 04.01

REV. 02/13/07

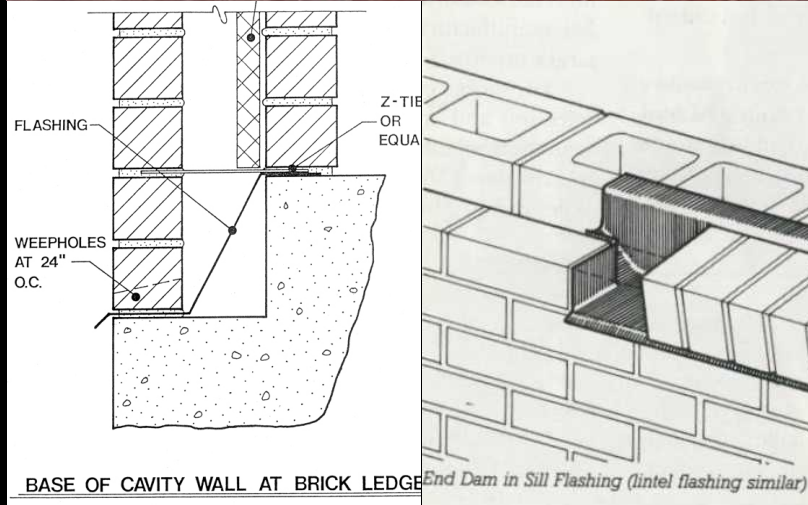
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→ DRAINAGE: 'FLASHING'

- SUCCESS OF ANY CAVITY WALL DEPENDS ON PROPER FLASHING:



BASE:

MOST IMPORTANT FOR DRAINAGE !

WINDOW:

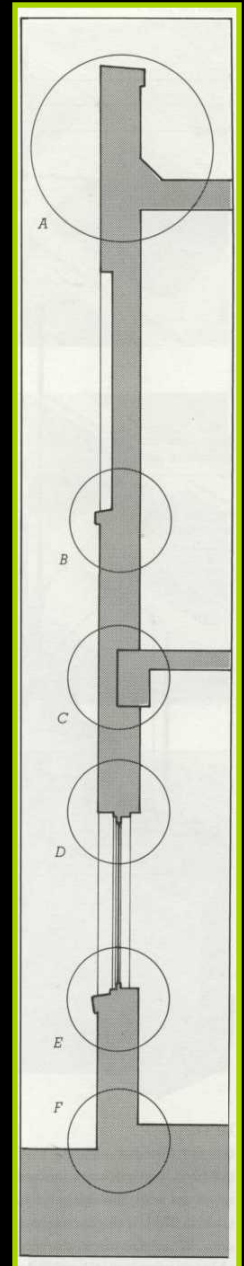
EXTENSION (6"-8") BEYOND JAMB LINES; BOTH ENDS NEED AN 'END DAM'. JAMB TO WINDOW FRAME DETAIL !

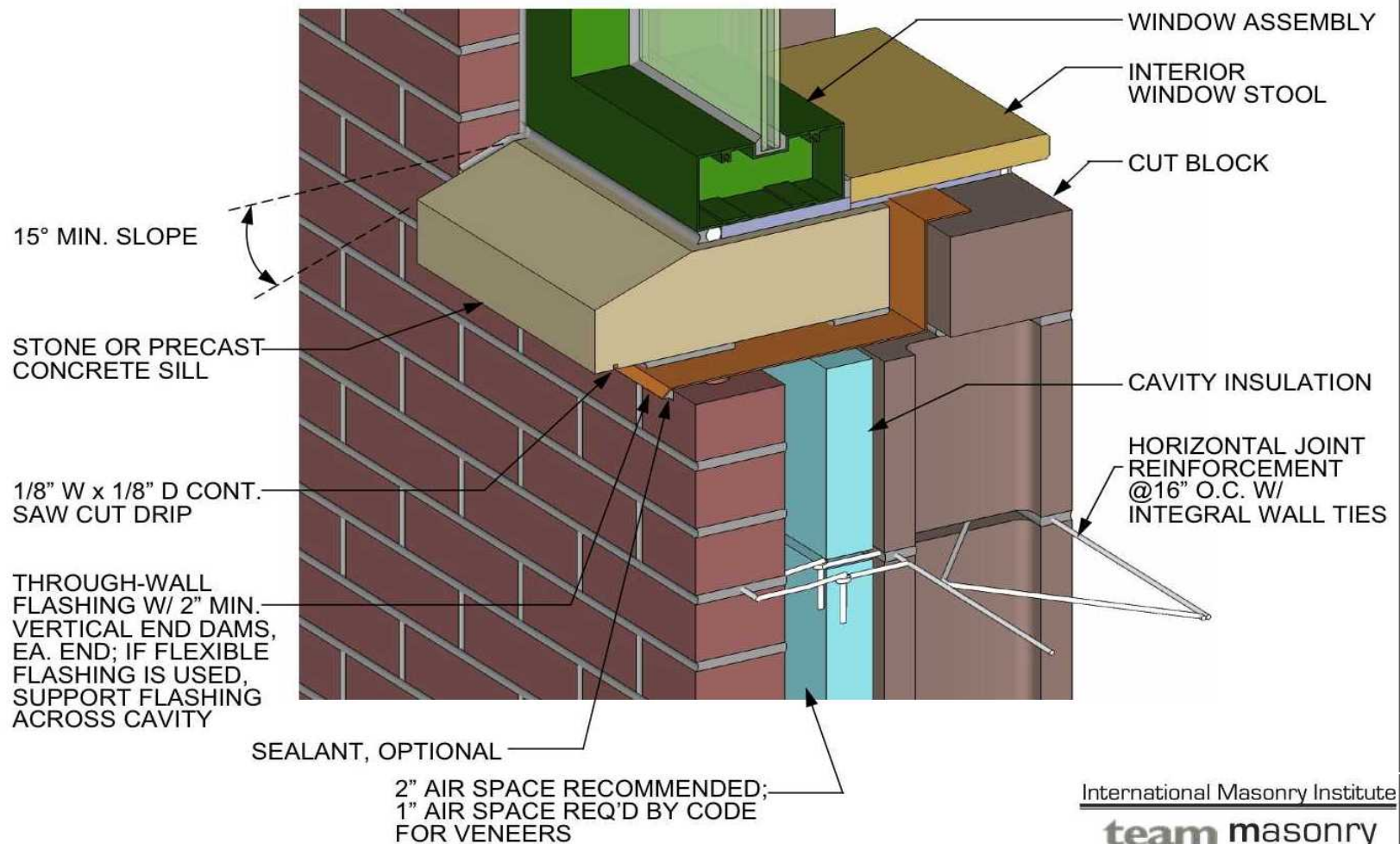
PARAPET: FLASHING

IMMEDIATELY UNDER COPING; COPING NEEDS SLOPE. ANCHOR + DOWEL ROD CONNECTION

INSTALLATION W/ CONTINUOUS MASTIC BED, OR SELF-ADHERING;

RULE OF THUMB: FLASHING IS NECESSARY: OVER OPENINGS, UNDER OPENINGS, @ ANY BASE OF WALL, @ ANY TOP OF WALL; CHANGE IN PROJECTION; SHELF ANGLES; WEEP HOLES: SAME!





STONE SILL AT CAVITY WALL

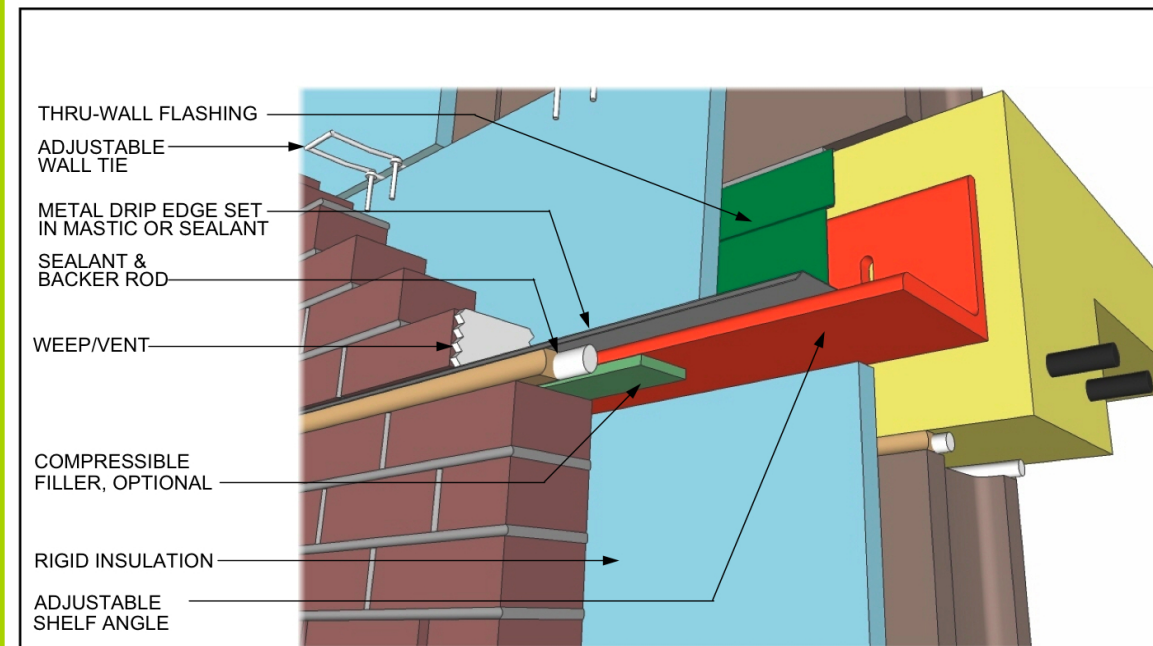
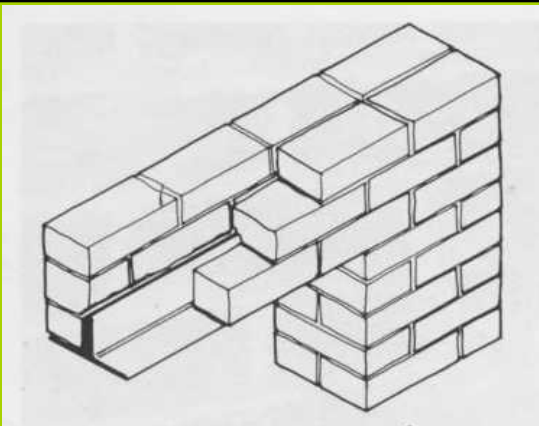
DETAIL 13.01

REV. 02/14/07

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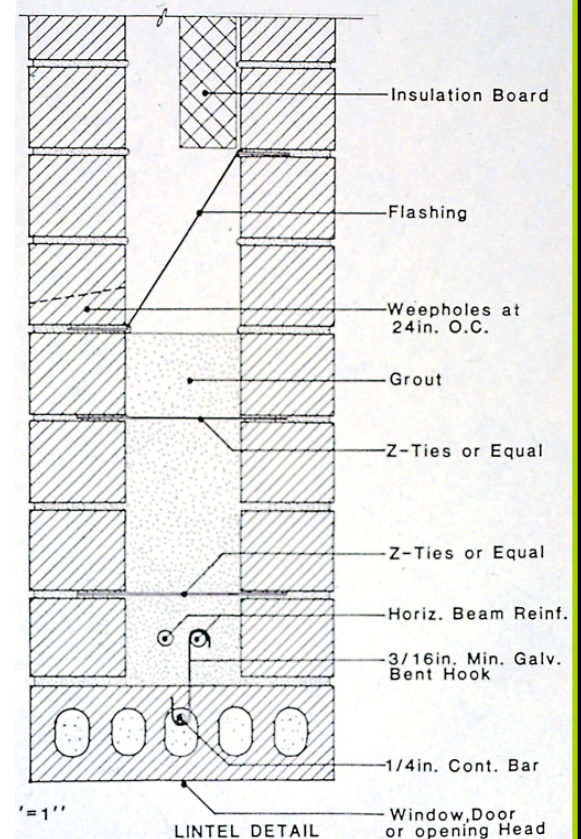
THERMAL EXPANSION:
STEEL: $\sim 7 \times 10^{-6} \text{ }^{\circ}\text{F}^{-1}$
BRICK: $\sim 4 \times 10^{-6} \text{ }^{\circ}\text{F}^{-1}$
 + DIRECT CONDUCTION FROM INSIDE...

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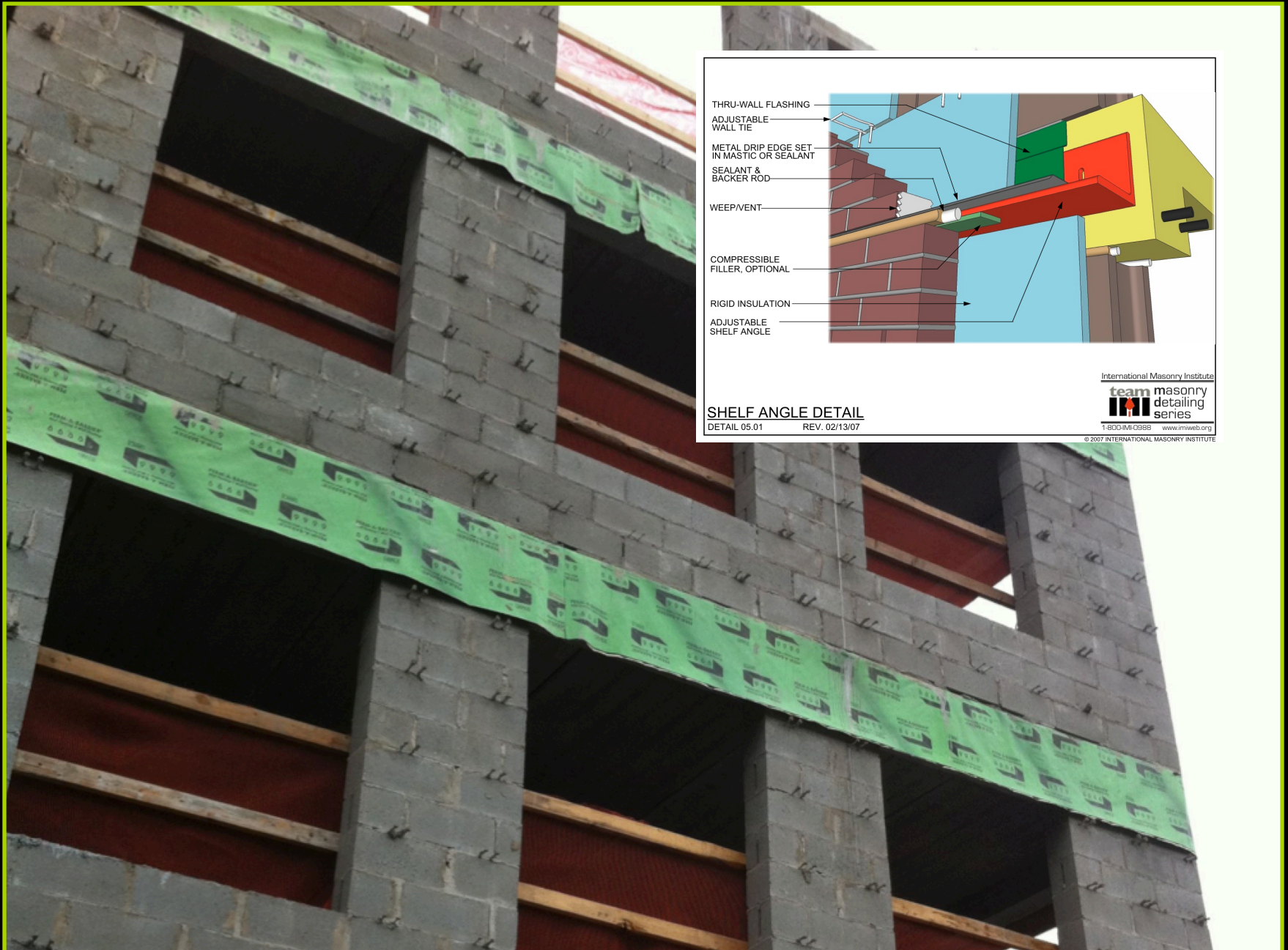
© 2007 INTERNATIONAL MASONRY INSTITUTE



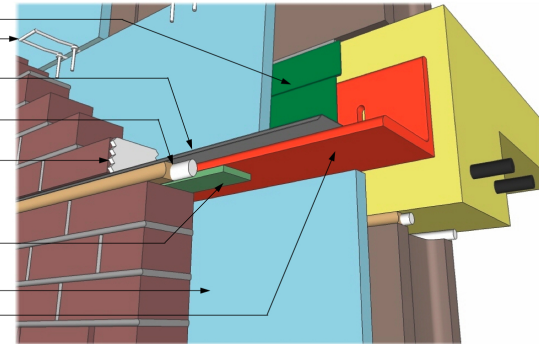
SHELF ANGLE DETAIL

DETAIL 05.01

REV. 02/13/07



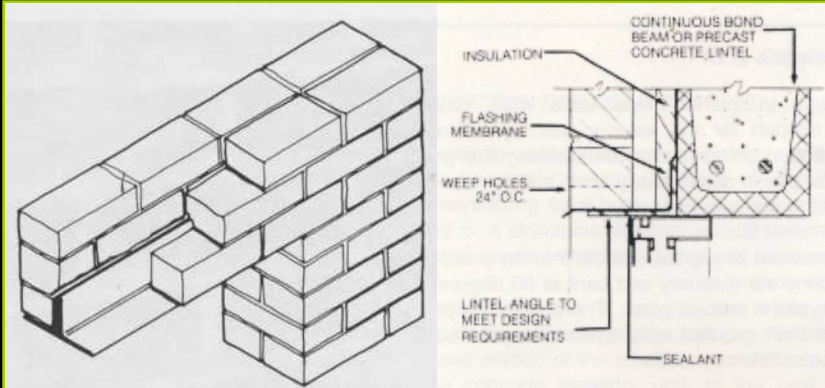
- THRU-WALL FLASHING
- ADJUSTABLE WALL TIE
- METAL DRIP EDGE SET IN MASTIC OR SEALANT
- SEALANT & BACKER ROD
- WEEP/VENT
- COMPRESSIBLE FILLER, OPTIONAL
- RIGID INSULATION
- ADJUSTABLE SHELF ANGLE



SHELF ANGLE DETAIL

DETAIL 05.01 REV. 02/13/07

→ *JAMES POLSHEK: BARNARD COLLEGE TOWER, 1985*



→ SUPPORT STRUCTURE: 'SHELF ANGLES'

WEIGHT / DEAD LOAD: 40-100 LB./CU.FT.

(HERE: 60 LB./CU.FT.)

COMPRESSIVE STRENGTH: ~ 6,000 PSI

CALCULATION:

PER FOOT OF BRICK FAÇADE;
1 WYTHER, 1 FLOOR, 9 feet HEIGHT:

$1 \times \frac{1}{3} \times 9 \text{ FT.} = 3 \text{ CU.FT.}$

$\times 60 \text{ LB./CU.FT.} = \mathbf{180 \text{ LB.}}$



SHELF ANGLE DESIGN

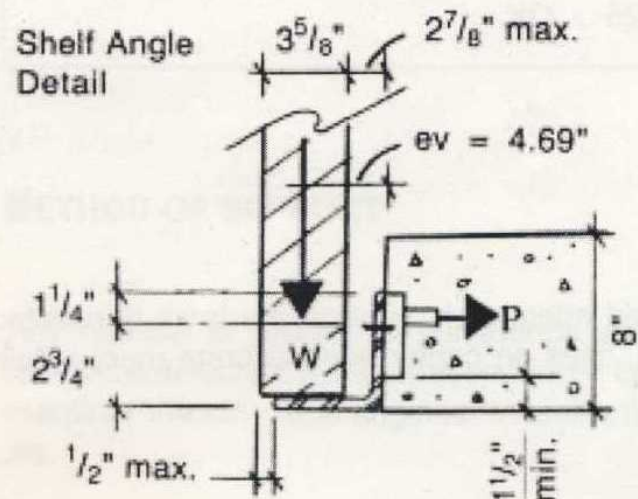
It is possible to limit shelf angles, to one every 30 vertical feet. First calculations must be developed to check the shear strength of the wedge insert, to determine size and spacing of anchor bolts, and to check angle capacity.

Brick.....3 5/8" actual bed depth,
weight = 60 #/ft²

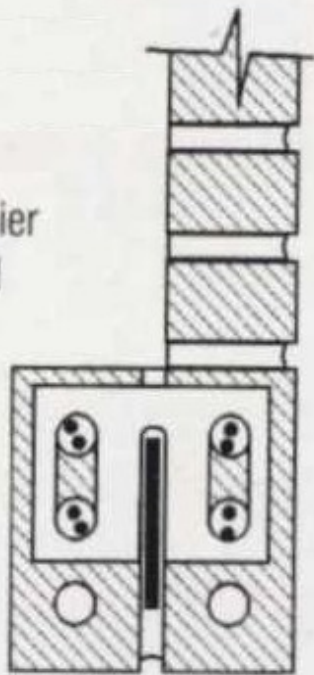
Concrete Slab8" depth, f'c = 4000 psi

Shelf Angle6" x 4" x 5/16"

Anchor Bolts.....3/4" diameter



Double soldier
course lintel



freedom can be achieved with made-to-order units which are readily available to suit arches and special shaped openings. For more information about Halfen Anchoring Systems, call 1-800-323-6896



The Lintel System combines a spine, horse shoe plates, stitching rods and bearing cleat.



No visible means of support

Concealed support system gives an all-brick face to lintels and soffits

By Kenneth A. Hooker

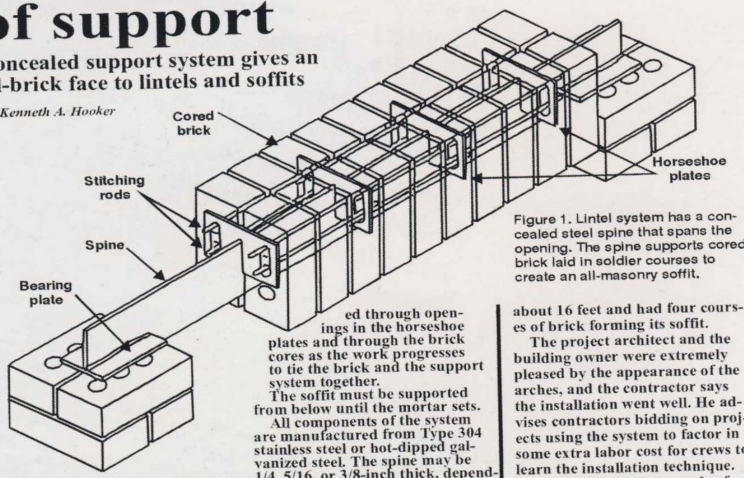


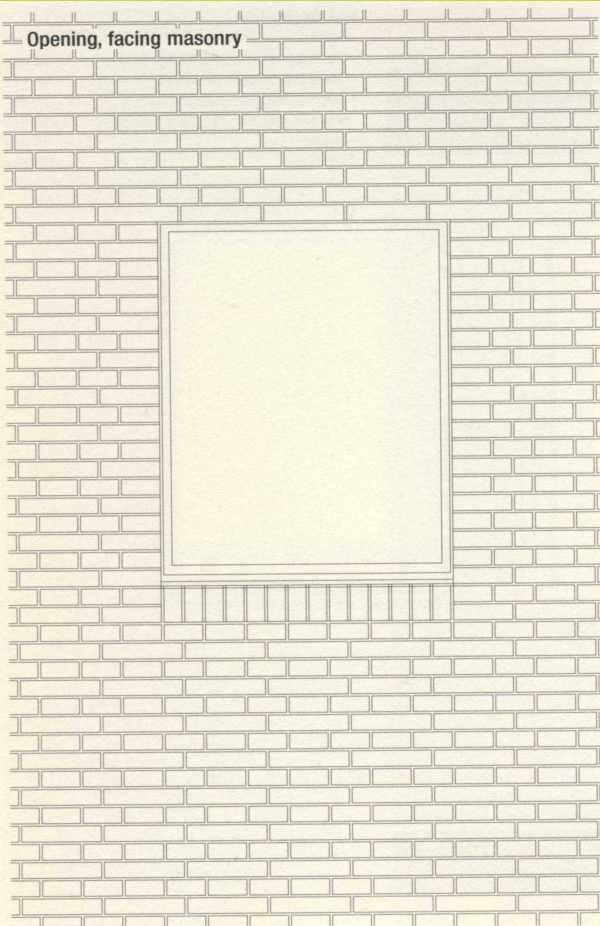
Figure 1. Lintel system has a concealed steel spine that spans the opening. The spine supports cored brick laid in soldier courses to create an all-masonry soffit.

ed through openings in the horse shoe plates and through the brick cores as the work progresses to tie the brick and the support system together. The soffit must be supported from below until the mortar sets. All components of the system are manufactured from Type 304 stainless steel or hot-dipped galvanized steel. The spine may be 1/4, 5/16, or 3/8-inch thick, depend-

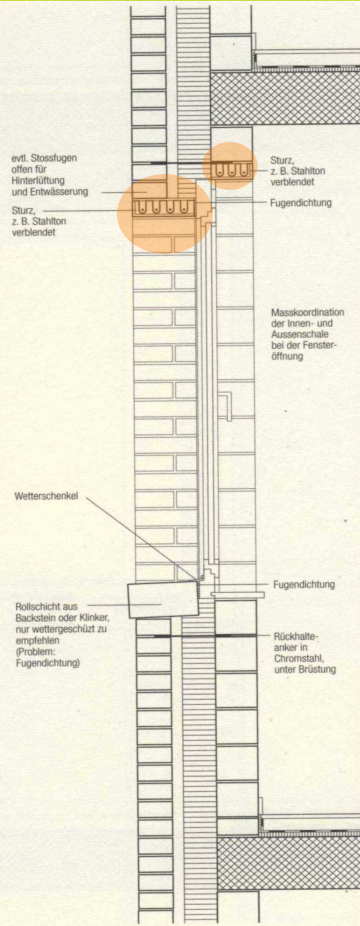
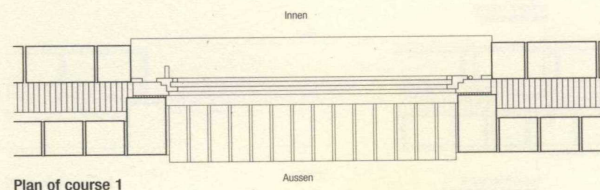
about 16 feet and had four courses of brick forming its soffit. The project architect and the building owner were extremely pleased by the appearance of the arches, and the contractor says the installation went well. He advises contractors bidding on projects using the system to factor in some extra labor cost for crews to learn the installation technique.



→ LINTELS: AVOIDANCE OF THERMAL BRIDGES

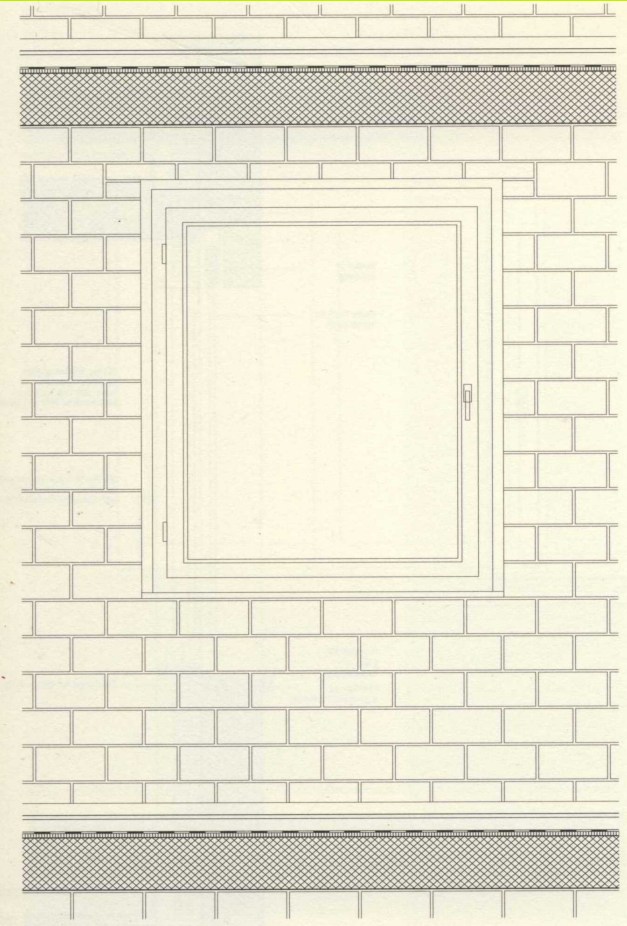


External elevation

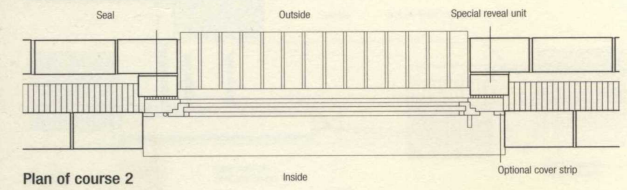


Wall construction

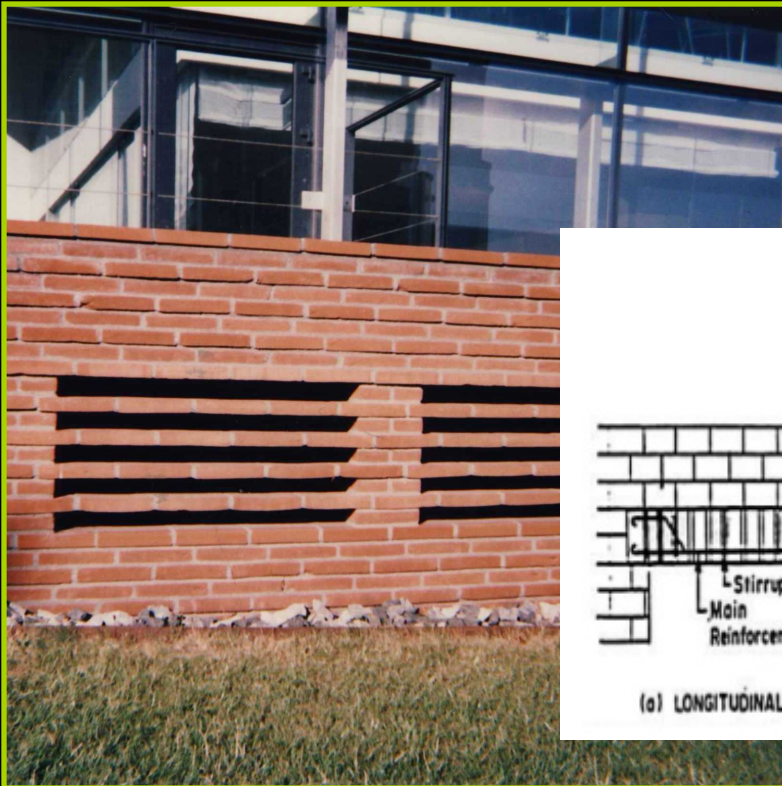
- Clay masonry, BS, course 1, 29 x 14 x 6.5 cm
- Clay masonry, BS, course 2, 14 x 14 x 6.5 cm
- 140 mm
- (Variations: diverse facing masonry modules, prefabricated concrete bricks or elements, etc.)
- Ventilated cavity min. 40 mm
- Thermal insulation (e.g. rockwool) 120 mm
- Clay masonry, BS, 25 x 15 x 14 cm 150 mm
- Total 450 mm



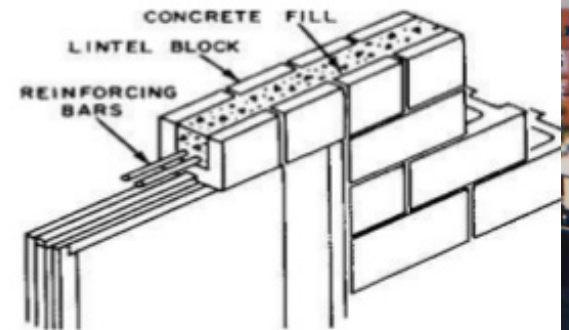
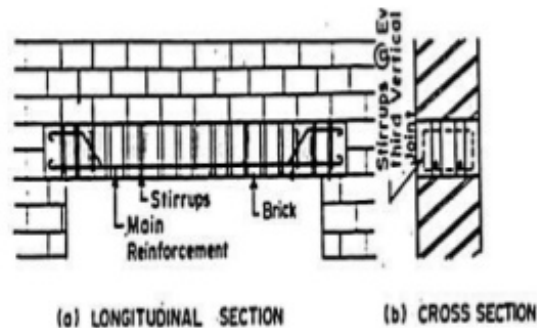
Internal elevation



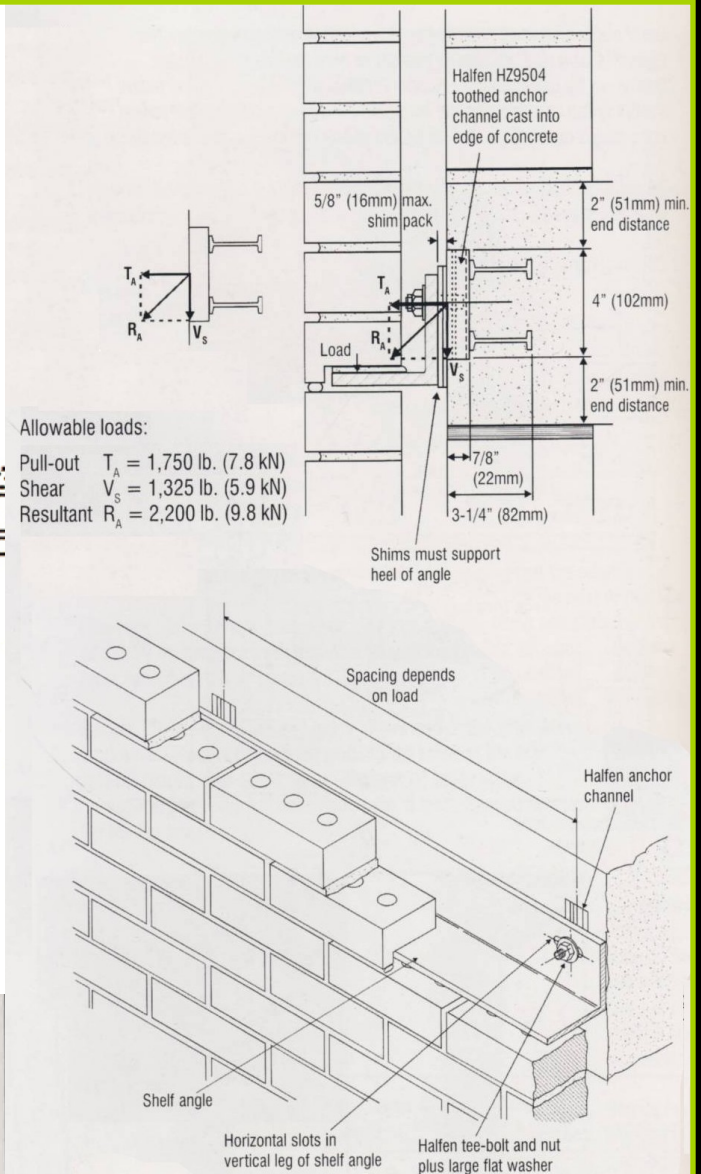
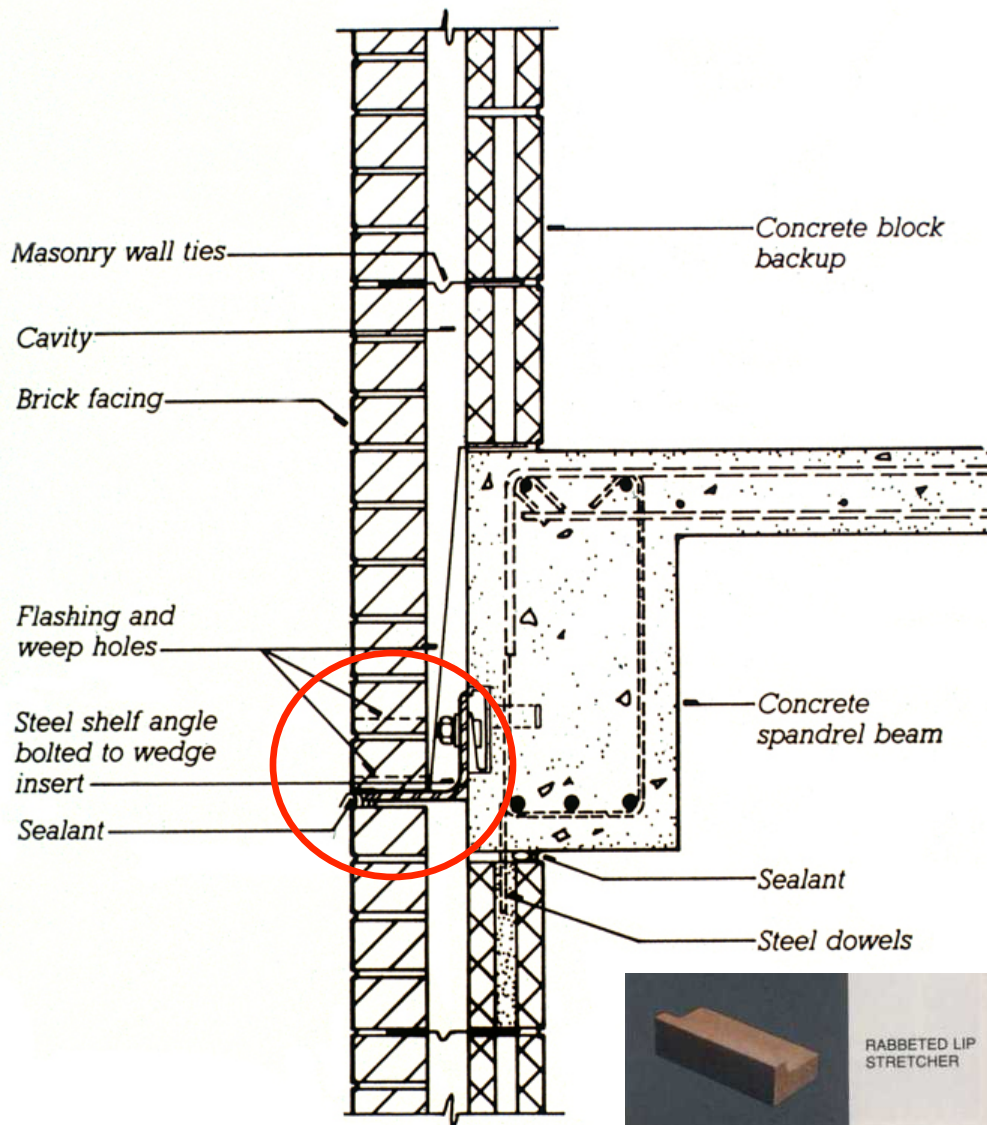
→ **CASE STUDY:**
SCHMIDT HAMMER LASSEN ARCH.,
AROS MUSEUM, AARHUS DENMARK



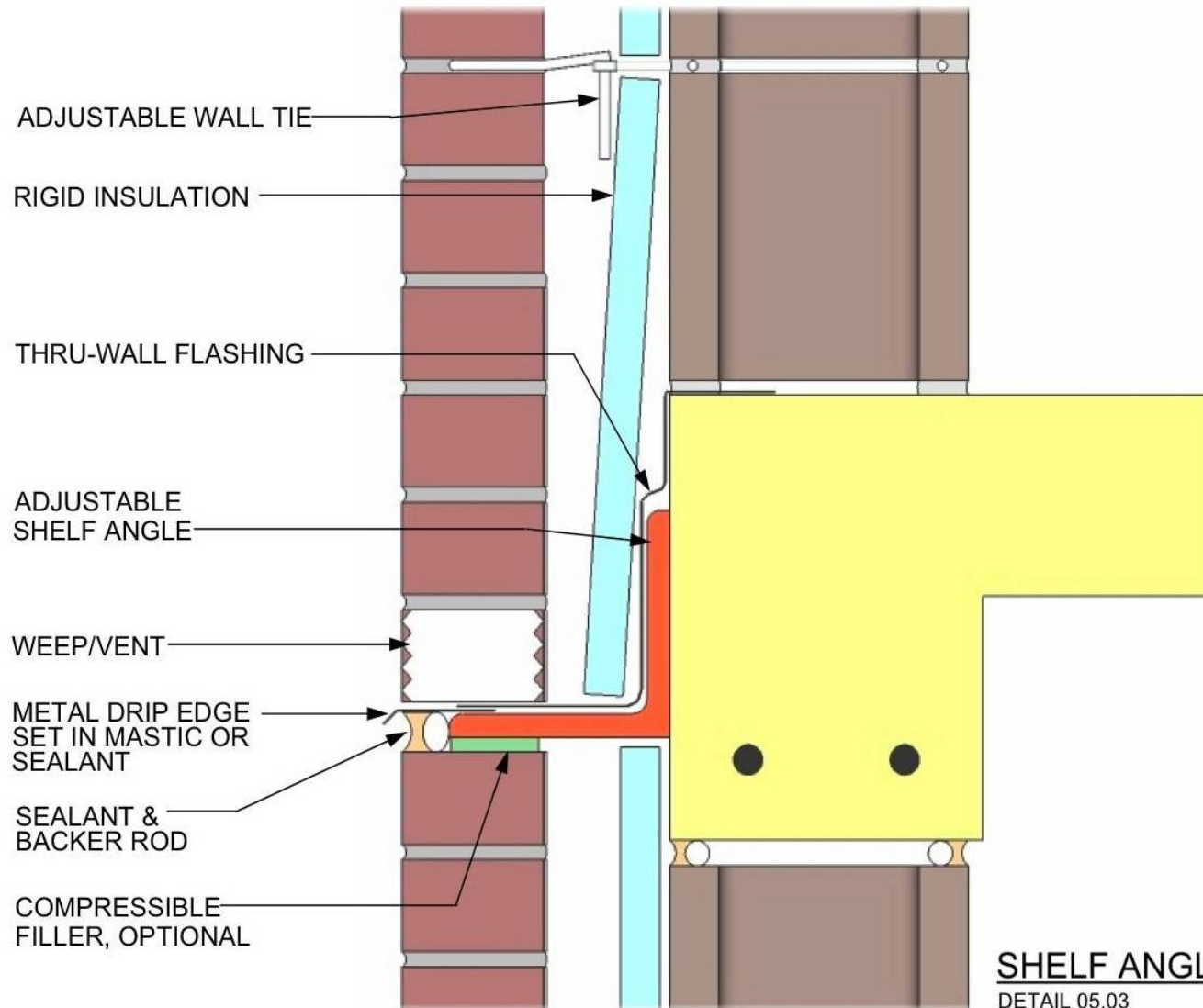
Reinforced Brick Lintels



→ SUPPORT STRUCTURE: 'SHELF ANGLES'



→ SUPPORT STRUCTURE: 'SHELF ANGLES'



SHELF ANGLE DETAIL

DETAIL 05.03

REV. 02/13/07

→ BUILDING JOINTS

CLIMATE:

→ THERMAL DIFFERENTIAL

WARMER = EXPANSION

COLDER = CONTRACTION

BUT,
FREEZING (MOISTURE) EXPANDS

FABRICATION:

→ MOISTURE CONTENT

WETTER = EXPANSION

DRYER = CONTRACTION

LOADS:

→ DEFLECTION

→ SAGGING

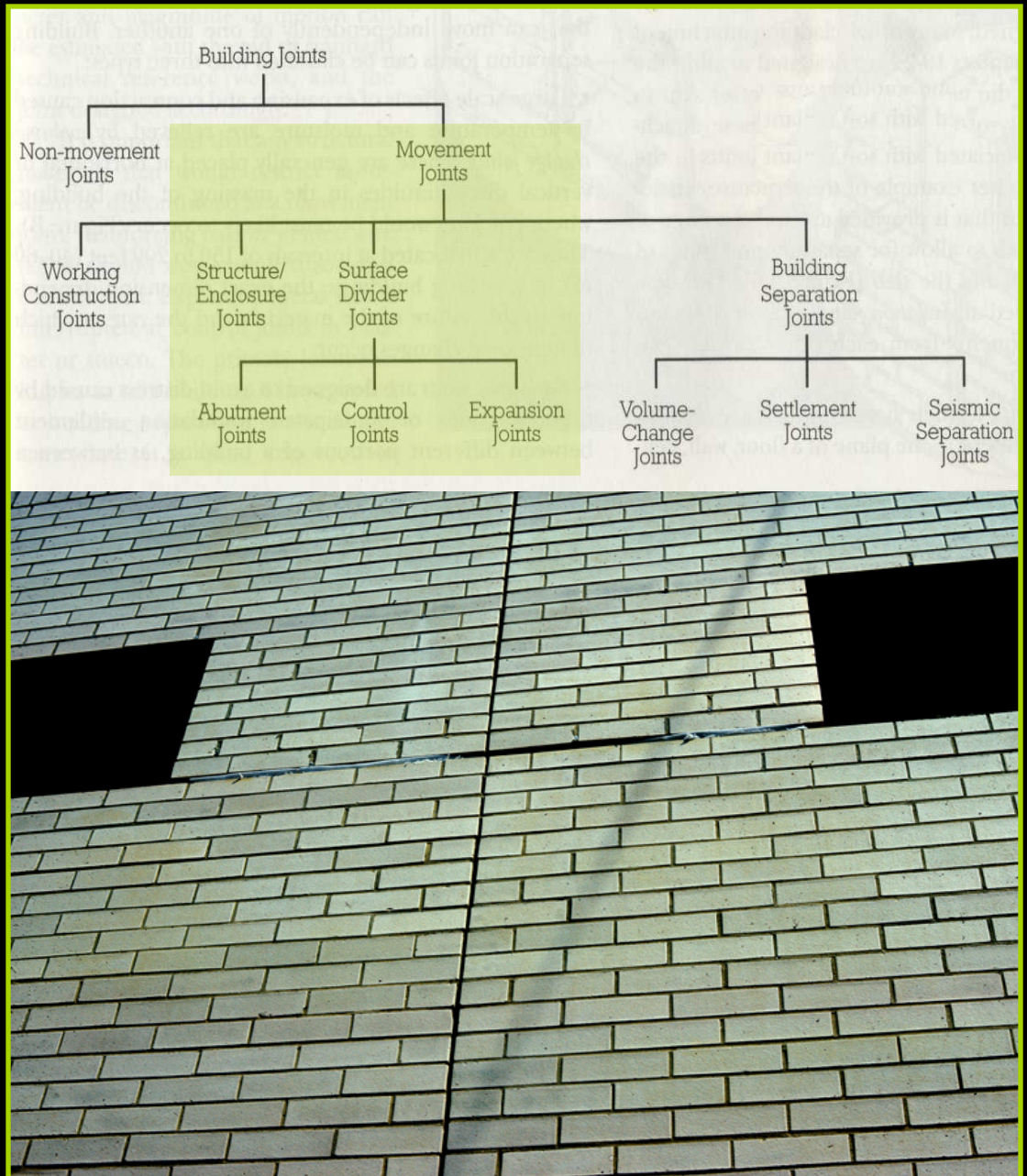
AGING:

→ RUST (= EXPANSION)

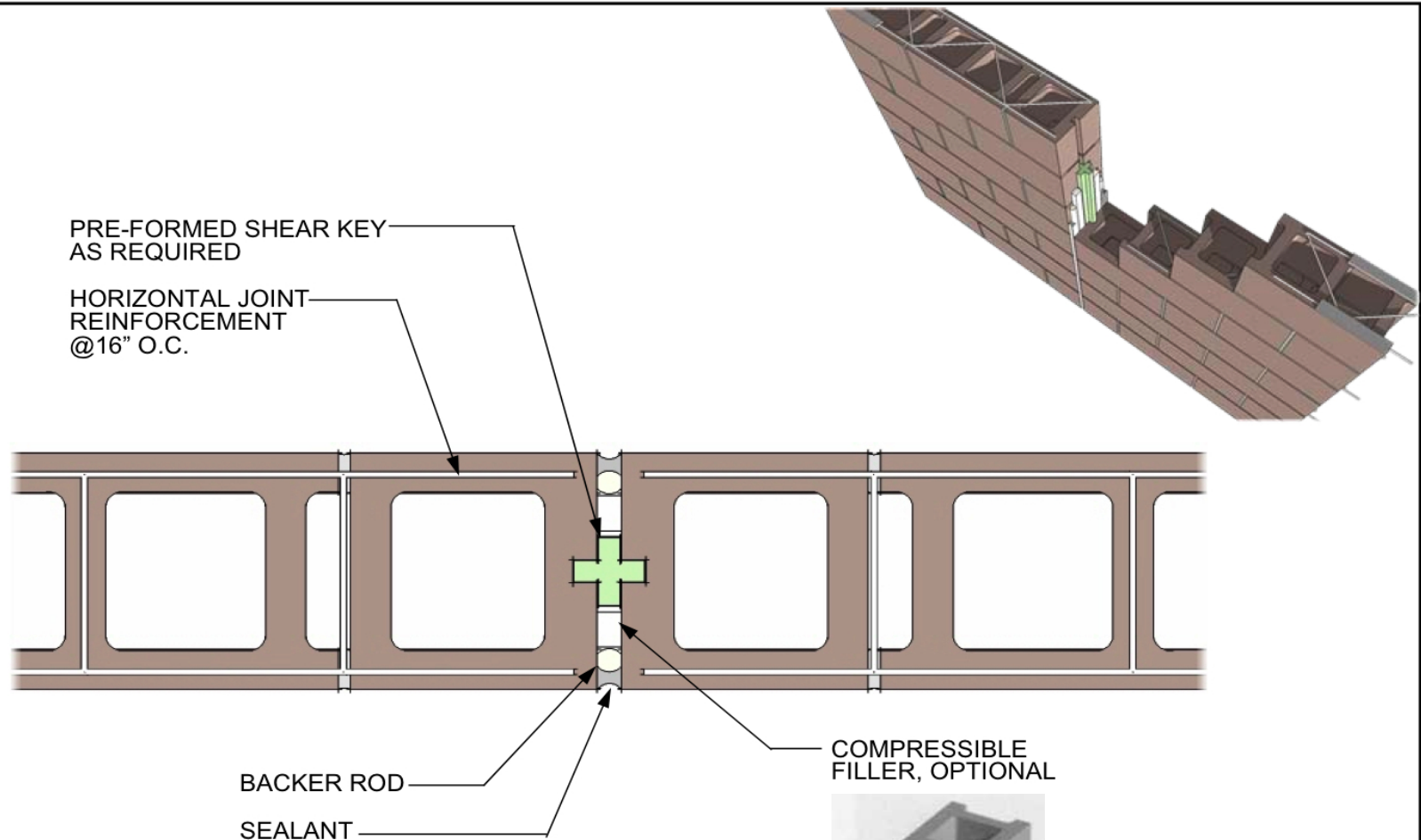
VOLUME-CHANGE JOINTS:

MASONRY: ~30 FT.,

DEPENDENT ON MATERIAL
EXPANSION RATE



→ CONTROL JOINT:



CONTROL JOINT

DETAIL 12.01 REV. 02/14/07



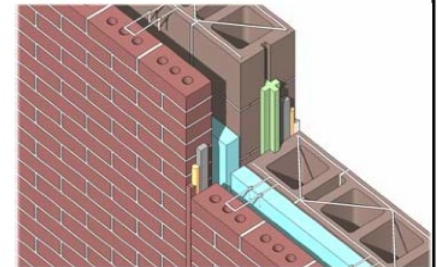
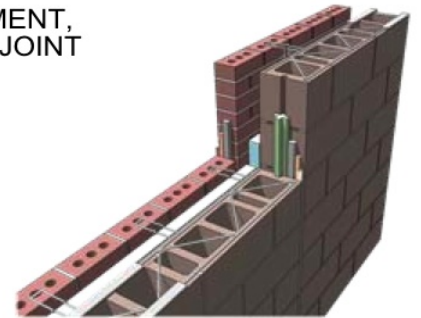
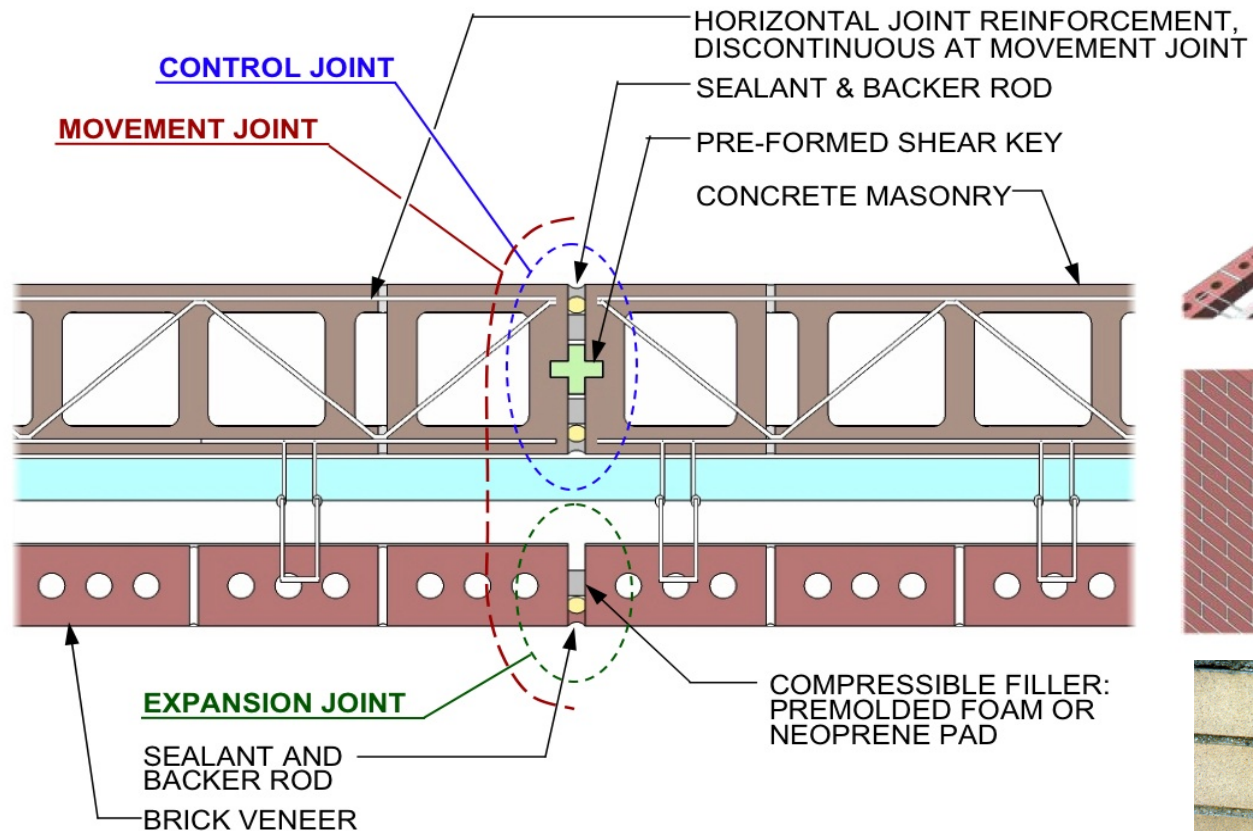
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→ CAVITY WALL: 'CONTROL JOINTS/EXPANSION JOINTS'

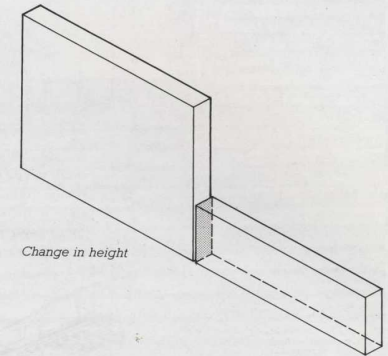


MOVEMENT JOINT IN BRICK & BLOCK CAVITY WALL

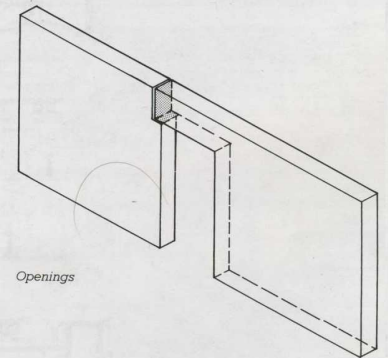
DETAIL 12.04

REV. 02/14/07

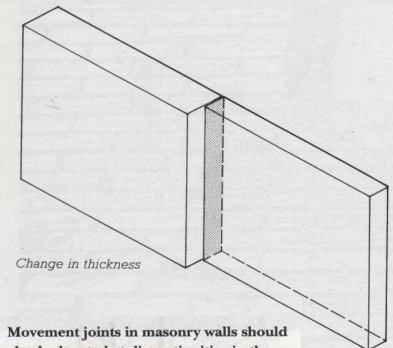
→ EXPANSION JOINTS: “WHERE TO PLACE THEM ?”



Change in height



Openings



Change in thickness

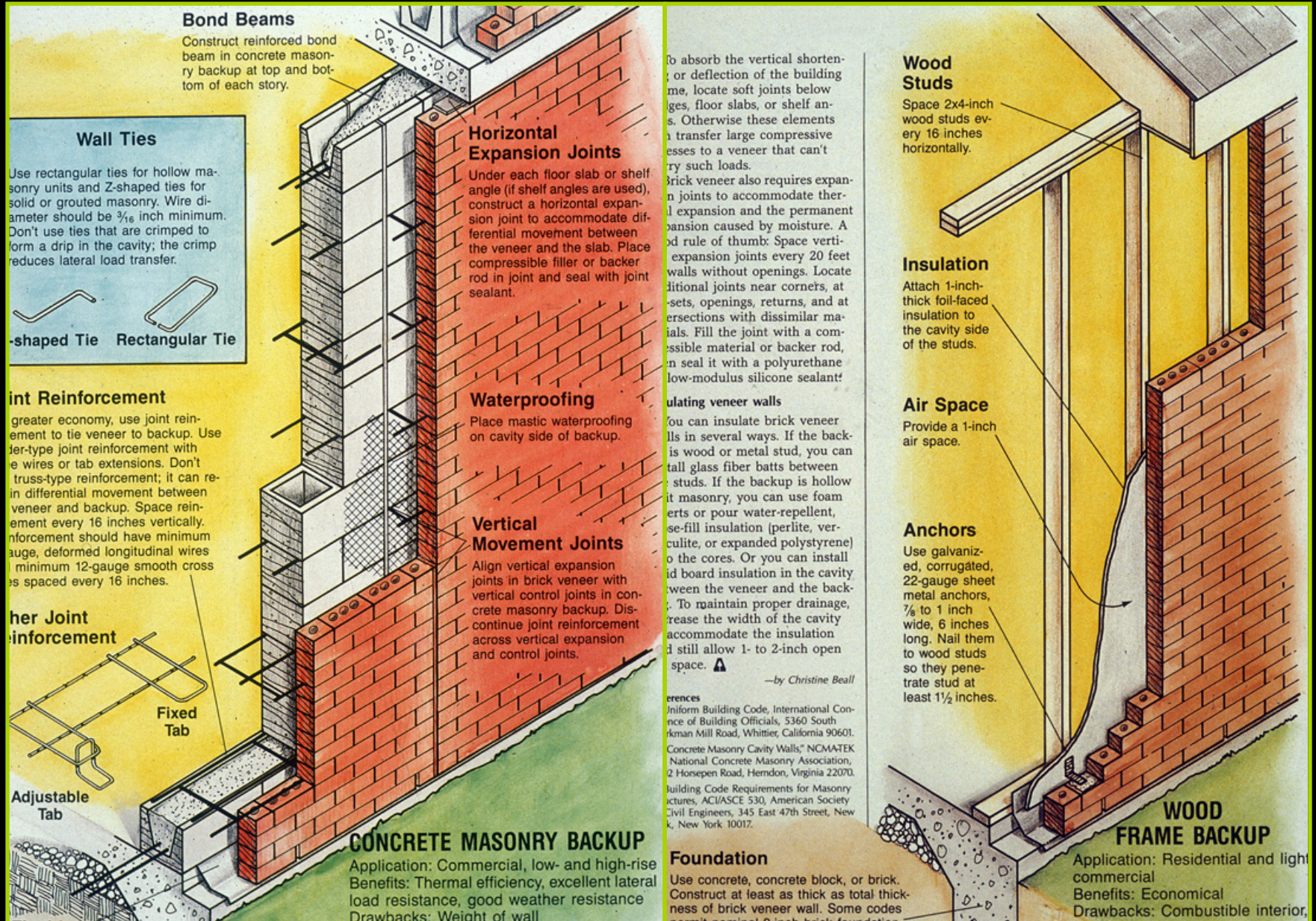
Movement joints in masonry walls should also be located at discontinuities in the wall, where cracks tend to form.

→ CAVITY WALL: 'STRUCTURE/ENCLOSURE, SURFACE DIVIDER'



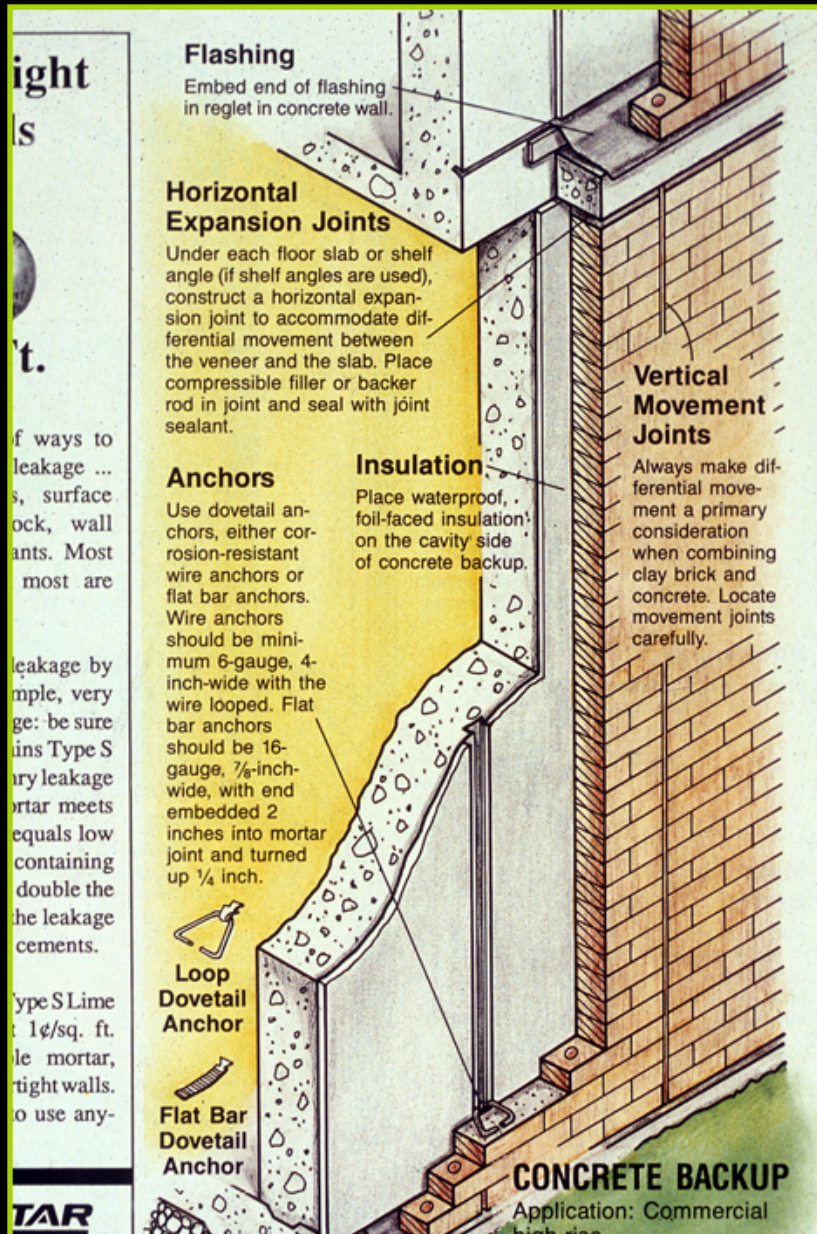
→ BACK-UP: STRUCTURE

(CONCRETE MASONRY; WOOD)



→ BACK-UP: STRUCTURE

(CONCRETE; STEEL)



→ BACK-UP: STRUCTURE

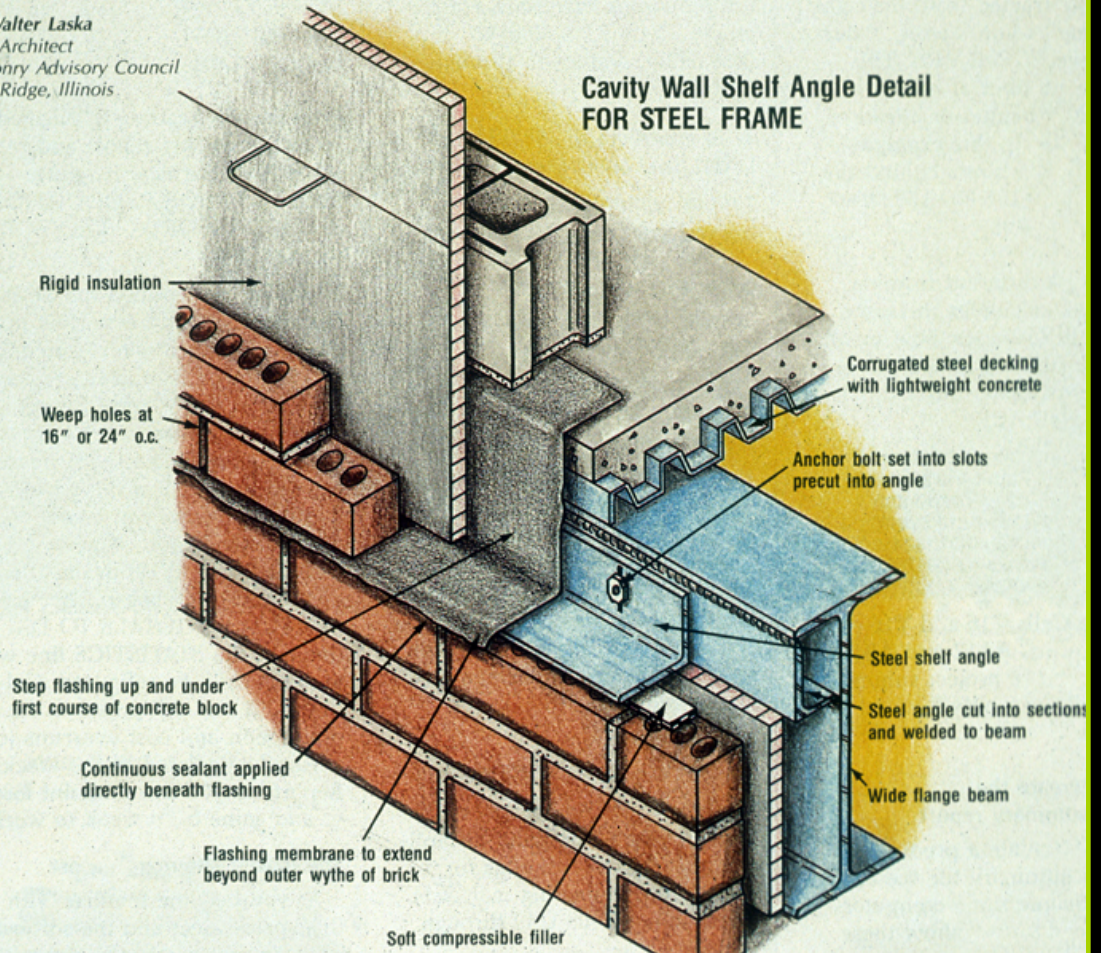
(STEEL)

Detailing shelf angles

Flashing and expansion joints are critical

By *Walter Laska*
Staff Architect
Masonry Advisory Council
Park Ridge, Illinois

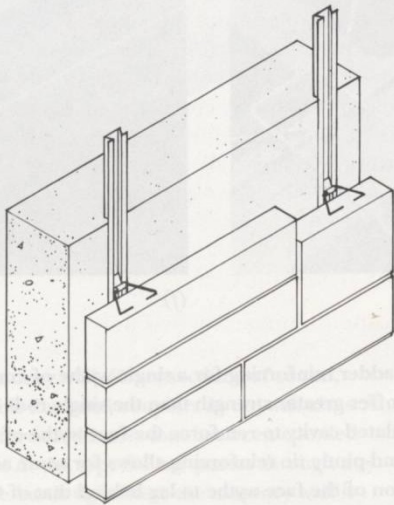
Cavity Wall Shelf Angle Detail FOR STEEL FRAME



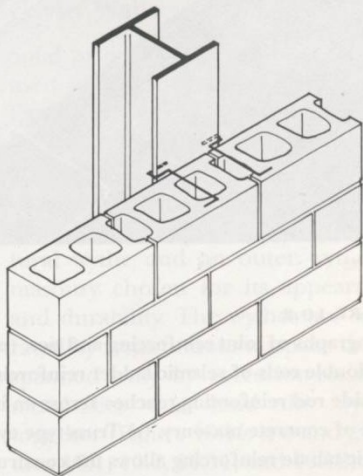
→ SUPPORT STRUCTURE: ...**MORE STEEL**...



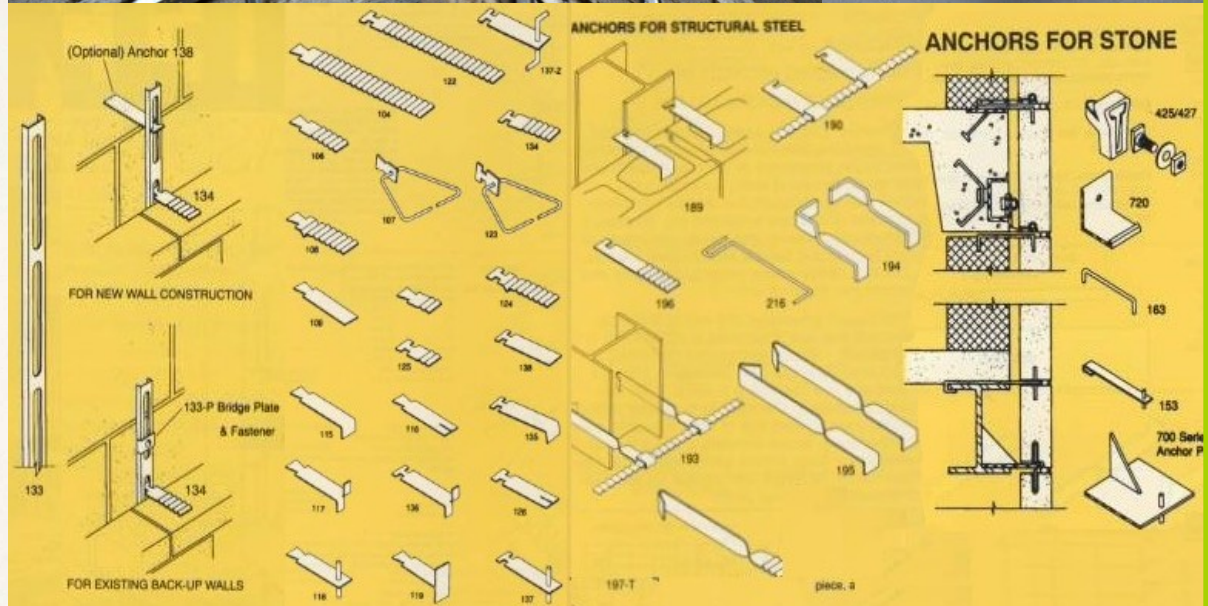
→ MORE TIES + ANCHORS:



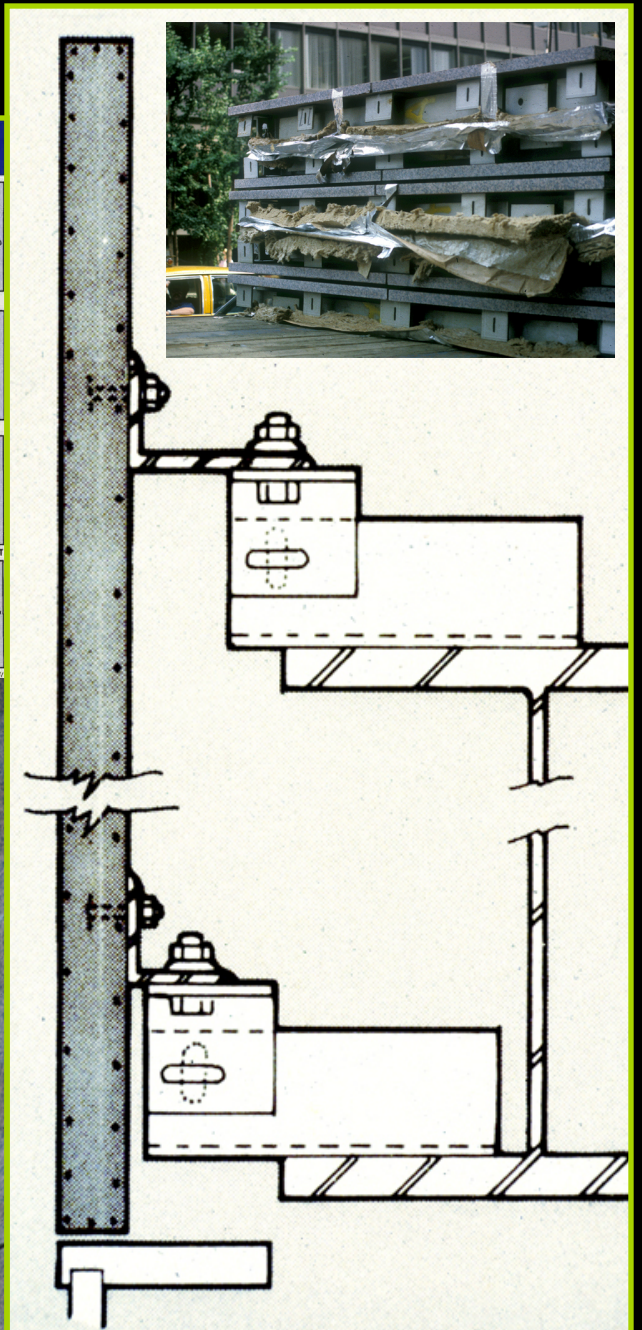
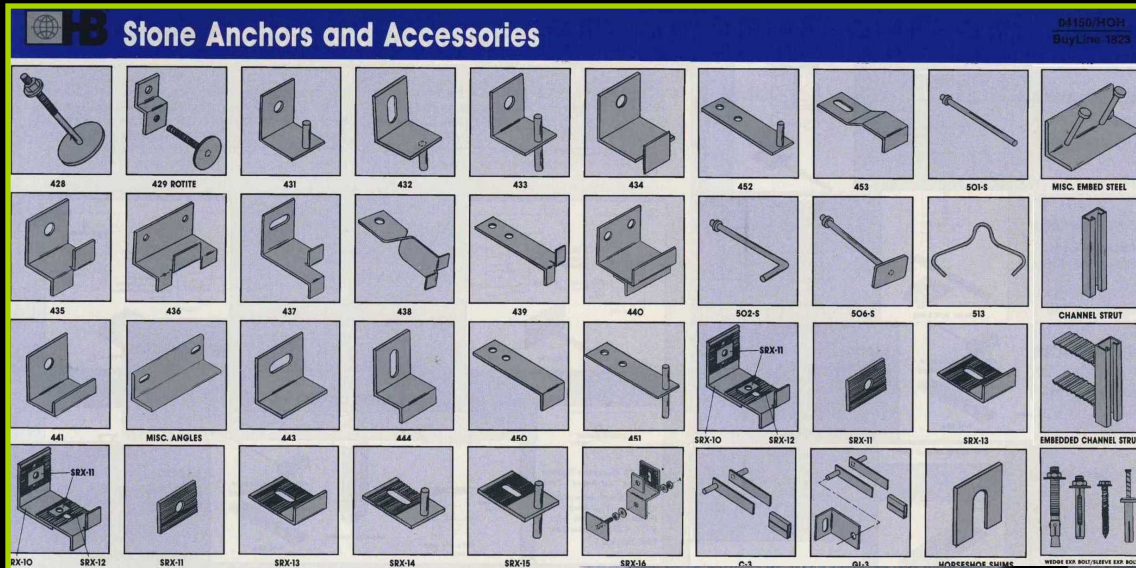
H. Dovetail Anchors for Concrete Backup



I. Steel Column Anchor



→ STONE INSTALLATION:



→ STONE FABRICATION: ... 'HIGH TECH' ...



→ QUESTION: HOW THICK IS STILL APPROPRIATE ?



→ IS THIS STILL A 'BRICK FAÇADE' ?



→ IS THIS STILL A 'BRICK FAÇADE' ?

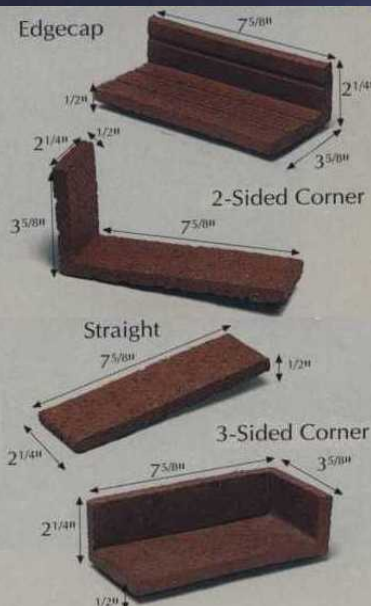
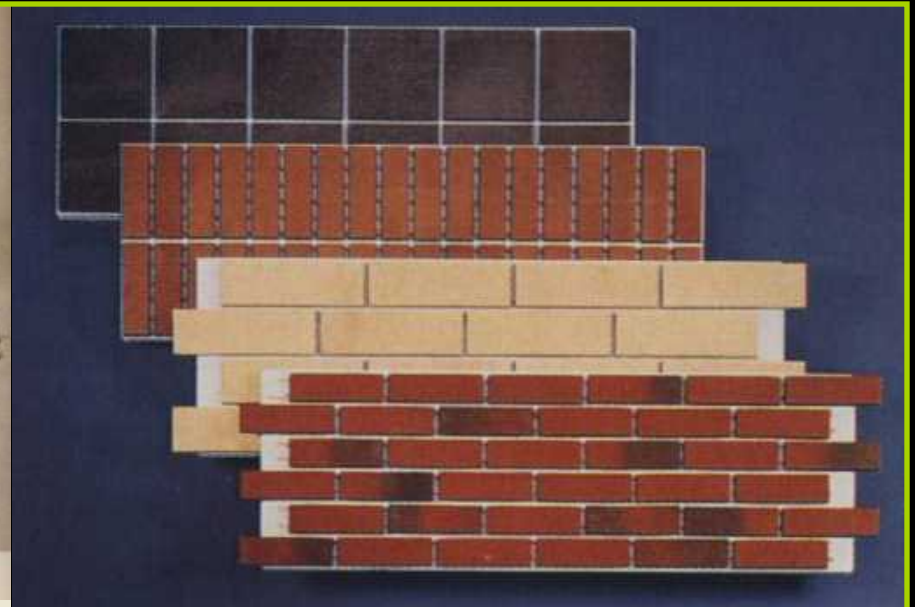
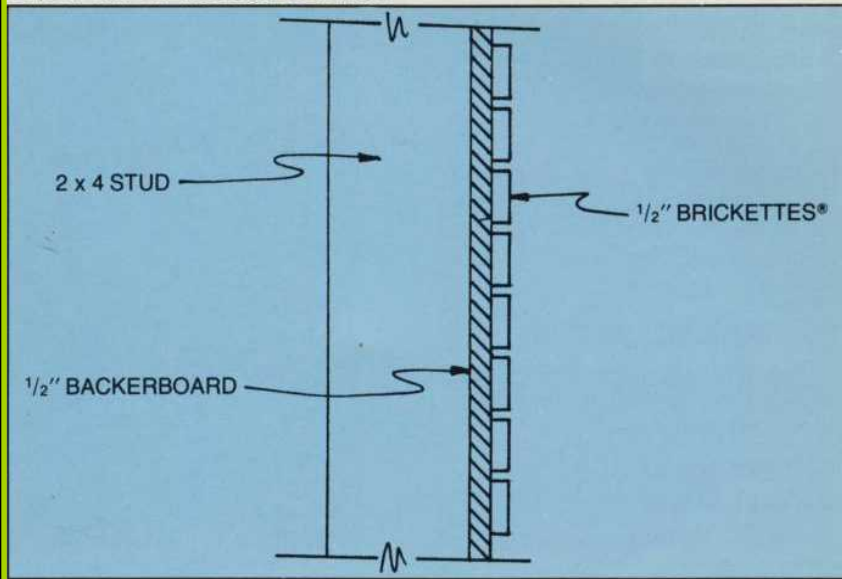


→ IS THIS STILL A 'BRICK FAÇADE' ?



BRICKETTE® PRODUCT LINE

OP/OVERALL PRODUCT IN PLACE



U.S. Brick Systems is the world's finest complete system that is remarkably suited to exteriors and interiors, high rise and single story, commercial and residential, new construction and renovation.

4' x 8' $\frac{1}{2}$ " x 1" extruded polystyrene gives waterproof R-5 insulation

Vacuum-formed polystyrene panel face

Tongue-in-groove seals panels from air infiltration

Imprinted tape measure on all four sides

Drip edge for overlapping multi-stories

Brick lock instantly holds brick in place as adhesive sets

Powerful pull-through value fasteners for steel, masonry or wood

Genuine $\frac{1}{2}$ " kiln-fired clay brick, severe weather grade

Specially-formulated U.S. Brick Systems mortar

Four simple steps:

1. Install panel (label must be readable) to substrate with U.S. Brick Systems fasteners and washers
2. Run single bead of adhesive
3. Lock brick into place
4. Mortar and tool joints

U.S. Brick Systems is the world's finest complete system that is remarkably suited to exteriors and interiors, high rise and single story, commercial and residential, new construction and renovation.

4' x 8' $\frac{3}{8}$ " x 1" extruded polystyrene gives waterproof R-5 insulation

Vacuum-formed polystyrene panel face

Tongue-in-groove seals panels from air infiltration

Imprinted tape measure on all four sides

Drip edge for overlapping multi-stories

Brick lock instantly holds brick in place as adhesive sets

Powerful pull-through value fasteners for steel, masonry or wood

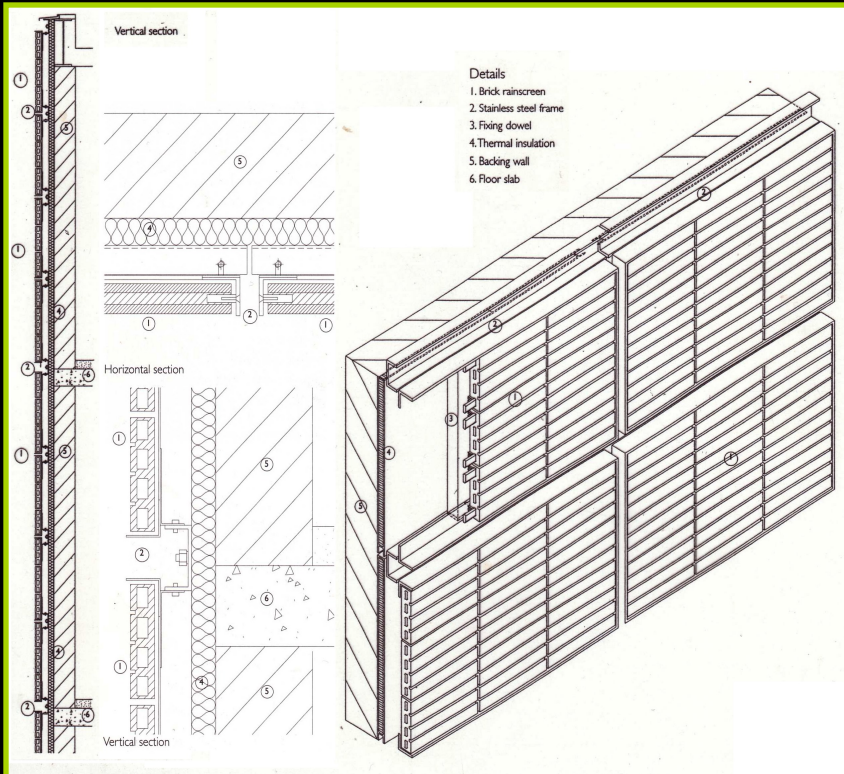
Genuine 1/2" kiln-fired clay brick, severe weather grade

Specially-formulated U.S. Brick Systems mortar

Four simple steps:

1. Install panel (label must be readable) to substrate with U.S. Brick Systems fasteners and washers
2. Run single bead of adhesive
3. Lock brick into place
4. Mortar and tool joints

→ OR, ... IS THIS A MORE CONTEMPORARY 'BRICK FAÇADE' ?

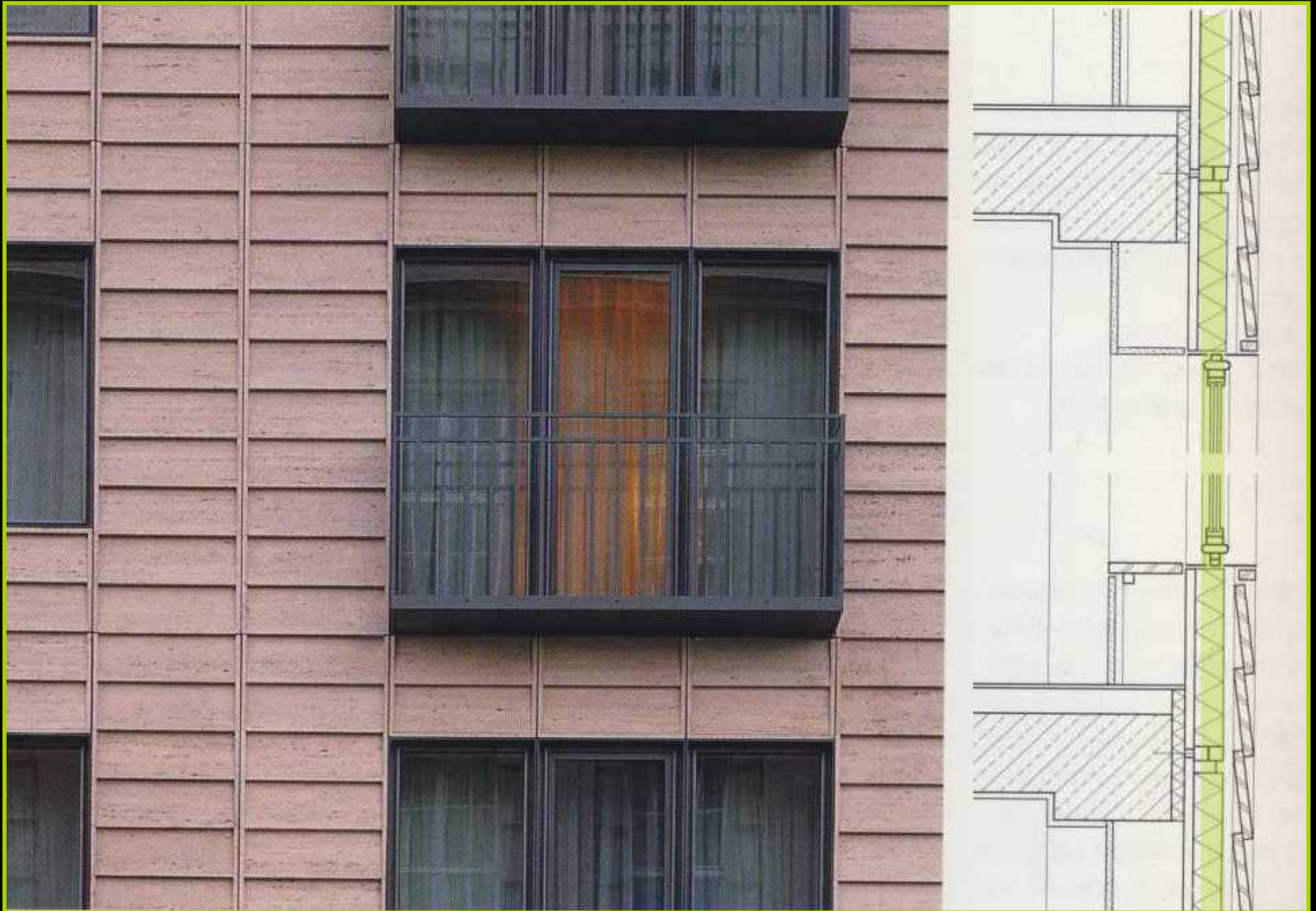


Renzo Piano: IRCAM, Paris 1990

→ OR, ... IS THIS A MORE CONTEMPORARY 'BRICK FAÇADE' ?



→ OR, ... IS THIS A MORE CONTEMPORARY 'STONE FAÇADE' ?



The architectural drawing on the left is a detailed cross-section of the building, showing the structural elements and the layout of the rooms. The drawing is titled "Abgang Kur und Therapie" at the top and "Kur und Therapie" at the bottom. It includes a list of rooms and their dimensions on the left side: "KURSAAL 12 x 12", "KURSAAL 1 x 12", "KURSAAL 12 x 12", "KURSAAL 12 x 12", "KURSAAL 12 x 12", "KURSAAL 12 x 12", "KURSAAL 12 x 12", "KURSAAL 12 x 12", "KURSAAL 12 x 12", "KURSAAL 12 x 12". The drawing shows a central corridor with rooms on either side, and a large open area at the bottom. The structural elements are shown in a cross-section view, with walls, floors, and ceilings clearly defined. The drawing is a technical illustration of the building's design.

The photograph on the right shows the interior of the building, featuring a large, open space with a high ceiling and a large window. The walls are made of light-colored wood, and the floor is made of dark wood. The space is bright and airy, with natural light coming in from the window. The photograph captures the essence of the building's design, which is a blend of modern and traditional architecture.

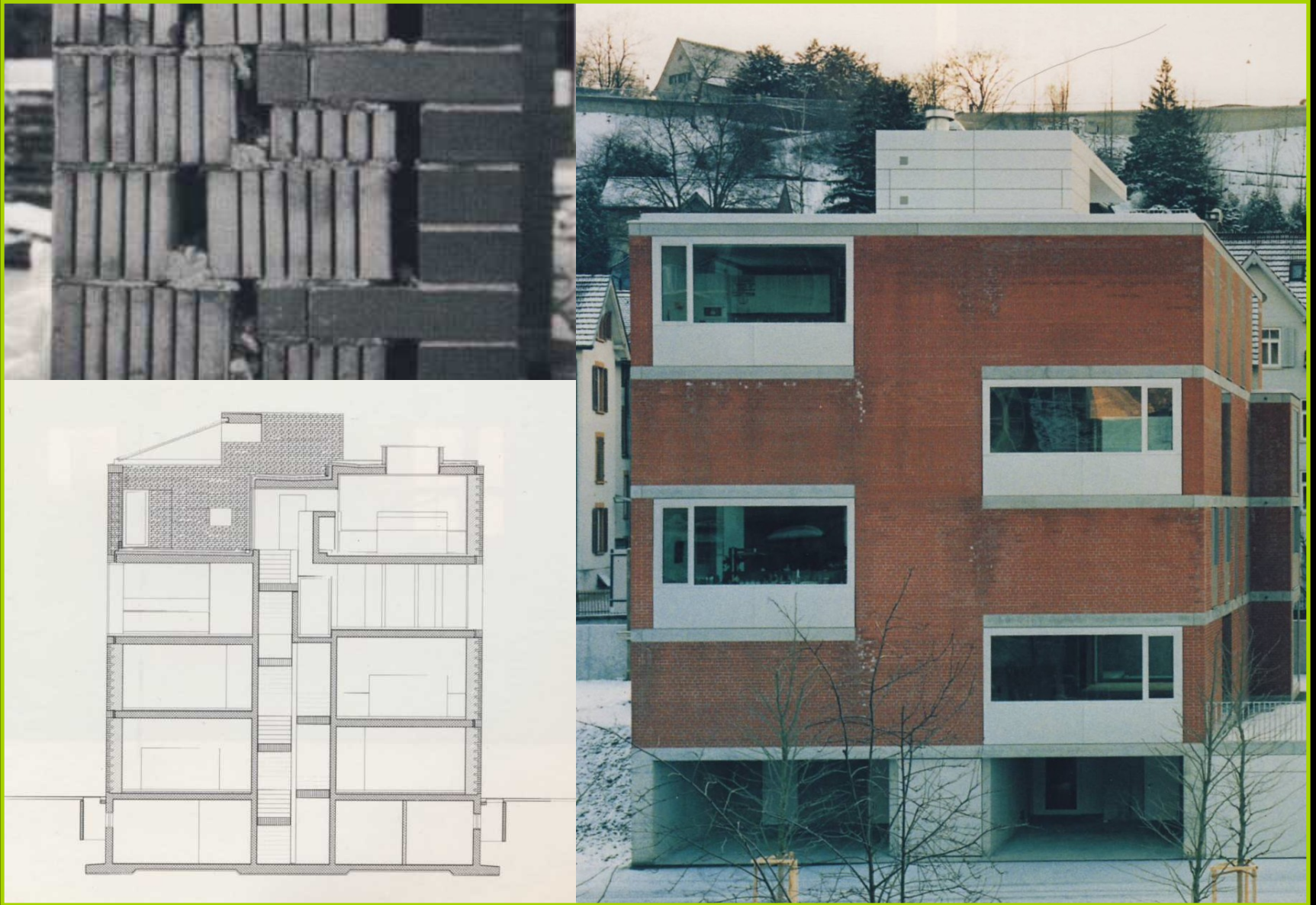
The photograph at the bottom right shows the exterior of the building, which is a modern, multi-story structure with a white facade and large windows. The building is situated in a mountainous area, with snow-capped peaks visible in the background. The photograph provides a clear view of the building's exterior, highlighting its architectural details and its integration with the surrounding environment.



→ VALS BATH, SWITZERLAND: PETER ZUMTHOR, 1996



- *BURKHARD/MEIER ARCH., HOUSE IN BADEN, SWITZERLAND, 2000*



- *BURKHARD/MEIER ARCH., HOUSE IN BADEN, SWITZERLAND, 2000*



- ALTERNATIVES: AUTOCLAVED AERATED CONCRETE (AAC)

[ALSO: AUTOCLAVED CELLULAR CONCRETE (ACC)]

PROPERTIES:

- FUNCTIONS SIMULTANEOUSLY AS STRUCTURE + INSULATION!
- R-VALUES UP TO 1.25 PER INCH
- ~20% DENSITY (IN COMPARISON TO CONCRETE);
- ~10% COMPRESSIVE STRENGTH (CONCRETE)
- LIMITED TO LOW-RISE BUILDINGS (UP TO 4 FLOORS W/ REINFORCEMENT)
- POROSITY REQUIRES MOISTURE PROTECTION



Static R-Value				
AAC Wall + Stucco				
	AAC-500	AAC-600	Class	AAC Class
	31	37	lb/ft ³	Nominal Dry Density
	500	600	kg/m ³	Nominal Dry Density
	0.93	1.12	Btu.in/h.ft ² .F	Thermal Conductivity k
4.0	5.21	4.48		
6.0	7.36	6.26		
8.0	9.51	8.05		
9.5	11.12	9.39		
12.0	13.81	11.62	h.ft ² .F/Btu	Static Thermal Resist. R
Th (Inch)				

