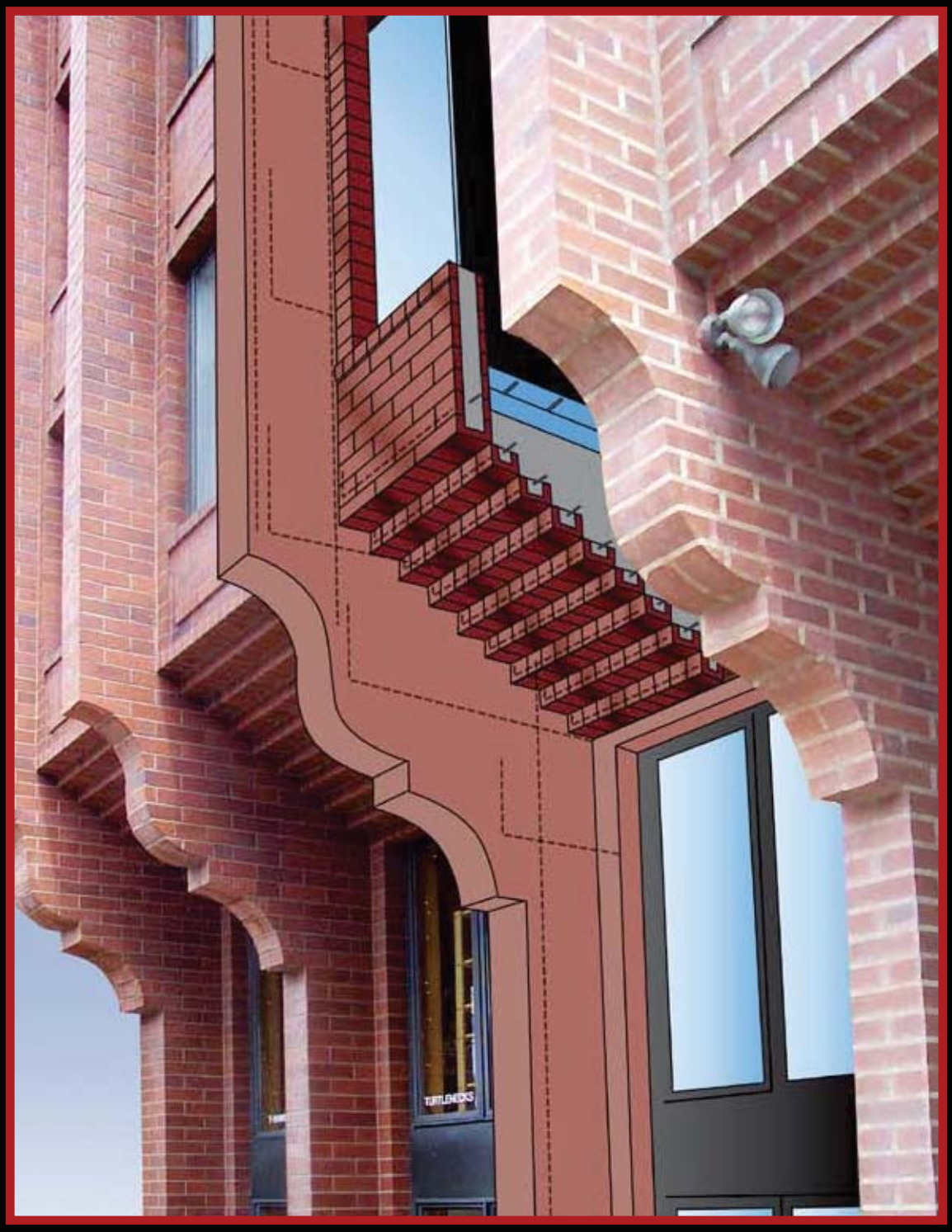
Atlas™ Brick Technical Data



INTERSTATE® BRICK
a division of PABCO®
building products, LLC

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Description

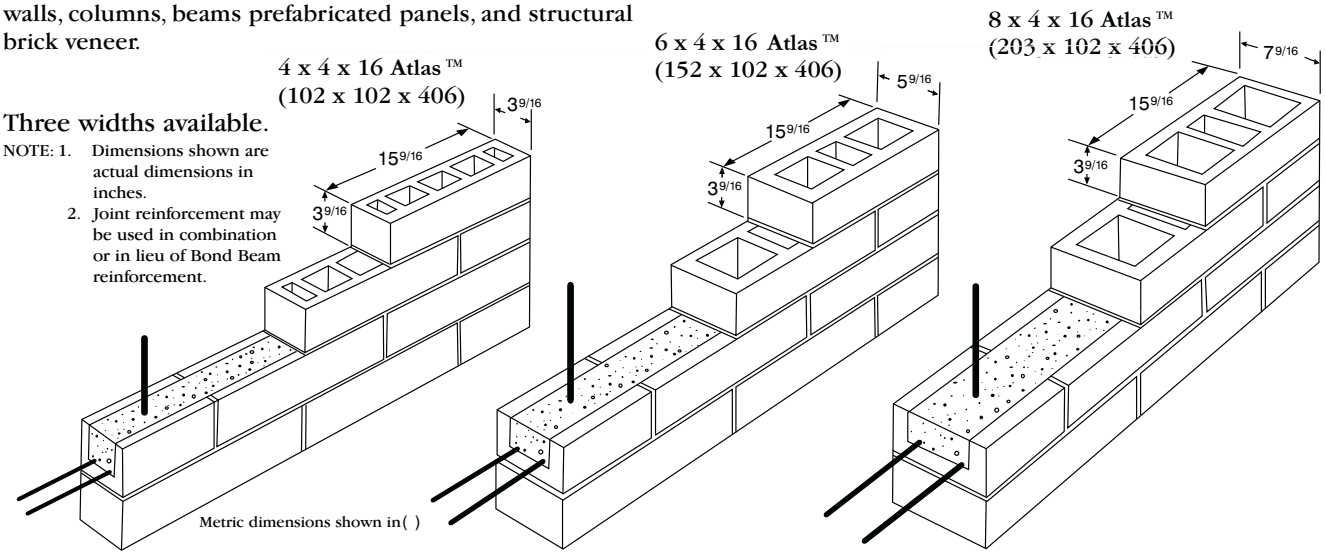
Atlas™ brick

A high-fired, burned-clay, extruded (stiff mud), hollow facing brick of blended clays. It is produced according to the specifications of ASTM C-652 and CAN3-A82.8-M78.

Atlas ™ brick combines the beauty and strength of Interstate Brick's standard face bricks with the economy of larger, through-the-wall, hollow, structural, two-faced units which makes Atlas ™ brick ideally suited for use in load-bearing walls, columns, beams prefabricated panels, and structural brick veneer.

Atlas ™ is Interstate's brand of hollow clay structural brick.

Atlas ™ Brick: A genuine clay and shale product extruded and fired to achieve permanent color, high strength, and maximum durability utilizing large hollow cells to allow easier grouting, more insulation, lighter weight and ease of handling.



Three widths available.

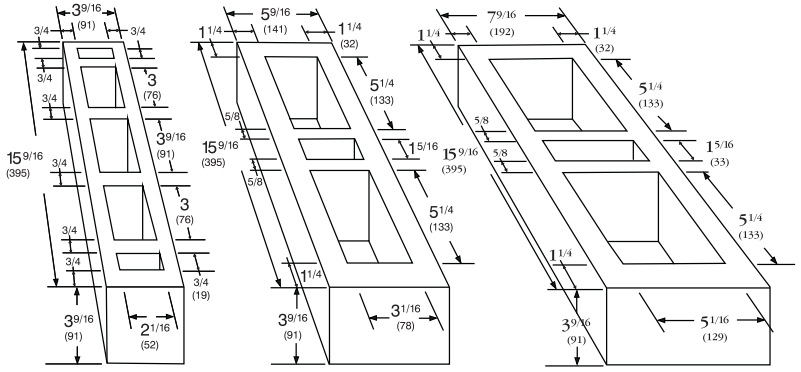
NOTE: 1. Dimensions shown are actual dimensions in inches.
2. Joint reinforcement may be used in combination or in lieu of Bond Beam reinforcement.

Our website can be found at www.interstatebrick.com or www.paccoast.com

ENGINEERING DATA

NOTE:
The products illustrated are typical of Atlas ™ through-the-wall 4" high by 16" long units. Atlas™ brick is also available 12" long. 6" and 8" high units are also available and are designated as super Atlas. Table values are not height dependent. Other brick sizes such as modular and utility can be custom cored.

Dimensions shown are actual dimensions in inches. Dimensions in brackets ( ) are in millimeters.



4 x 4 x 16 Atlas™ (102 x 102 x 406)

6 x 4 x 16 Atlas™ (152 x 102 x 406)

8 x 4 x 16 Atlas™ (203 x 102 x 406)

WEIGHT OF WALL	4 x 4 x 16	6 x 4 x 16	8 x 4 x 16
	PSF (Kg/M²)	PSF (Kg/M²)	PSF (Kg/M²)
HOLLOW	25 (122.00)	30 (146.47)	35 (170.89)
GROUT @ 48" o.c. (1.2 m)	28 (136.71)	38 (185.53)	48 (234.36)
40" o.c. (1.0 m)	29 (141.59)	39 (190.42)	49 (239.24)
32" o.c. (.81 m)	30 (146.47)	40 (195.30)	51 (249.00)
24" o.c. (.61 m)	31 (151.36)	42 (205.06)	54 (263.65)
16" o.c. (.41 m)	33 (161.12)	45 (219.71)	59 (288.07)
SOLID	38 (185.53)	56 (273.42)	77 (375.95)

STC RATING	DECIBELS	DECIBELS	DECIBELS
HOLLOW	41	45	50
SOLID	45	51	62

EQUIVALENT THICKNESS AND FIRE RATING	THICKNESS		RATING	THICKNESS		RATING	THICKNESS		RATING
	in.	mm	HOURS	in.	mm	HOURS	in.	mm	HOURS
HOLLOW	2.10	53.34	1*	3.23	82.04	1, 3*	3.70	93.98	2, 4*
GROUT @ 48" o.c. (1.2 m)	2.23	56.66	1*	3.57	90.74	1, 3*	4.26	108.19	2, 4*
40" o.c. (1.0 m)	2.26	57.32	1*	3.64	92.44	1, 3*	4.40	111.76	2, 4*
32" o.c. (.81 m)	2.30	58.30	1*	3.74	94.99	1, 3*	4.54	115.22	2, 4*
24" o.c. (.61 m)	2.36	59.94	1*	3.91	99.25	1, 3*	4.81	122.25	2, 4*
16" o.c. (.41 m)	2.49	63.21	1*	4.24	107.76	1, 3*	5.37	136.32	2, 4*
SOLID	3.50	73.04	1	5.50	133.28	3	7.50	178.51	4

UL Fire Rating:
According to **UL Design No. U935**, walls constructed with 8" Atlas Bricks filled with grout, perlite, or vermiculite are 4 hr fire rated walls.

THERMAL CONDUCTANCE**	"U"	"R"	"U"	"R"	"U"	"R"
HOLLOW W/AIR IN CELLS	0.54	1.84	0.47	2.13	0.45	2.23
SOLID GROUTED	0.68	1.46	0.59	1.69	0.50	2.00
KORFILL POLYSTYRENE INSERT	N/A	N/A	0.22	4.60	0.21	4.76
ZONOLITE IN CELLS	0.37	2.70	0.22	4.57	0.17	5.95
FOAM BEADS IN CELLS	0.35	2.86	0.20	5.00	0.16	6.45
CORE-FILL 500 FOAM	0.27	3.70	0.17	5.90	0.16	6.50
POLYURETHANE IN CELLS	0.32	3.14	0.17	5.85	0.14	7.30

* NOTE: Values without asterisks are for walls grouted at spacings shown. Values with asterisks require all empty cells to be filled with perlite, vermiculite, or expanded shale aggregates to achieve fire rating shown. Fire ratings are according to IBC Table 719.1(2), 1-1.2 and 1-13. Equivalent thickness shown should not be used in determining bearing and shear areas of masonry walls.

** NOTE: Higher values may be obtained from using bond beam units. Vertical grouted cells assumed to be 48 inch spacing.

Design Properties

Uncracked effective moment of inertia	4" ATLAS		6" ATLAS		8" ATLAS	
	$in.^4/FT$	$mm^4/M \times 10^{-4}$	$in.^4/FT$	$mm^4/M \times 10^{-4}$	$in.^4/FT$	$mm^4/M \times 10^{-4}$
HOLLOW GROUT @	34.03	.466	135.46	1.86	292.97	4.01
48" o.c. (1.220 m)	34.78	.476	139.48	1.91	311.52	4.27
40" o.c. (1.020 m)	34.93	.479	140.27	1.92	315.24	4.32
32" o.c. (.813 m)	35.16	.480	141.48	1.94	320.80	4.40
24" o.c. (.609 m)	35.53	.490	143.48	1.97	330.08	4.52
16" o.c. (.406 m)	36.28	.500	147.50	2.02	348.64	4.78
SOLID	42.90	.590	166.40	2.28	421.80	5.78
RADIUS OF GYRATION	in.	mm	in.	mm	in.	mm
HOLLOW GROUT @	1.375	34.93	2.13	53.98	3.13	79.50
48" o.c. (1.220 m)	1.310	33.27	1.98	50.29	2.83	71.88
40" o.c. (1.020 m)	1.290	32.77	1.96	49.78	2.78	70.61
32" o.c. (.813 m)	1.280	32.51	1.93	49.02	2.72	69.09
24" o.c. (.609 m)	1.260	32.00	1.88	47.75	2.63	66.80
16" o.c. (.406 m)	1.210	30.73	1.79	45.47	2.48	63.00
SOLID	1.010	25.65	1.59	40.39	2.16	54.86

Compressive Strength Data [5]

COLOR OF ATLAS BRICK	STRENGTH OF UNIT[(1)]		ASSUMED f'm from 08 TMS[(2 3 4)]	
	psi	(Mpa)	psi	(Mpa)
Arctic White	9,000	62.05	3,226	22.24
Autumn Red	11,000	75.84	3,667	25.28
Bronzestone	12,000	82.74	3,818	26.32
Canyon Rose	11,000	75.84	3,667	25.28
Cedar	11,000	75.84	3,667	25.28
Copperstone	11,000	75.84	3,667	25.28
Desert Sand	11,000	75.84	3,667	25.28
Golden Buff	12,000	82.74	3,818	26.32
Ironstone	12,000	82.74	3,818	26.32
Midnight Black	13,200	91.01	4,000	27.58
Monterey	12,000	82.74	3,818	26.32
Mountain Red	13,200	91.01	4,000	27.58
Ochre Buff	11,000	75.84	3,667	25.28
Park Rose	12,000	82.74	3,818	26.32
Platimum	9,000	62.05	3,226	22.24
Smokey Mountain	11,000	75.84	3,667	25.28
Tumbleweed	11,000	75.84	3,667	25.28
Walnut	13,200	91.01	4,000	27.58

1. Contact Interstate Brick for latest test data
2. f'm is based on Type S Mortar
3. Type S Mortar is 1:1/2:4 1/2: parts by volume Portland Cement, hydrated lime and sand respectively.
4. Grout strength greater than or equal to f'm
5. Although the compressive strength of the masonry may reach values in excess of 4000 psi, Interstate Brick recommends prism test be performed using the actual brick, mortar and grout to establish design values of f'm greater than 4000 psi.

ENGINEERING DESIGN

The design guidelines provided in this brochure are based on IBC 2006 or 2008 Building Code Requirements for Masonry Structures (TMS 402-08/ACI530-08/ASCE 5-08). The information in this brochure is only to be used as a guideline. It is the responsibility of the Project Architect/Engineer to determine the suitability of the information to specific applications.

Material Properties

The following masonry properties and equations are taken from TMS 402-08/ACI530-08/ASCE 5-08

Modulus of elasticity $E_m = 700\ f'_m$ — Modulus of rigidity $E_v = 0.4\ E_m$

Coefficient of thermal expansion $k_t = 4 \times 10^{-6}$ in./in./°F — Coefficient of creep $k_c = 0.7 \times 10^{-7}$ per psi

Coefficient of moisture expansion $k_e = 3 \times 10^{-4}$ in./in.

Allowable Stress Design

Allowable Compression Load - P_a

h/r < 99	h/r > 99
$P_a = \left(0.25 f'_m A_n + 0.65 A_{st} f_s\right)\left[1 - \left(\frac{h}{140r}\right)^2\right]$	$P_a = \left(0.25 f'_m A_n + 0.65 A_{st} f_s\right)\left[1 - \left(\frac{70r}{h}\right)^2\right]$

The compressive stress in the masonry shall not exceed $\frac{1}{3} f'_m$

Allowable Masonry Shear Stress - F_v

Without Shear Reinforcement

Flexural member	Shear wall	
	$M/Vd < 1$	$M/Vd \geq 1$
$F_v = \sqrt{f'_m}$ ≤ 50 psi	$F_v = \frac{1}{3}\left[4 - \frac{M}{Vd}\right]\sqrt{f'_m}$ ≤ 80 – 45 (M/Vd) psi	$F_v = \sqrt{f'_m}$ ≤ 35 psi

With shear reinforcement

Flexural member	Shear wall	
	$M/Vd < 1$	$M/Vd \geq 1$
$F_v = 3\sqrt{f'_m}$ ≤ 150 psi	$F_v = \frac{1}{2}\left[4 - \frac{M}{Vd}\right]\sqrt{f'_m}$ ≤ 120 – 45 (M/Vd) psi	$F_v = 1.5\sqrt{f'_m}$ ≤ 75 psi

Strength Design

Nominal Axial Compressive Strength - P_n

h/r < 99	h/r > 99
$P_n = 0.8\left(0.8 f'_m\left[A_n - A_{st}\right] + A_{st} f_y\right)\left[1 - \left(\frac{h}{140r}\right)^2\right]$	$P_n = 0.8\left(0.8 f'_m\left[A_n - A_{st}\right] + A_{st} f_y\right)\left[1 - \left(\frac{70r}{h}\right)^2\right]$

Nominal Shear Strength

$V_n = V_{nm} + V_{ns}$

$$V_{nm} = \left[4.0 - 1.75\left[\frac{M}{Vd}\right]\right] A_n \sqrt{f'_m} + 0.25 P_u \qquad V_{ns} = 0.5\left[\frac{A_v}{s}\right] f_y d$$

For $M/Vd \leq 0.25$, $V_n \leq 6 A_n \sqrt{f'_m}$ — For $M/Vd \geq 1$, $V_n \leq 4 A_n \sqrt{f'_m}$

Notations:

h = effective height of the member
r = radius of gyration, refer to Design Properties Table on Page 2 for r values
f'_m = Masonry Design Strength refer Compressive Strength Data on Page 2 and verify with latest test data.
f_s = Allowable tensile stress in reinforcement, 24,000 psi for Grade 60,and 20,000 psi for Grade 40 and 50
A_n = Net area of masonry
A_{st} = Area of steel reinforcement
M = Maximum moment at the section
V = Shear force
d = depth of section
For SI: 1 psi = 0.00689 MPa

Quality Assurance

The use of quality assurance construction techniques will reduce the cost of the building while improving the overall quality and strength of the masonry.

Building codes recognize that quality control during masonry construction can significantly improve the quality, the safety, the strength, the durability and the economy of a masonry member by allowing the designer to use the full, actual strength of the masonry assemblage in the design of the structure.

TMS 402/ACI530 establishes three levels of quality assurance for all masonry structures. Compliance with one of these three levels is now required. Quality assurance will pay for itself many times over by guaranteeing better masonry through better workmanship. Utilizing Atlas™ brick along with these new procedures allows for the full use of the masonry strength, thereby: (1) reducing the required thickness of walls (2) reducing the amount of reinforcing steel required (3) reducing the weight of the building (4) reducing the induced seismic loads (5) reducing the foundation size and cost and (6) most importantly, increasing the engineers confidence that the masonry will be as strong as his design requires. Quality Assurance will create a better building for much less cost.

Quality Assurance of masonry construction includes but not limited to:

Prism Testing

Prism test can be used to (1) verify compliance of the masonry strength with the design strength (2) design with strengths higher than the prescriptive unit strength method. Prism tests, at a relatively low cost, allow the designer to use higher, but safer, allowable stresses that allow thinner walls with less steel to do a better job of carrying their loads and stresses. It is also a form of on-the-job inspection and a monitor of quality. Construct and test masonry prism according to ASTM C1314.

Mechanical Vibration

Other than where self consolidating grout is used, mix the grout to a consistency of a slump between 8 in. and 11 in. Consolidation and reconsolidation by mechanical vibration of the grout is a very important part of good construction and is mandatory by code unless in the use of self-consolidating grout. Consolidation is essential because it causes the grout to flow intimately in every opening and void within the wall. Reconsolidation densifies and strengthens the grout because it remixes the grout after the initial vibration has forced the free water to migrate to the absorbing surfaces of the masonry units and closes all of the capillaries or tunnels formed by this free water migration. Vibration improves the strength and bond of the grout. Reconsolidation should occur within 10-15 minutes of grout placement.

Self Consolidating Grout (SCG)

SCG is a grout with high fluidity achieved through the use of admixtures which does not require consolidation during placement. SCG offers savings in labor cost and time while providing a properly grouted wall. Job-site proportioning of SCG is not permitted and water should be added only as per the recommendation of the grout manufacturer since high fluid grouts are susceptible to segregation.

Mortar Selection

Various factors such as strength of the masonry, initial rate of absorption (IRA) of the brick, weather conditions etc. can affect the selection of the mortar. Type S mortar is typically used for above grade construction of structural masonry and Type M mortar is used for below grade construction.

IRA is a measurement of initial absorption of the moisture from mortar to the brick. IRA is not a prerequisite or indicator of performance but merely a broad and general guideline to assist in the selection of mortar. IRA of a brick should be between 5 g/min/30 in.^{2} and 30 g/min/30 in.^{2} during the time of laying. If the IRA of the brick is higher than 30 g/min/30 in.^{2} the bricks can be pre-wetted prior to laying to reduce the IRA. Conversely, a low IRA brick should be covered prior to installation.

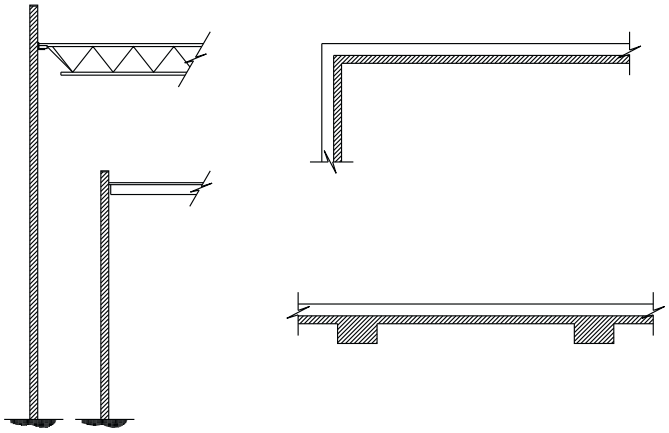
Water retention capacity is an important factor in the selection of the mortar. Type N mortar can be used when high water retention is desired for the mortar in hot and dry weather conditions or when installing high IRA bricks or a combination of both. However, the use of Type N mortar and masonry cement mortar are prohibited in Seismic Design Category D, E and F. Admixtures to improve the water retention of the mortar are available and may be used if prism tests show compliance with design requirements.

Strength Design of Slender Reinforced Masonry Walls

The slender wall design method considers the slenderness effects of walls by taking into account the bending moment induced (1) by Uniform lateral forces ($wl^2/8$), (2) by axial loads applied eccentrically to the center line of the wall (Pe), and (3) by the magnifying moment effect due to wall weight and axial loads caused by the "P" delta effect of wall deflection ($P\Delta$).

Tall, Slender Walls Have Many User Benefits

The ability to build masonry walls taller and thinner results in many user benefits. Tall, slender walls provide initial cost savings, space savings, and permit increased vertical clearance.



1. Initial cost saving is the result of
   —less masonry material required
   —less "minimum" reinforcing steel because the wall is thinner
   —smaller footings because walls weigh less
   —lower seismic forces because of walls having less weight
   —reduced construction time as lighter units can be laid faster
   —reduced interim financing costs as construction time is decreased
   —fewer movement joints

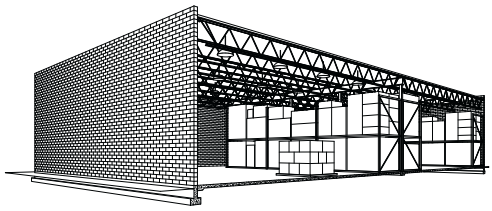
2. More space at less cost
   Thinner walls provide more usable floor space inside the building, i.e., reducing the wall thickness from 12" to 6" results in 400 square feet more usable space in a 200 ft. x 200 ft. building with the same clear height inside the building.

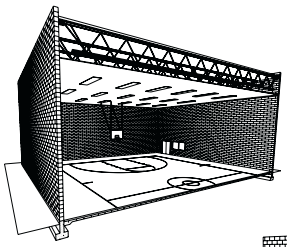
3. Increase vertical clearance
   —high strength clay masonry allows walls to be thinner and higher
   —higher heights of walls can be achieved with the same thickness of wall.

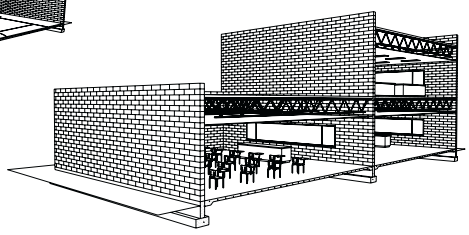
4. No pilasters projecting into the floor space interfering with the smooth run of walls.

Application of Tall, Slender, Reinforced Masonry Walls

Many structures require high walls and roofs for their maximum efficient use. Such structures may be warehouses, supermarkets, gymnasiums and auditoriums, to mention just a few.







ESTIMATING TABLES FOR VARIOUS LATERAL LOADINGS

How to use tables: Select the table that is closest to your required wind (Table A) or seismic load (Table B). Select an allowable design f'm, Refer to page 2 of this brochure for the preferred color or Table 1 in TMS 602-08/ACI 530.1-08/ASCE 6-08. Select the unsupported height of your wall on the left hand side of the table. Proceed horizontally until you reach the column for the required roof or floor load which includes both dead and live loads. Read the required amount of steel per lineal foot of wall. Use Table C to select the next larger reinforcing bar size than the amount of steel required for the spacing you want.

Table A

WIND LOADING ACCORDING TO ASCE 7 IN PSF

	70 MPH ** (85 MPH - 3 SEC GUST)				85 MPH ** (105 MPH - 3 SEC GUST)			
CATEGORY	EXPOSURE B		EXPOSURE C		EXPOSURE B		EXPOSURE C	
	IN	OUT	IN	OUT	IN	OUT	IN	OUT
1	11.1	-12.2	14.3	-15.7	16.9	-18.5	21.8	-23.9
2	12.8	-14.0	16.5	-18.1	19.4	-21.3	25.4	-27.4
3	12.8	-14.0	16.5	-18.1	19.4	-21.3	25.1	-27.4

** Fastest Mile wind speed per 2006 IBC, table 1609.3.1

* Values listed are per 2006 IBC simplified provision for low-rise buildings. Effective wind area equals 100 SF and mean roof height equals 20 ft.

Table B

OUT OF PLANE EARTHQUAKE LOADING AS PER ASCE 7
ASSUMPTION: SITE CLASS D

$F_p = 0.40\ I\ S_{DS}\ W_w$

F_p = Design Out of Plane Earthquake Load — I = Importance Factor

S_{DS} = Spectral Acceleration Parameter at Short Period — W_w = Wall Weight

SESMIC DESIGN CATAGORY►	SDC A	SDC B	SDC C	SDC D	SDC E	SDC F
I	1	1	1	1	1.25	1.5
S_{DS}	0.167	0.25	0.42	0.63	0.75	0.75

Grout Spacing, in., (m)	6 in. Atlas - F_p in PSF (Kg/m^2)						
	Wall Wt.	SDC A	SDC B	SDC C	SDC D	SDC E	SDC F
Solid	56 (273)	3.7 (18)	5.6 (27)	9.4 (46)	14.1 (69)	21.0 (103)	25.2 (123)
16 (0.41)	45 (219)	3.0 (15)	4.5 (22)	7.6 (37)	11.3 (56)	16.9 (83)	20.3 (99)
24 (0.61)	42 (205)	2.8 (14)	4.2 (21)	7.1 (35)	10.6 (52)	15.8 (77)	18.9 (93)
32 (0.81)	40 (195)	2.7 (13)	4.0 (20)	6.7 (33)	10.1 (49)	15.0 (74)	18.0 (88)
40 (1.02)	39 (190)	2.6 (13)	3.9 (19)	6.6 (32)	9.8 (48)	14.6 (72)	17.6 (86)
48 (1.22)	38 (185)	2.5 (12)	3.8 (19)	6.4 (31)	9.6 (47)	14.3 (70)	17.1 (84)

Grout Spacing in., (m)	8 in. Atlas - F_p in PSF (Kg/m^2)						
	Wall Wt.	SDC A	SDC B	SDC C	SDC D	SDC E	SDC F
Solid	77 (375)	5.1 (25)	7.7 (38)	12.9 (63)	19.4 (95)	28.9 (141)	34.7 (170)
16 (0.41)	60 (293)	4.0 (20)	6.0 (29)	10.1 (49)	15.1 (74)	22.5 (110)	27.0 (132)
24 (0.61)	53 (258)	3.5 (17)	5.3 (26)	8.9 (44)	13.4 (65)	19.9 (97)	23.9 (117)
32 (0.81)	50 (244)	3.3 (16)	5.0 (25)	8.4 (41)	12.6 (62)	18.8 (92)	22.5 (110)
40 (1.02)	49 (239)	3.3 (16)	4.9 (24)	8.2 (40)	12.3 (61)	18.4 (90)	22.1 (108)
48 (1.22)	48 (234)	3.2 (16)	4.8 (24)	8.1 (40)	12.1 (59)	18.0 (88)	21.6 (106)

Table C

EQUIVALENT AREA OF REINFORCING BARS IN SQUARE INCHES PER LINEAL FOOT AT THESE SPACINGS OF REINFORCING BARS

AREA OF BAR IN SQUARE INCHES	NUMBER OF BAR SIZE	8"	16"	24"	32"	40"	48"
.20	#4Ø	.300	.150	.100	.075	.060	.050
.31	#5Ø	.465	.233	.155	.116	.093	.078
.44	#6Ø	.660	.330	.220	.165	.132	.110
.60	#7Ø	.900	.450	.300	.225	.180	.150
.79	#8Ø	1.185	.593	.395	.296	.237	.198
1.00	#9Ø	1.500	.750	.500	.375	.300	.250

Illustration:
Design 7.5 in. thick, 30 ft. tall Atlas wall for a wind speed of 85 MPH for a category 1 exposure B and roof axial load 1000 lbs per linear foot with Mountain Red brick.

Steps:
From Table A of Page 6 select the appropriate wind pressure = -18.5 psf, use 20 psf for design)

Select f'_m from Compressive Strength Data Table on Page 2, Strength of the unit = 13200 psi f'_m = 4000 psi

Look for the table corresponding to width of the brick = 7.5 in.; f'm = 4000 psi; and Wind pressure = 20 psf

Table in column 2 of row 1 on page 9 matches the criteria. Select column corresponding to the height of the wall (30 ft.)and the row corresponding to the roof load (1000 lbs/ft.) and select the area of reinforcing are per linear foot at the intersection of this column and row (0.22 in^2 per linear foot).

Using this area of steel, refer back to Table C of Page 6 to determine bar size and requirements. Select a value equal to or larger than the area required (#6 @ 24 or #7 @ 32).

Caution: These tables are for estimating preliminary wall thicknesses and vertical steel areas. The bending moment caused by the eccentricity of the roof connections due to the roof's dead and live load may partially offset the maximum moment caused by the maximum inward or positive wind pressure. Both conditions must be investigated in the design.

SLENDER WALL TABLES

Area of Reinforcing (in²/LF Wall)
Width of Brick = 5.5
f'm = 3,500
Wind Pressure or EQ = 15 psf

HT = FT P = lbs. per lineal foot

HT \ P	0	500	750	1000	1500	2000
28	0.21	0.23	0.24	0.25	0.28	0.32
27	0.19	0.20	0.21	0.22	0.24	0.27
26	0.17	0.18	0.18	0.19	0.20	0.22
25	0.16	0.16	0.16	0.16	0.17	0.17
24	0.14	0.14	0.14	0.14	0.18	0.20
23	0.13	0.14	0.14	0.15	0.16	0.17
22	0.12	0.12	0.13	0.13	0.13	0.14
21	0.11	0.11	0.11	0.11	0.11	0.11
20	0.10	0.10	0.10	0.10	0.09	0.09
19	0.09	0.08	0.08	0.08	0.08	0.07
18	0.08	0.07	0.07	0.07	0.06	0.06
17	0.07	0.06	0.06	0.06	0.05	0.05
16	0.06	0.06	0.06	0.06	U	U
15	0.05	0.05	0.05	U	U	U

Area of Reinforcing (in²/LF Wall)
Width of Brick = 5.5
f'm = 3,500
Wind Pressure or EQ = 20 psf

HT = FT P = lbs. per lineal foot

HT \ P	0	500	750	1000	1500	2000
25	0.22	0.22	0.22	0.22	0.22	0.22
24	0.20	0.21	0.22	0.22	0.22	0.22
23	0.18	0.19	0.20	0.21	0.22	0.22
22	0.16	0.17	0.17	0.18	0.20	0.22
21	0.15	0.15	0.15	0.16	0.18	0.19
20	0.13	0.14	0.15	0.16	0.17	0.19
19	0.12	0.13	0.12	0.14	0.15	0.16
18	0.10	0.11	0.11	0.12	0.13	0.14
17	0.09	0.10	0.09	0.10	0.11	0.12
16	0.08	0.08	0.09	0.08	0.10	0.11
15	0.07	0.07	0.07	0.08	0.08	0.09
14	0.06	0.06	0.06	0.07	0.07	0.07
13	0.05	0.05	0.06	0.06	0.07	0.07

Area of Reinforcing (in²/LF Wall)
Width of Brick = 5.5
f'm = 3,500
Wind Pressure or EQ = 25 psf

HT = FT P = lbs. per lineal foot

HT \ P	0	500	750	1000	1500	2000
23	0.23	0.23	0.23	0.23	0.23	0.23
22	0.20	0.22	0.23	0.23	0.23	0.23
21	0.18	0.19	0.20	0.21	0.23	0.23
20	0.16	0.17	0.17	0.18	0.20	0.21
19	0.15	0.16	0.16	0.16	0.19	0.19
18	0.13	0.14	0.14	0.15	0.16	0.17
17	0.11	0.12	0.12	0.13	0.14	0.15
16	0.10	0.10	0.11	0.11	0.12	0.13
15	0.09	0.09	0.09	0.10	0.10	0.11
14	0.08	0.08	0.08	0.08	0.09	0.10
13	0.06	0.07	0.07	0.07	0.07	0.08
12	0.05	0.06	0.06	0.06	0.06	0.07

Area of Reinforcing (in²/LF Wall)
Width of Brick = 5.5
f'm = 3,500
Wind Pressure or EQ = 30 psf

HT = FT P = lbs. per lineal foot

HT \ P	0	500	750	1000	1500	2000
22	O	O	O	O	O	O
21	0.47	0.47	0.47	0.47	0.47	0.47
20	0.30	0.30	0.30	0.30	0.30	0.30
19	0.30	0.30	0.30	0.30	0.30	0.30
18	0.23	0.23	0.23	0.23	0.23	0.23
17	0.23	0.23	0.23	0.23	0.23	0.23
16	0.22	0.22	0.22	0.22	0.22	0.22
15	0.17	0.17	0.17	0.17	0.17	0.17
14	0.16	0.16	0.16	0.16	0.16	0.16
13	0.13	0.13	0.13	0.13	0.13	0.13
12	0.10	0.10	0.10	0.10	0.10	0.10
11	0.09	0.09	0.09	0.09	0.09	0.09
10	0.08	0.08	0.08	0.08	0.08	0.08

Area of Reinforcing (in²/LF Wall)
Width of Brick = 5.5
f'm = 3,500
Wind Pressure or EQ = 35 psf

HT = FT P = lbs. per lineal foot

HT \ P	0	500	750	1000	1500	2000
20	O	O	O	O	O	O
19	0.47	0.47	0.47	0.47	0.47	0.47
18	0.30	0.30	0.30	0.30	0.30	0.30
17	0.30	0.30	0.30	0.30	0.30	0.30
16	0.23	0.23	0.23	0.23	0.23	0.23
15	0.22	0.22	0.22	0.22	0.22	0.22
14	0.17	0.17	0.17	0.17	0.17	0.17
13	0.16	0.16	0.16	0.16	0.16	0.16
12	0.13	0.13	0.13	0.13	0.13	0.13
11	0.10	0.10	0.10	0.10	0.10	0.10
10	0.09	0.09	0.09	0.09	0.09	0.09

Area of Reinforcing (in²/LF Wall)
Width of Brick = 5.5
f'm = 4,000
Wind Pressure or EQ = 15 psf

HT = FT P = lbs. per lineal foot

HT \ P	0	500	750	1000	1500	2000
28	0.23	0.26	0.27	0.29	0.34	0.47
27	0.21	0.23	0.24	0.27	0.30	0.34
26	0.19	0.21	0.22	0.23	0.27	0.30
25	0.17	0.20	0.19	0.20	0.23	0.27
24	0.16	0.18	0.18	0.18	0.22	0.22
23	0.15	0.16	0.17	0.18	0.20	0.21
22	0.13	0.14	0.15	0.16	0.18	0.20
21	0.12	0.13	0.13	0.14	0.15	0.17
20	0.11	0.11	0.12	0.13	0.14	0.16
19	0.09	0.10	0.10	0.11	0.12	0.13
18	0.08	0.09	0.09	0.09	0.10	0.11
17	0.07	0.08	0.08	0.08	0.08	0.09
16	0.06	0.07	0.07	0.07	0.07	0.08
15	0.05	0.06	0.06	0.06	0.06	0.07
14	0.05	0.05	0.05	0.05	0.05	0.06

Area of Reinforcing (in²/LF Wall)
Width of Brick = 5.5
f'm = 4,000
Wind Pressure or EQ = 20 psf

HT = FT P = lbs. per lineal foot

HT \ P	0	500	750	1000	1500	2000
26	0.23	0.26	0.47	0.47	0.47	0.47
25	0.21	0.23	0.24	0.25	0.28	0.47
24	0.19	0.20	0.22	0.23	0.25	0.27
23	0.17	0.18	0.19	0.20	0.22	0.24
22	0.16	0.16	0.17	0.18	0.19	0.22
21	0.14	0.16	0.16	0.17	0.17	0.17
20	0.13	0.14	0.15	0.16	0.17	0.18
19	0.11	0.12	0.12	0.13	0.14	0.16
18	0.10	0.10	0.11	0.11	0.13	0.14
17	0.09	0.10	0.10	0.10	0.11	0.12
16	0.08	0.08	0.08	0.08	0.09	0.10
15	0.07	0.07	0.07	0.07	0.08	0.08
14	0.06	0.06	0.06	0.07	0.07	0.08
13	0.05	0.05	0.05	0.06	0.06	0.07

Area of Reinforcing (in²/LF Wall)
Width of Brick = 5.5
f'm = 4,000
Wind Pressure or EQ = 25 psf

HT = FT P = lbs. per lineal foot

HT \ P	0	500	750	1000	1500	2000
23	0.22	0.23	0.25	0.26	0.28	0.31
22	0.20	0.21	0.22	0.23	0.25	0.27
21	0.18	0.18	0.19	0.20	0.21	0.24
20	0.16	0.18	0.16	0.17	0.19	0.20
19	0.14	0.16	0.16	0.17	0.18	0.20
18	0.13	0.13	0.14	0.15	0.16	0.18
17	0.11	0.12	0.12	0.13	0.14	0.15
16	0.10	0.10	0.11	0.11	0.12	0.13
15	0.08	0.09	0.09	0.10	0.10	0.11
14	0.07	0.07	0.08	0.08	0.09	0.10
13	0.06	0.06	0.07	0.07	0.08	0.09
12	0.06	0.06	0.06	0.06	0.07	0.08

O Indicates reinforcement is over the limit.
U Indicates reinforcement is under the limit.
HT Indicates height in feet.
*Shaded portions require solid grouting

Tables are Continued on Page 8 of this Brochure.

SLENDER WALL TABLES (Continued from page 7)

Area of Reinforcing (in²/LF Wall)
Width of Brick = 5.5
f'm = 4,000
Wind Pressure or EQ = 30 psf

HT = FT P = lbs. per lineal foot

HT \ P	0	500	750	1000	1500	2000
22	0.47	0.47	0.47	0.47	0.47	0.47
21	0.33	0.33	0.33	0.33	0.33	0.33
20	0.30	0.30	0.30	0.30	0.30	0.30
19	0.30	0.30	0.30	0.30	0.30	0.30
18	0.23	0.23	0.23	0.23	0.23	0.23
17	0.22	0.22	0.22	0.22	0.22	0.22
16	0.22	0.22	0.22	0.22	0.22	0.22
15	0.17	0.17	0.17	0.17	0.17	0.17
14	0.16	0.16	0.16	0.16	0.16	0.16
13	0.13	0.13	0.13	0.13	0.13	0.13
12	0.10	0.10	0.10	0.10	0.10	0.10
11	0.09	0.09	0.09	0.09	0.09	0.09
10	0.08	0.08	0.08	0.08	0.08	0.08

Area of Reinforcing (in²/LF Wall)
Width of Brick = 5.5
f'm = 4,000
Wind Pressure or EQ = 35 psf

HT = FT P = lbs. per lineal foot

HT \ P	0	500	750	1000	1500	2000
20	0.47	0.47	0.47	0.47	0.47	0.47
19	0.33	0.33	0.33	0.33	0.33	0.33
18	0.30	0.30	0.30	0.30	0.30	0.30
17	0.30	0.30	0.30	0.30	0.30	0.30
16	0.23	0.23	0.23	0.23	0.23	0.23
15	0.22	0.22	0.22	0.22	0.22	0.22
14	0.17	0.17	0.17	0.17	0.17	0.17
13	0.16	0.16	0.16	0.16	0.16	0.16
12	0.13	0.13	0.13	0.13	0.13	0.13
11	0.10	0.10	0.10	0.10	0.10	0.10
10	0.09	0.09	0.09	0.09	0.09	0.09

Area of Reinforcing (in²/LF Wall)
Width of Brick = 7.5
f'm = 3,500
Wind Pressure or EQ = 15 psf

HT = FT P = lbs. per lineal foot

HT \ P	0	500	750	1000	1500	2000
38	0.30	0.33	0.34	0.35	0.38	0.41
37	0.28	0.30	0.30	0.31	0.34	0.37
36	0.26	0.27	0.28	0.28	0.30	0.32
35	0.24	0.24	0.25	0.25	0.26	0.27
34	0.22	0.22	0.22	0.23	0.23	0.23
33	0.20	0.20	0.20	0.20	0.20	0.20
32	0.18	0.18	0.18	0.18	0.18	0.24
31	0.17	0.19	0.20	0.20	0.21	0.22
30	0.17	0.17	0.18	0.18	0.19	0.19
29	0.16	0.16	0.16	0.16	0.17	0.17
28	0.14	0.15	0.15	0.15	0.15	0.15
27	0.13	0.13	0.13	0.13	0.13	0.13
26	0.12	0.12	0.12	0.12	0.12	0.12
25	0.11	0.11	0.11	0.11	0.10	0.10
24	0.10	0.10	0.10	0.09	0.09	0.08
23	0.09	0.09	0.08	0.08	0.08	0.07
22	0.08	0.08	0.07	0.07	0.07	0.06
21	0.07	0.07	0.06	0.06	0.6	U
20	0.06	0.06	U	U	U	U

Area of Reinforcing (in²/LF Wall)
Width of Brick = 7.5
f'm = 3,500
Wind Pressure or EQ = 20 psf

HT = FT P = lbs. per lineal foot

HT \ P	0	500	750	1000	1500	2000
34	0.31	0.32	0.33	0.33	0.35	0.37
33	0.28	0.29	0.30	0.30	0.31	0.33
32	0.26	0.27	0.27	0.27	0.28	0.29
31	0.24	0.24	0.24	0.25	0.25	0.25
30	0.22	0.22	0.23	0.22	0.22	0.22
29	0.20	0.20	0.20	0.20	0.20	0.24
28	0.19	0.20	0.20	0.20	0.21	0.22
27	0.18	0.18	0.18	0.18	0.19	0.19
26	0.16	0.16	0.17	0.17	0.17	0.17
25	0.15	0.15	0.15	0.15	0.15	0.15
24	0.14	0.14	0.14	0.13	0.13	0.13
23	0.12	0.12	0.12	0.12	0.12	0.12
22	0.11	0.11	0.11	0.11	0.10	0.10
21	0.10	0.10	0.10	0.09	0.09	0.08
20	0.09	0.09	0.08	0.08	0.08	0.07
19	0.08	0.08	0.07	0.07	0.07	0.06
18	0.07	0.07	0.06	0.06	0.06	U
17	0.06	0.06	U	U	U	U

Area of Reinforcing (in²/LF Wall)
Width of Brick = 7.5
f'm = 3,500
Wind Pressure or EQ = 25 psf

HT = FT P = lbs. per lineal foot

HT \ P	0	500	750	1000	1500	2000
32	0.47	0.35	0.35	0.36	0.37	0.39
31	0.31	0.32	0.32	0.32	0.34	0.35
30	0.28	0.29	0.29	0.29	0.30	0.31
29	0.26	0.26	0.27	0.27	0.27	0.27
28	0.24	0.24	0.24	0.24	0.24	0.24
27	0.22	0.22	0.22	0.22	0.22	0.22
26	0.20	0.21	0.21	0.21	0.22	0.22
25	0.19	0.19	0.19	0.19	0.20	0.20
24	0.17	0.17	0.17	0.17	0.17	0.18
23	0.16	0.16	0.16	0.16	0.16	0.16
22	0.14	0.14	0.14	0.14	0.14	0.14
21	0.13	0.13	0.12	0.12	0.12	0.12
20	0.11	0.11	0.11	0.11	0.11	0.10
19	0.10	0.10	0.10	0.10	0.09	0.09
18	0.09	0.09	0.08	0.08	0.08	0.07
17	0.08	0.08	0.07	0.07	0.07	0.06
16	0.07	0.07	0.06	0.06	0.06	U
15	0.06	0.06	0.06	U	U	U

Area of Reinforcing (in²/LF Wall)
Width of Brick = 7.5
f'm = 3,500
Wind Pressure or EQ = 30 psf

HT = FT P = lbs. per lineal foot

HT \ P	0	500	750	1000	1500	2000
29	0.66	0.66	0.66	0.66	0.66	0.66
28	0.66	0.66	0.66	0.66	0.66	0.66
27	0.47	0.47	0.47	0.47	0.47	0.47
26	0.47	0.47	0.47	0.47	0.47	0.47
25	0.33	0.33	0.33	0.33	0.33	0.33
24	0.30	0.30	0.30	0.30	0.30	0.30
23	0.30	0.30	0.30	0.30	0.30	0.30
22	0.30	0.30	0.30	0.30	0.30	0.30
21	0.23	0.23	0.23	0.23	0.23	0.23
20	0.22	0.22	0.22	0.22	0.22	0.22
19	0.22	0.22	0.22	0.22	0.22	0.22
18	0.17	0.17	0.17	0.17	0.17	0.17
17	0.16	0.16	0.16	0.16	0.16	0.16
16	0.13	0.13	0.13	0.13	0.13	0.13
15	0.12	0.12	0.12	0.12	0.12	0.12
14	0.10	0.10	0.10	0.10	0.10	0.10
13	0.09	0.09	0.09	0.09	0.09	0.09
12	0.08	0.08	0.08	0.08	0.08	0.08
11	0.06	0.06	0.06	0.06	0.06	0.06
10	0.05	0.05	0.05	0.05	0.05	0.05

Area of Reinforcing (in²/LF Wall)
Width of Brick = 7.5
f'm = 3,500
Wind Pressure or EQ = 35 psf

HT = FT P = lbs. per lineal foot

HT \ P	0	500	750	1000	1500	2000
27	0.66	0.66	0.66	0.66	0.66	0.66
26	0.66	0.66	0.66	0.66	0.66	0.66
25	0.47	0.47	0.47	0.47	0.47	0.47
24	0.47	0.47	0.47	0.47	0.47	0.47
23	0.33	0.33	0.33	0.33	0.33	0.33
22	0.30	0.30	0.30	0.30	0.30	0.30
21	0.30	0.30	0.30	0.30	0.30	0.30
20	0.30	0.30	0.30	0.30	0.30	0.30
19	0.22	0.22	0.22	0.22	0.22	0.22
18	0.22	0.22	0.22	0.22	0.22	0.22
17	0.22	0.22	0.22	0.22	0.22	0.22
16	0.16	0.16	0.16	0.16	0.16	0.16
15	0.16	0.16	0.16	0.16	0.16	0.16
14	0.12	0.12	0.12	0.12	0.12	0.12
13	0.10	0.10	0.10	0.10	0.10	0.10
12	0.09	0.09	0.09	0.09	0.09	0.09
11	0.08	0.08	0.08	0.08	0.08	0.08
10	0.06	0.06	0.06	0.06	0.06	0.06

O Indicates reinforcement is over the limit.
U Indicates reinforcement is under the limit.
HT Indicates height in feet.

*Shaded portions require solid grouting

Tables are Continued on Page 9 of this Brochure.

SLENDER WALL TABLES (Continued from page 8)

Area of Reinforcing (in²/LF Wall)
Width of Brick = 7.5
f'm = 4,000
Wind Pressure or EQ = 15 psf

HT = FT P = lbs. per lineal foot

HT \ P	0	500	750	1000	1500	2000
39	0.32	0.34	0.35	0.36	0.39	0.42
38	0.29	0.31	0.32	0.33	0.35	0.37
37	0.27	0.28	0.29	0.29	0.31	0.33
36	0.25	0.26	0.26	0.27	0.27	0.29
35	0.23	0.23	0.24	0.24	0.24	0.25
34	0.21	0.21	0.21	0.21	0.21	0.21
33	0.19	0.19	0.19	0.19	0.19	0.26
32	0.18	0.20	0.21	0.21	0.22	0.23
31	0.18	0.19	0.19	0.20	0.20	0.21
30	0.17	0.17	0.17	0.18	0.18	0.18
29	0.15	0.16	0.16	0.16	0.16	0.16
28	0.14	0.14	0.14	0.14	0.14	0.14
27	0.13	0.13	0.13	0.13	0.13	0.13
26	0.12	0.12	0.12	0.12	0.11	0.11
25	0.11	0.11	0.10	0.10	0.10	0.09
24	0.10	0.10	0.09	0.09	0.09	0.08
23	0.09	0.09	0.08	0.08	0.07	0.07
22	0.08	0.08	0.07	0.07	0.07	0.06
21	0.07	0.07	0.07	0.06	0.06	U
20	0.07	0.06	0.06	U	U	U
19	0.06	U	U	U	U	U

Area of Reinforcing (in²/LF Wall)
Width of Brick = 7.5
f'm = 4,000
Wind Pressure or EQ = 20 psf

HT = FT P = lbs. per lineal foot

HT \ P	0	500	750	1000	1500	2000
35	0.32	0.33	0.34	0.35	0.37	0.39
34	0.30	0.31	0.31	0.32	0.33	0.35
33	0.27	0.28	0.28	0.29	0.30	0.31
32	0.25	0.26	0.26	0.26	0.27	0.27
31	0.23	0.24	0.24	0.24	0.24	0.24
30	0.22	0.22	0.22	0.22	0.21	0.22
29	0.20	0.21	0.22	0.22	0.23	0.23
28	0.19	0.19	0.20	0.20	0.21	0.21
27	0.18	0.18	0.18	0.18	0.18	0.19
26	0.16	0.16	0.16	0.16	0.17	0.17
25	0.15	0.15	0.15	0.15	0.15	0.15
24	0.13	0.13	0.13	0.13	0.13	0.13
23	0.12	0.12	0.12	0.12	0.12	0.11
22	0.11	0.11	0.11	0.10	0.10	0.10
21	0.10	0.10	0.09	0.09	0.09	0.08
20	0.09	0.08	0.08	0.08	0.07	0.07
19	0.08	0.08	0.07	0.07	0.07	0.06
18	0.07	0.07	0.06	0.06	0.06	U

Area of Reinforcing (in²/LF Wall)
Width of Brick = 7.5
f'm = 4,000
Wind Pressure or EQ = 25 psf

HT = FT P = lbs. per lineal foot

HT \ P	0	500	750	1000	1500	2000
33	0.47	0.36	0.37	0.38	0.39	0.41
32	0.33	0.33	0.34	0.34	0.36	0.37
31	0.30	0.31	0.31	0.31	0.32	0.33
30	0.28	0.28	0.28	0.29	0.29	0.29
29	0.26	0.26	0.26	0.27	0.26	0.26
28	0.23	0.23	0.23	0.26	0.23	0.24
27	0.21	0.23	0.23	0.23	0.24	0.24
26	0.20	0.21	0.21	0.21	0.21	0.22
25	0.19	0.19	0.19	0.19	0.19	0.19
24	0.17	0.17	0.17	0.17	0.17	0.17
23	0.15	0.15	0.15	0.15	0.15	0.15
22	0.14	0.14	0.14	0.14	0.14	0.13
21	0.13	0.12	0.12	0.12	0.12	0.12
20	0.11	0.11	0.11	0.11	0.10	0.10
19	0.10	0.10	0.10	0.09	0.09	0.08
18	0.09	0.09	0.08	0.08	0.08	0.07
17	0.08	0.08	0.07	0.07	0.07	0.06
16	0.07	0.07	0.06	0.06	0.06	U

Area of Reinforcing (in²/LF Wall)
Width of Brick = 7.5
f'm = 4,000
Wind Pressure or EQ = 30 psf

HT = FT P = lbs. per lineal foot

HT \ P	0	500	750	1000	1500	2000
30	0.66	0.66	0.66	0.66	0.66	0.66
29	0.47	0.47	0.47	0.47	0.47	0.47
28	0.47	0.47	0.47	0.47	0.47	0.47
27	0.47	0.47	0.47	0.47	0.47	0.47
26	0.47	0.47	0.47	0.47	0.47	0.47
25	0.33	0.33	0.33	0.33	0.33	0.33
24	0.30	0.30	0.30	0.30	0.30	0.30
23	0.30	0.30	0.30	0.30	0.30	0.30
22	0.30	0.30	0.30	0.30	0.30	0.30
21	0.23	0.23	0.23	0.23	0.23	0.23
20	0.22	0.22	0.22	0.22	0.22	0.22
19	0.22	0.22	0.22	0.22	0.22	0.22
18	0.17	0.17	0.17	0.17	0.17	0.17
17	0.16	0.16	0.16	0.16	0.16	0.16
16	0.13	0.13	0.13	0.13	0.13	0.13
15	0.12	0.12	0.12	0.12	0.12	0.12
14	0.10	0.10	0.10	0.10	0.10	0.10
13	0.09	0.09	0.09	0.09	0.09	0.09
12	0.08	0.08	0.08	0.08	0.08	0.08
11	0.06	0.06	0.06	0.06	0.06	0.06
10	0.05	0.05	0.05	0.05	0.05	0.05

Area of Reinforcing (in²/LF Wall)
Width of Brick = 7.5
f'm = 4,000
Wind Pressure or EQ = 35 psf

HT = FT P = lbs. per lineal foot

HT \ P	0	500	750	1000	1500	2000
28	0.66	0.66	0.66	0.66	0.66	0.66
27	0.66	0.66	0.66	0.66	0.66	0.66
26	0.47	0.47	0.47	0.47	0.47	0.47
25	0.47	0.47	0.47	0.47	0.47	0.47
24	0.47	0.47	0.47	0.47	0.47	0.47
23	0.33	0.33	0.33	0.33	0.33	0.33
22	0.30	0.30	0.30	0.30	0.30	0.30
21	0.30	0.30	0.30	0.30	0.30	0.30
20	0.30	0.30	0.30	0.30	0.30	0.30
19	0.22	0.22	0.22	0.22	0.22	0.22
18	0.22	0.22	0.22	0.22	0.22	0.22
17	0.22	0.22	0.22	0.22	0.22	0.22
16	0.16	0.16	0.16	0.16	0.16	0.16
15	0.13	0.13	0.13	0.13	0.13	0.13
14	0.12	0.12	0.12	0.12	0.12	0.12
13	0.10	0.10	0.10	0.10	0.10	0.10
12	0.09	0.09	0.09	0.09	0.09	0.09
11	0.08	0.08	0.08	0.08	0.08	0.08
10	0.06	0.06	0.06	0.06	0.06	0.06

O Indicates reinforcement is over the limit.
U Indicates reinforcement is under the limit.
HT Indicates height in feet.

*Shaded portions require solid grouting

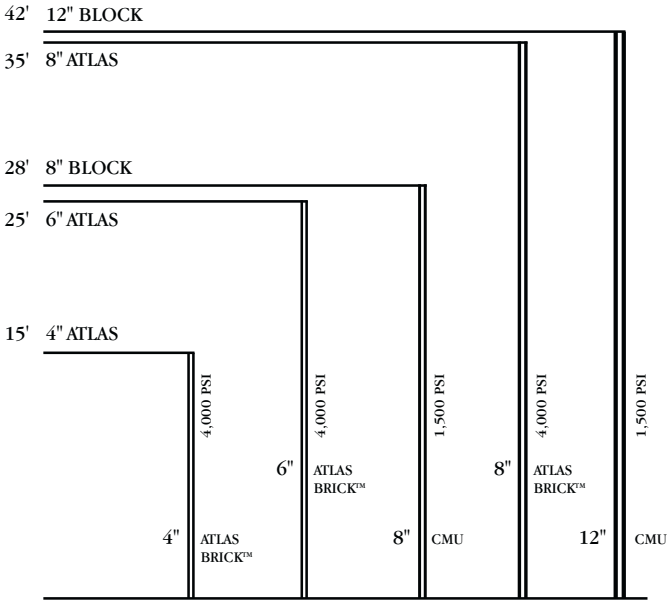
Comparison of Strength and Allowable Heights of Masonry Walls

Using Slender Wall Design Method

Chart One

ROOFLOAD WITHOUT SNOW

Roof Load = 750 lbs per lineal foot For Wind Load = 85MPH - EXP B - CAT 1

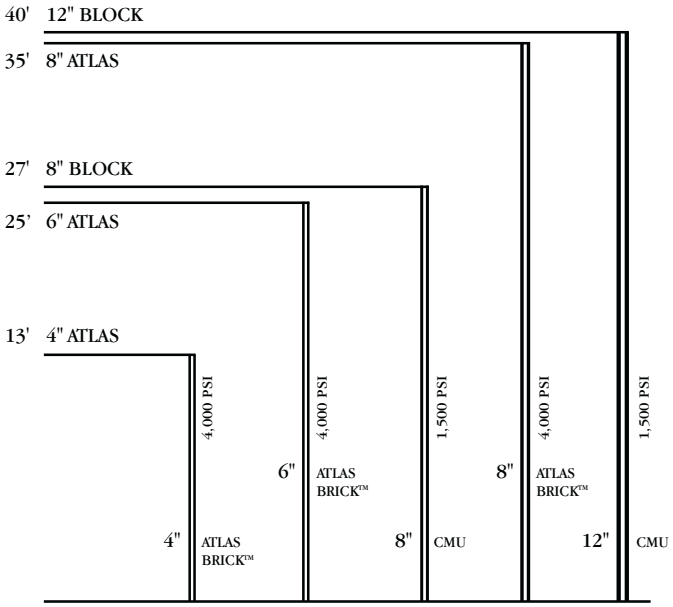


ALLOWABLE HEIGHTS OF MASONRY WALL FOR A WAREHOUSE

Chart One

ROOFLOAD WITHOUT SNOW

Roof Load = 1,500 lbs per lineal foot For Wind Load = 85MPH - EXP B - CAT 1

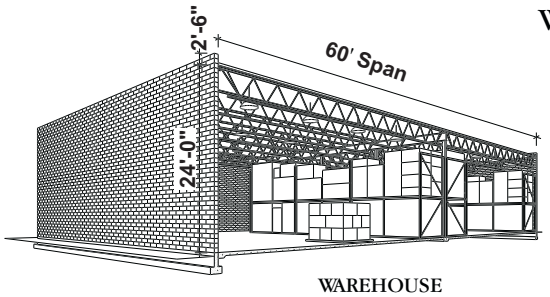


ALLOWABLE HEIGHTS OF MASONRY WALL FOR A WAREHOUSE

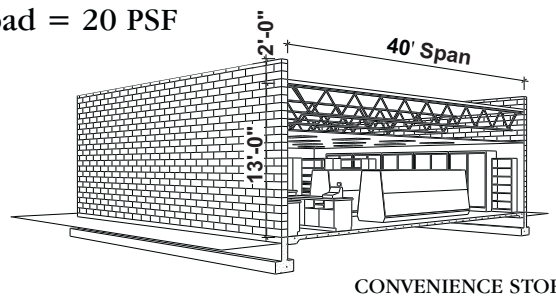
Building Comparison of Suitable Walls

Using Working Stress Design Method

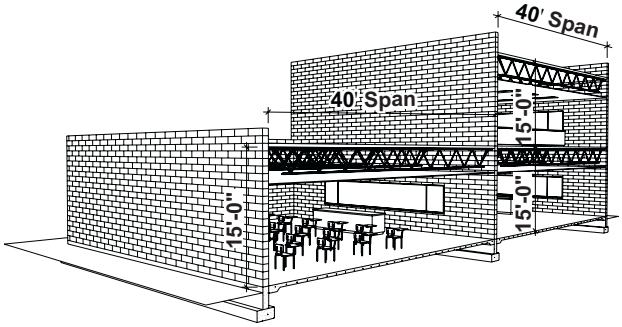
Wind Load = 20 PSF



WAREHOUSE
Roof load = 50 PSF
Wall thickness required:
Atlas = 8" @ 4,000 PSI
CMU = 8" @ 1,500 PSI (Not Adequate)



CONVENIENCE STORE
Roof load = 50 PSF
Wall thickness required:
Atlas = 6" @ 4,000 PSI
CMU = 8" @ 1,500 PSI



SCHOOL
Roof load = 60 PSF
Floor Load = 100 PSF

Wall thickness required:	①	②	③
Atlas = @ 4,000 PSI	6"	6"	6"
CMU = @ 1,500 PSI	8"	8"	12 "

Atlas Brick Beam Tables

One of the greatest advantages of Atlas Brick is its value when designing and constructing masonry beams and lintels. Atlas Brick when designed as a reinforced masonry beam eliminates the need for additional backup, steel ledgers and steel beams. Soffits are more easily detailed and constructed. Construction time is reduced and a more direct method of load transfer is provided.

The following charts are intended to be a preliminary design guide. The charts indicate the flexural capacity of the beam only; the shear and deflection requirements must also be investigated. To use the following tables, the designer must first calculate the applied bending moment acting on the beam. Once the bending moment is known, the designer can choose the appropriate beam thickness and f'm from the chart and determine the required depth of beam (d) and area of steel (As).

Moment Capacity Beam Tables (K-FT)

6" ATLAS BRICK f'm = 3,000 PSI

	As (in²)					
d (in.)	0.4	0.6	0.8	0.9	1.0	1.2
10	7.05	8.32	9.06	9.37	9.64	10.11
14	10.03	14.63	16.06	16.65	17.19	18.11
18	13.05	19.21	24.48	25.44	26.31	27.83
22	16.08	23.70	31.16	34.84	36.85	39.08
26	19.13	28.22	37.14	41.54	45.90	51.72
30	22.19	32.77	43.14	48.27	53.35	63.43
34	25.26	37.33	49.17	55.02	60.84	72.35
38	28.33	41.90	55.22	61.81	68.35	81.31
42	31.42	46.48	61.29	68.61	75.89	90.31

8" ATLAS BRICK f'm = 3,000 PSI

	As (in²)					
d (in.)	0.4	0.6	0.8	0.9	1.0	1.2
10	7.16	10.25	11.24	11.65	12.02	12.67
14	10.17	14.98	19.68	20.55	21.26	22.51
18	13.21	19.49	25.63	28.67	31.68	34.38
22	16.27	24.03	31.63	35.39	39.12	46.50
26	19.34	28.51	37.67	42.15	46.61	55.44
30	22.42	33.17	43.73	48.95	54.13	64.41
34	25.51	37.76	49.81	55.77	61.69	73.43
38	28.60	42.36	55.91	62.61	69.27	82.48
42	31.70	46.98	62.02	69.47	76.87	91.56

6" ATLAS BRICK f'm = 3,500 PSI

	As (in²)					
d (in.)	0.4	0.6	0.8	0.9	1.0	1.2
10	7.10	9.25	10.11	10.46	10.78	11.33
14	10.11	14.87	17.84	18.52	19.14	20.22
18	13.13	19.35	25.44	28.22	29.22	30.97
22	16.18	23.87	31.40	35.12	38.81	43.38
26	19.24	28.41	37.41	41.85	46.26	55.00
30	22.31	32.97	43.44	48.62	53.75	63.93
34	25.39	37.55	49.50	55.41	61.28	72.91
38	28.47	42.14	55.57	62.22	68.82	81.91
42	31.56	46.74	61.67	69.05	76.39	90.95

8" ATLAS BRICK f'm = 3,500 PSI

	As (in²)					
d (in.)	0.4	0.6	0.8	0.9	1.0	1.2
10	7.21	10.60	12.49	12.97	13.40	14.14
14	10.24	15.09	19.84	22.18	23.59	25.03
18	13.29	19.62	25.83	28.89	31.93	37.96
22	16.36	24.18	31.85	35.65	39.41	46.88
26	19.44	28.76	37.91	42.44	46.94	55.86
30	22.52	33.35	44.00	49.27	54.50	64.88
34	25.62	37.96	50.10	56.11	62.09	73.84
38	28.72	42.58	56.22	62.98	69.70	83.03
42	31.83	47.20	62.36	69.86	77.30	92.14

6" ATLAS BRICK f'm = 4,000 PSI

	As (in²)					
d (in.)	0.4	0.6	0.8	0.9	1.0	1.2
10	7.15	10.11	11.09	11.50	11.86	12.49
14	10.17	14.97	19.54	20.28	20.98	22.20
18	13.20	19.47	25.61	28.64	31.64	33.93
22	16.26	24.01	31.60	35.36	39.08	46.46
26	19.33	28.57	37.63	42.12	46.57	55.38
30	22.41	33.14	43.69	48.91	54.09	64.35
34	25.49	37.73	49.77	55.72	61.64	73.37
38	28.58	42.33	55.86	62.56	69.21	82.41
42	33.23	46.95	61.98	69.42	76.81	91.48

8" ATLAS BRICK f'm = 4,000 PSI

	As (in²)					
d (in.)	0.4	0.6	0.8	0.9	1.0	1.2
10	7.25	10.67	13.67	14.20	14.69	15.54
14	10.29	15.18	19.97	22.34	24.69	27.40
18	13.35	19.73	25.98	29.08	32.14	38.22
22	16.43	24.30	32.04	35.86	39.66	47.19
26	19.52	28.29	38.12	42.68	47.21	56.20
30	22.61	33.50	44.22	49.53	54.80	65.76
34	25.71	38.12	50.34	56.40	62.42	74.36
38	28.82	42.75	56.48	63.29	70.05	83.48
42	31.93	47.39	62.64	70.19	77.70	97.21

NOTES:
1. Moments are calculated using working stress design.
2. Beams are assumed fully grouted.
3. Check shear and deflections for all beams. Tables reflect moment capacity only.
4. Moments to the right and above the solid line are controlled by masonry stress.
5. Ductility excess of beam may be reduced when masonry stress controls.
6. Fs is based on 24,000 PSI.

UNIT SPECIFICATIONS

Interstate Brick's 16 Atlas™ brick meets or exceeds the physical requirements of ASTM C652 specifications.

For our customers in Canada, Atlas™ brick meets or exceeds CAN3-A82.8-M78.

ASTM C652 is reproduced in part below:

ASTM C-652 (in part)

TABLE 1 Physical Requirements

Designation	Compressive Strength (Hollow Brick in Bearing Position) gross area, min, psi (MPa)		Water Absorption by 5-h Boiling, max, %		Saturation Coefficient, max	
	Average of 5 brick	Individual	Average of 5 brick	Individual	Average of 5 brick	Individual
Grade SW	3,000 (20.7)	2,500 (17.2)	17.0	20.0	0.78	0.80

TABLE 2 Tolerances on Dimension in. (mm)

Specified Dimensions	Permissible Variation, max	
	Type HBX	Type HBS and HBB
3 (76) and under	± 1/16 (1.58)	± 3/32 (2.38)
Over 3 to 4 (102), incl	± 3/32 (2.38)	± 1/8 (3.18)
Over 4 to 6 (152), incl	± 1/8 (3.18)	± 3/16 (4.76)
Over 6 to 8 (204), incl	± 5/32 (3.97)	± 1/4 (6.35)
Over 8 to 12 (306), incl	± 7/32 (5.56)	± 5/16 (7.94)
Over 12 to 16 (408), incl	± 9/32 (7.14)	± 3/8 (9.52)

TABLE 3 Tolerances on Distortion in. (mm)

Face Dimension	Permissible Distortion, max	
	Type HBX	Type HBS and HBB
8 (204) and under	± 1/16 (1.58)	± 3/32 (2.38)
Over 8 to 12 (306), incl	± 3/32 (2.38)	± 1/8 (3.18)
Over 12 to 16 (408), incl	± 1/8 (3.18)	± 5/32 (3.97)

Unless otherwise agreed upon by the purchaser and the seller, a delivery of brick shall contain not less than 95 percent whole brick. In these specifications the term whole brick shall be understood to mean the brick meeting the requirements of these specifications for chippage and tolerances.

TABLE 4 Maximum Permissible Range of Chippage That Extends from the Edges and Corners of the Finished Face or Faces Onto the Surface

Type	Percentage Allowed[A]	Chippage in in. (mm) in from		Percentage Allowed[A]	Chippage in in. (mm) in from	
		Edge	Corner		Edge	Corner
HBX	5% or less	1/8 to 1/4 (3.18 to 6.35)	1/4 to 3/8 (6.35 to 9.52)	95% to 100%	0 to 1/8 (0 to 3.18)	0 to 1/4 (0 to 0.35)
HBS[B](formed)	10% or less	1/4 to 5/16 (6.35 to 7.94)	3/8 to 1/2 (9.52 to 12.7)	90% to 100%	0 to 1/4 (0 to 6.35)	0 to 3/8 (0 to 9.52)
HBS[C](altered)	15% or less	5/16 to 7/16 (7.94 to 11.11)	1/2 to 3/4 (12.7 to 19.05)	85% to 100%	0 to 5/16 (0 to 7.94)	0 to 1/2 (0 to 12.7)
HBA and HBB						

A. The allowable percentage of brick that will be exposed in the wall having the allowed maximum size chips measured the listed maximum dimensions in from an edge or corner.

B. Formed units are extruded brick with an unbroken natural die finish face.

C. Altered units are extruded brick with the face sanded, combed, scratched, or broken by mechanical means such as wire-cutting or wire brushing, or are molded brick.

EXAMPLE— The units to be placed into the wall should be inspected prior to being placed. These HBS[B] units will then conform to the requirements of Table 4 if not more than 10% of the units have edge chips greater than 1/4 in. from the edge or 3/8 in. from the corner.

SPECIFICATION GUIDE

PART I — QUALITY ASSURANCE

A. Brick Tests:

1. All tests shall be performed by an independent certified testing laboratory.
2. All tests shall be in accordance with ASTM C67 latest edition.

B. Submittals:

1. Submit test report and certificate of conformance document for each type and color of brick specified on contract documents for architect's approval.
2. Test reports shall include:
    a. Compressive strength
    b. Modulus of rupture
    c. 24 hour cold water absorption
    d. 5 hour boil water absorption
    e. Saturation coefficient
    f. Initial rate of absorption
    g. Efflorescence
    h. Weather classification

C. Sample Panels:

1. Sample panel size shall be 4' x 6' showing the proposed color range, texture, bond, mortar, and workmanship.
2. Final brick selection shall be made only following architect's review of sample panel.
3. Brick from manufactured material for project shall be shipped to site and sample panel erected as noted in C.1.
4. No brick shall be shipped from manufacturer to site until the architect has accepted the panel erected from actual material for the project. This panel shall replace the panel noted in C.1., and remain on site throughout construction, and become the project standard for bond, mortar, workmanship, and appearance.
5. All the material shipped for the sample panel must be used in its entirety.

PART II — PRODUCTS

A. Hollow Brick:

1. All brick shown on contract documents shall be *color, texture* as manufactured by Interstate Brick Co., 9780 S. 5200 W, West Jordan, Utah 84081.
2. ASTM C652 latest edition, Grade SW, Type *HBS* or better.
3. Dimensions *width x height x length.*
4. Minimum net compressive strength *9,000 psi.*
5. Maximum saturation coefficient 0.78.
6. Minimum *IRA 5 g/30 sq. in.*
7. Maximum *IRA 30 g/30 sq. in.* where IRA exceeds 30g/30in^2 pre-wetting brick is recommended.
8. Shapes: where special shapes are shown on architectural drawings, manufacturer shall provide shop drawings for architects approval prior to manufacturing shapes.
9. All materials required for project shall be manufactured from clays.

B. Mortar: Mortar shall be Type S consisting by proportion: 1 part Portland Cement Type I or II Low Alkali (ASTM C150), 1/2 part hydrated lime (ASTM C207) 4 1/2 parts sand (ASTM C144).

C. Grout: Grout strength shall be greater than or equal to f'm.

PART III — EXECUTION

A. Bond: Bond shall be *running bond* unless otherwise shown on contract documents.

B. Jointing: Mortar joints shall be *concave* unless otherwise shown on contract documents.

C. Construction: All construction strictly adheres to part 3 of TMS 602.

D. Cleaning: Cleaning shall confirm to *BIA technical note #20* and Interstate Brick Technical Bulletin No. 4. Contact manufacturer for recommendations.

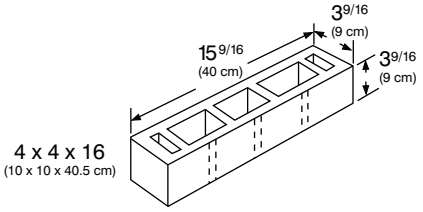
E. Water Repellent Coatings: Where water repellents are required, consult Interstate Brick Technical Bulletin No. 1 "Water Repellent Coatings."

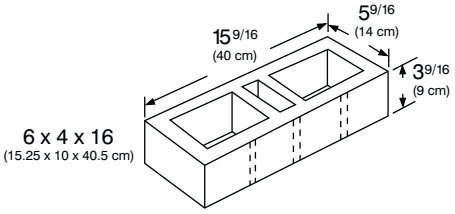
NOTE: Contact local distributor or manufacturer to discuss italicized items. Adjust per specific job and brick requirements.

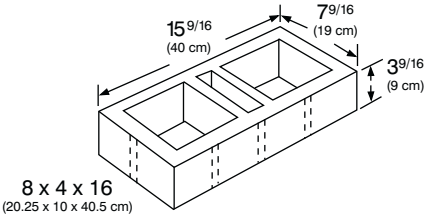
DETAILS

AVAILABLE SHAPES

Standard Units: (Finished on two sides - slotting optional shown dashed)

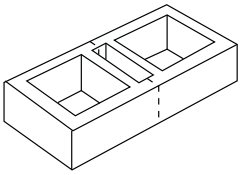




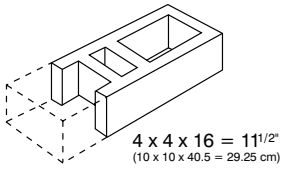


Standard shapes available upon request

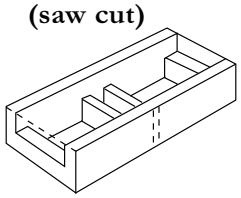
Knifed for halves



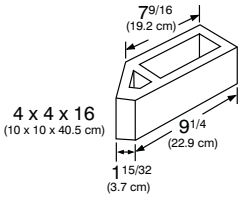
Corner unit (knifed/saw cut)

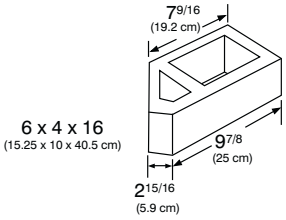


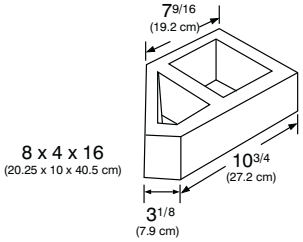
Bond Beam unit (saw cut)



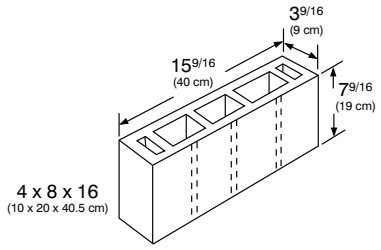
Forty-five degree flip-flop corner units

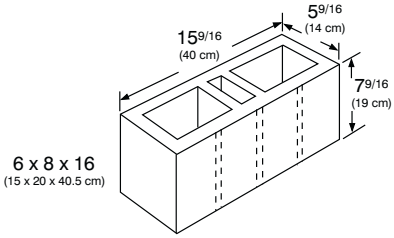


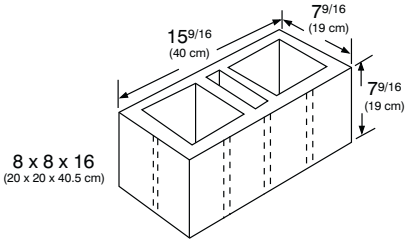




Super Atlas ™ units: (Finished on two sides - slotting optional shown dashed)

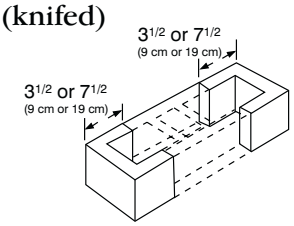




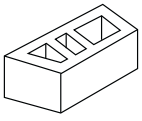


Special Shapes: (Available upon request)

Lintel Beam unit (knifed)

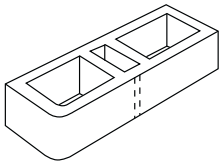


Angle unit*



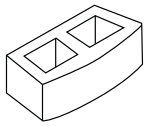
Length of face determined by angle cut. Cut to any angle on special request.

Bullnose



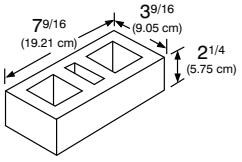
1" radius available also in double bullnose and double-end bullnose.

Radius brick*

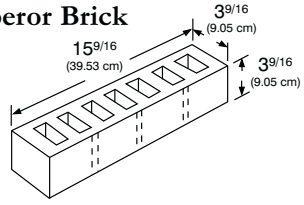


Contact Interstate Brick to confirm your radius requirements.

Reinforceable Modular Brick



3 1/2 Emperor Brick

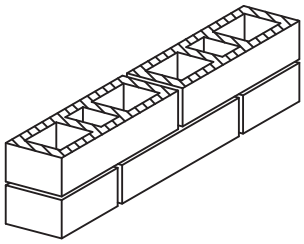


Note: Metric sizes rounded to nearest .25 cm

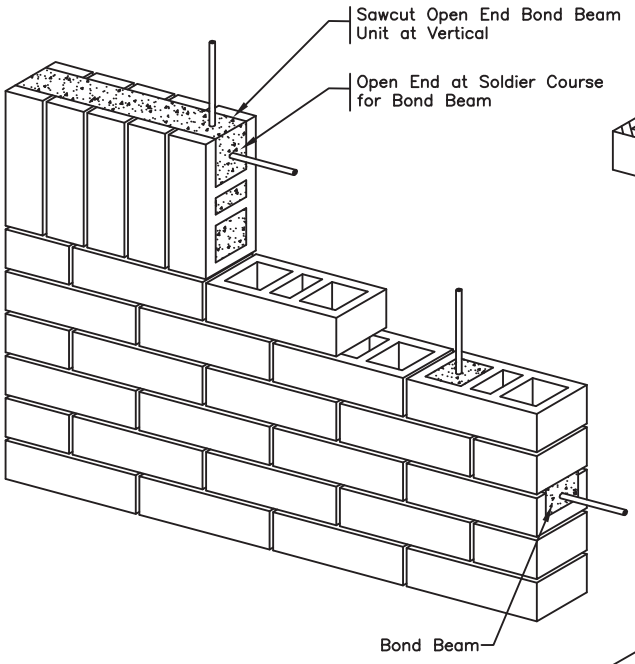
(For veneer or extra strong, double wythe construction. Finished one side.)

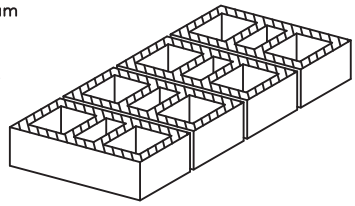
NOTE: Atlas™ bricks are selected for 2-face exposure. Additional information in pricing schedule for one-face exposure. All knifed units are to be broken out by customer.
*Pattern, size and shape may vary from that shown here. Most units available with one to seven slots. Slots shown dashed on units. Interstate is not limited to the shapes shown, but has provided drawings of the most commonly used shapes. Contact your local supplier or visit our website at www.interstatebrick.com for more information on available shapes.

Brick Orientation

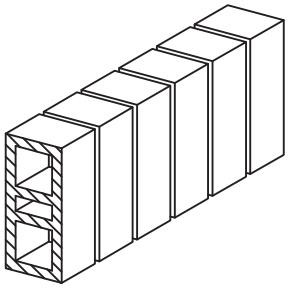


STRETCHER COURSE

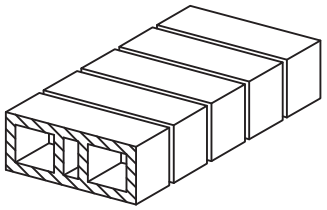




HEADER COURSE

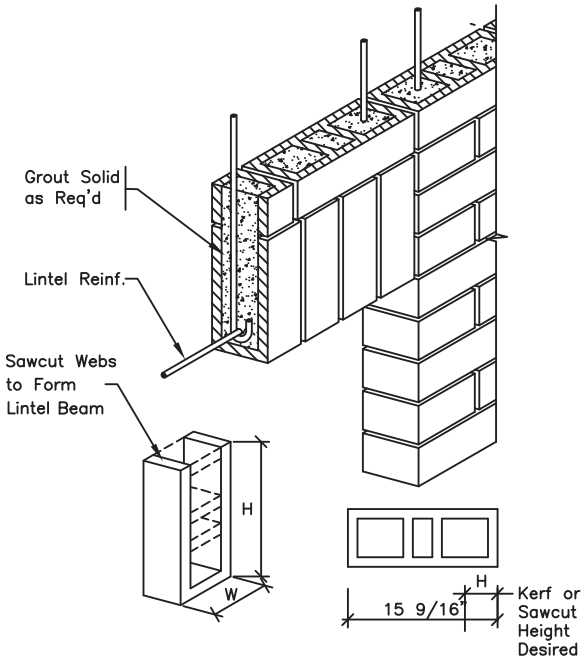


SOLDIER COURSE

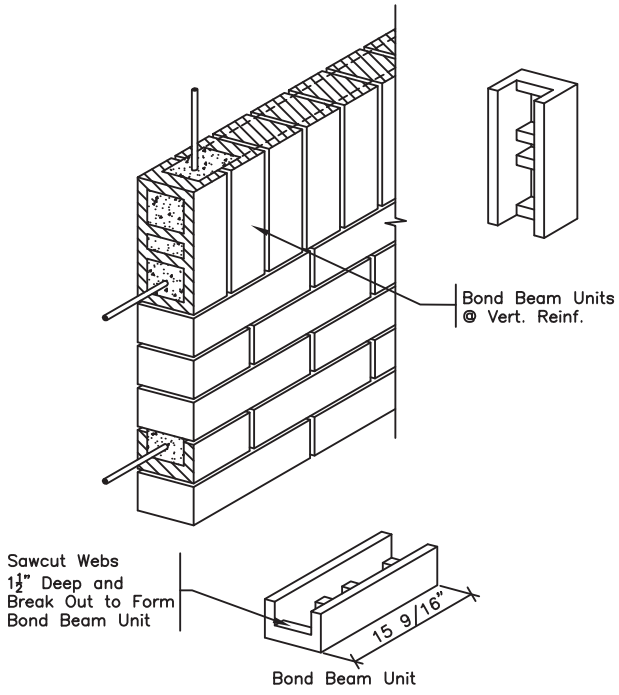


ROWLOCK COURSE

Special Reinforcing



LINTEL BEAM

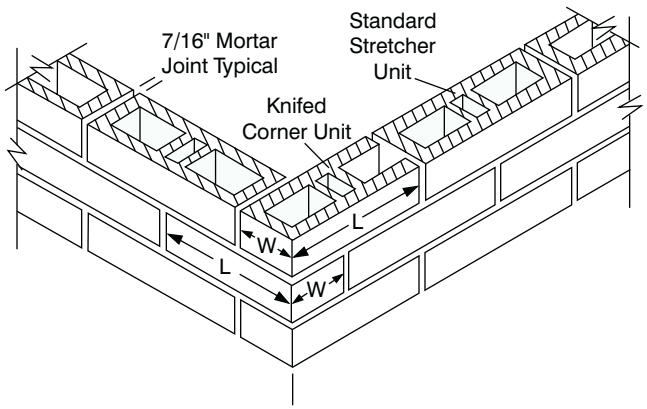


SOLDIER COURSE

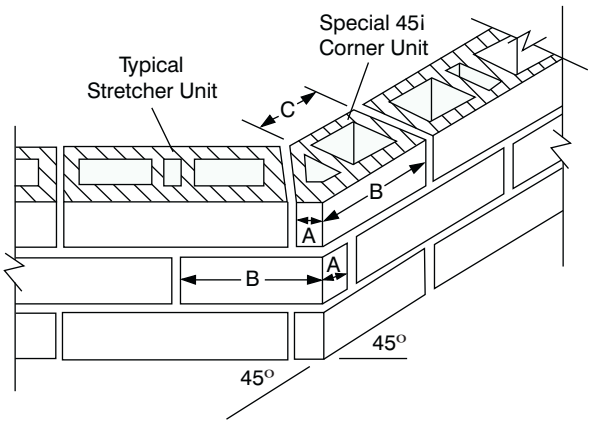
Corner Details

W (Wall Width)	L (Corner Unit Length)
3 9/16"	11 9/16"
5 9/16"	13 9/16"
7 9/16"	15 9/16" (Reg. Stretcher Unit, No Knifed Corner Req'd.)

W (Wall Width)	A	B	C
3 9/16"	1 1/4"	9 1/4"	7 9/16"
5 9/16"	2 1/16"	10 1/16"	7 9/16"
7 9/16"	2 7/8"	10 7/8"	7 9/16"

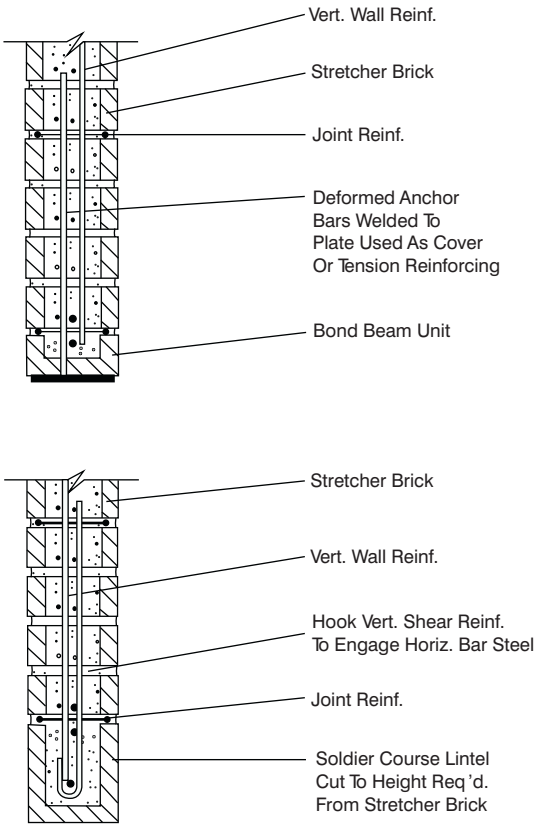


90° CORNER

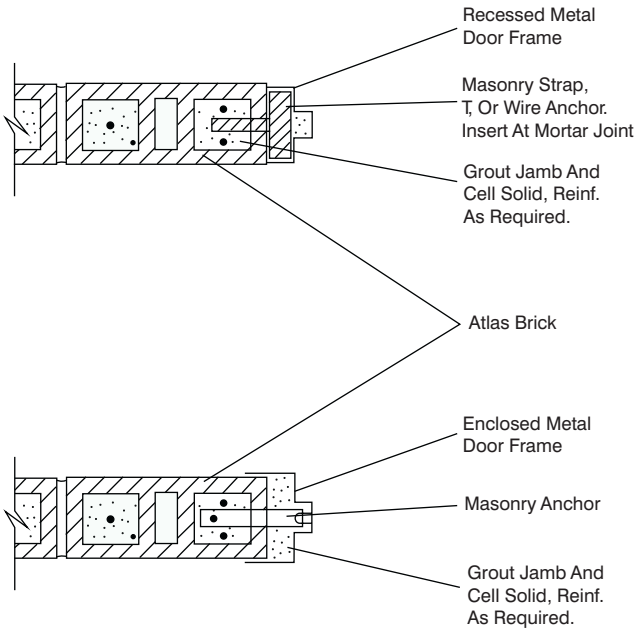


45° CORNER

Beam and Jamb Options

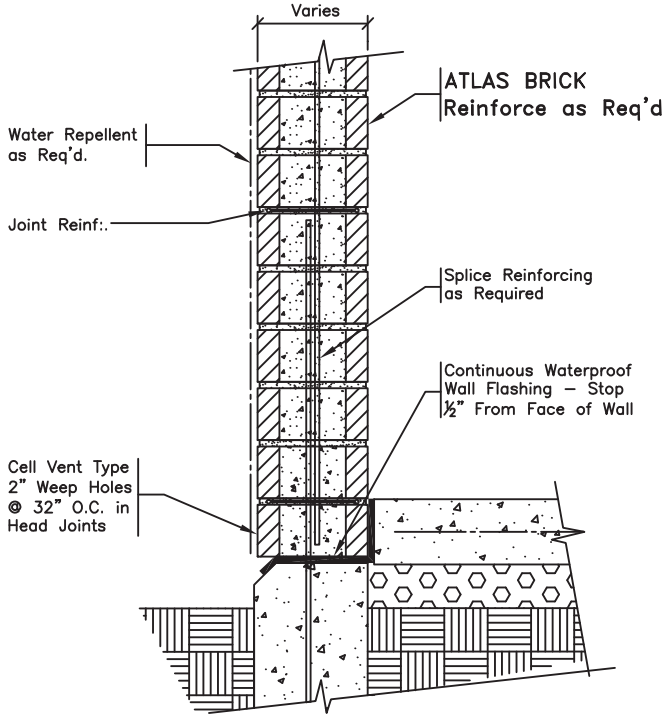


LINTEL BEAM OPTIONS

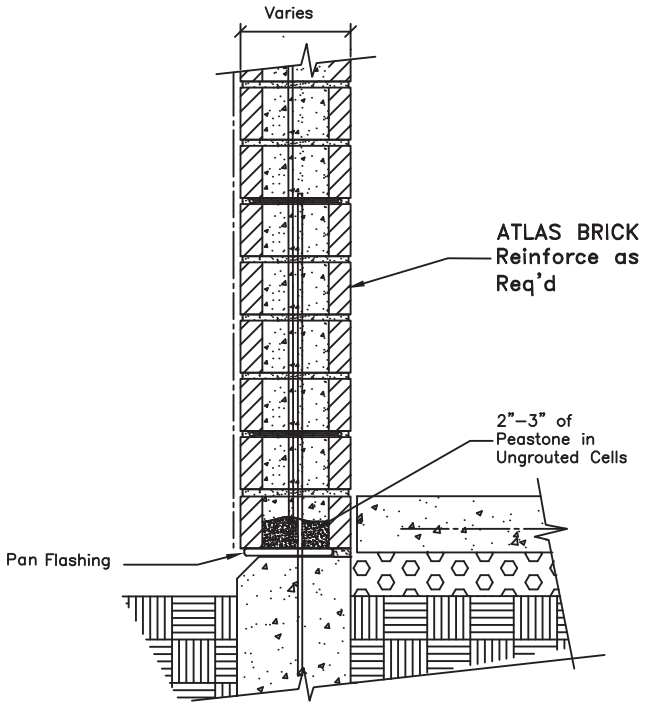


DOOR JAMB OPTIONS

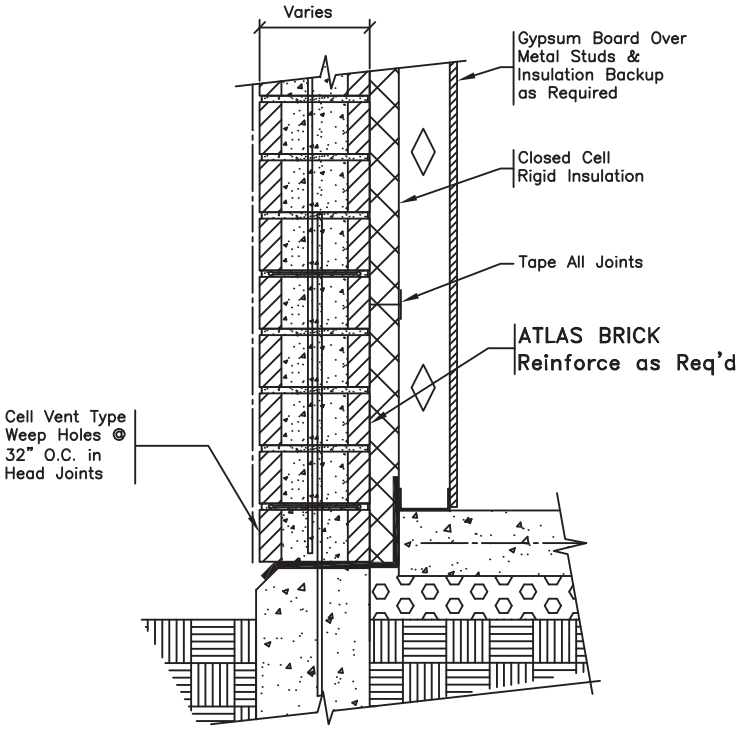
Base Flashing Details



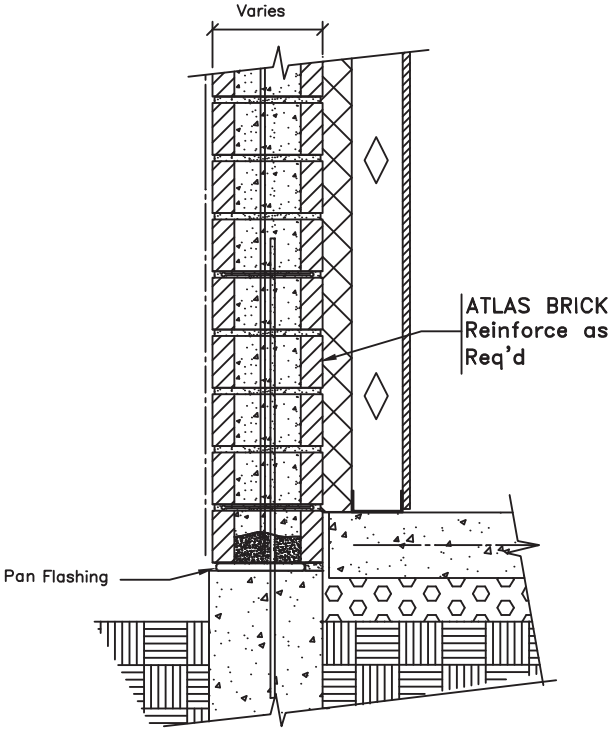
SINGLE UNIT BASE



SINGLE UNIT BASE WITH PAN FLASHING

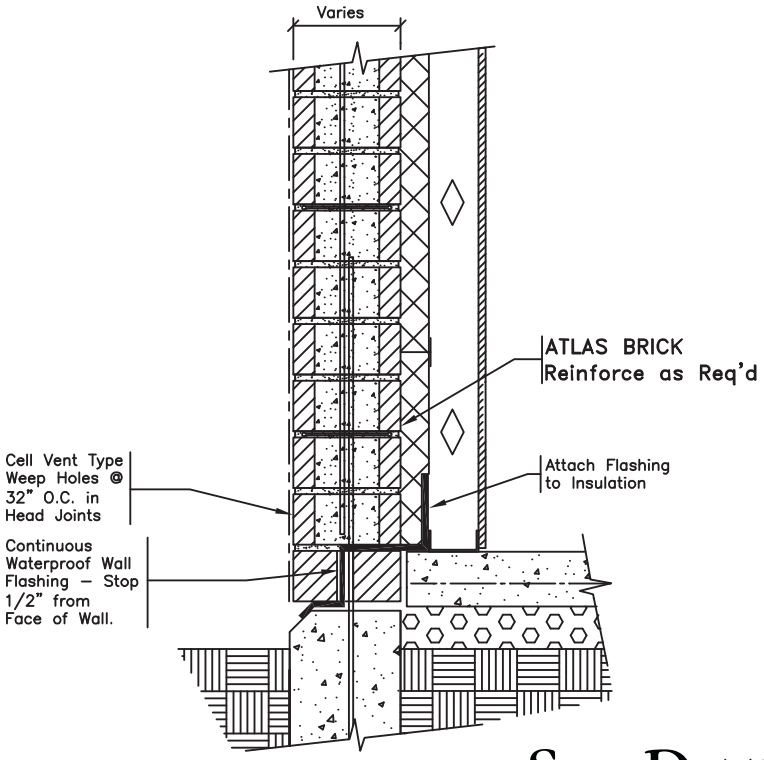


SINGLE UNIT BASE WITH FLASHING

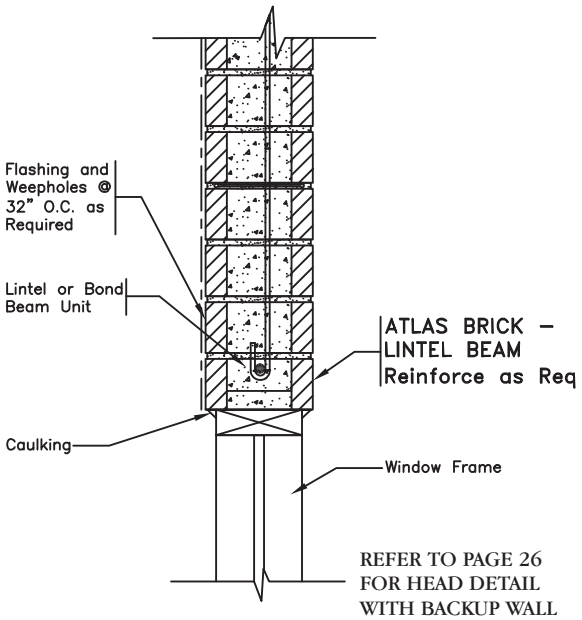


SINGLE UNIT BASE WITH PAN FLASHING AND INSULATION

Double Unit Base Flashing Detail

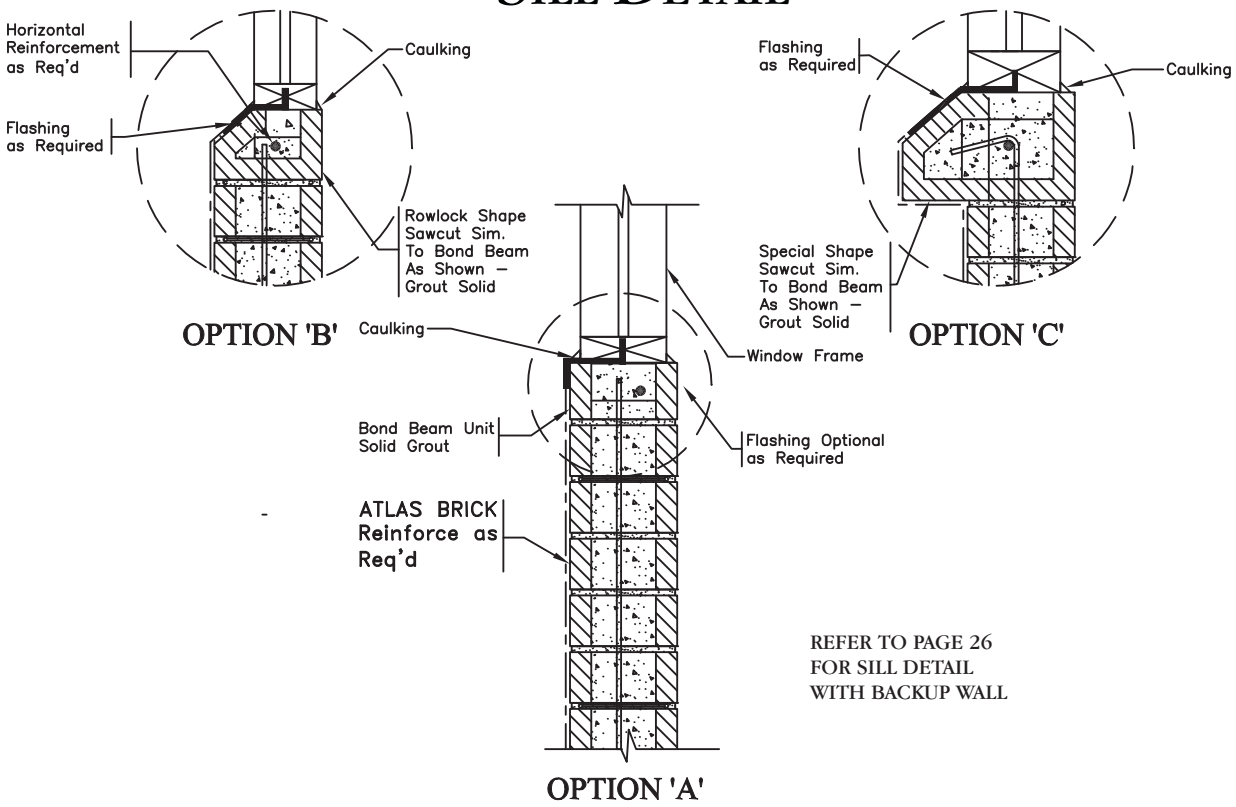


Head Detail



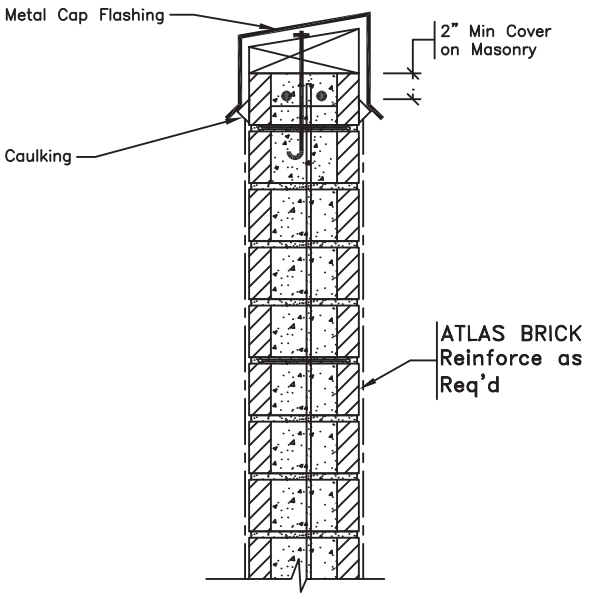
REFER TO PAGE 26
FOR HEAD DETAIL
WITH BACKUP WALL

Sill Detail

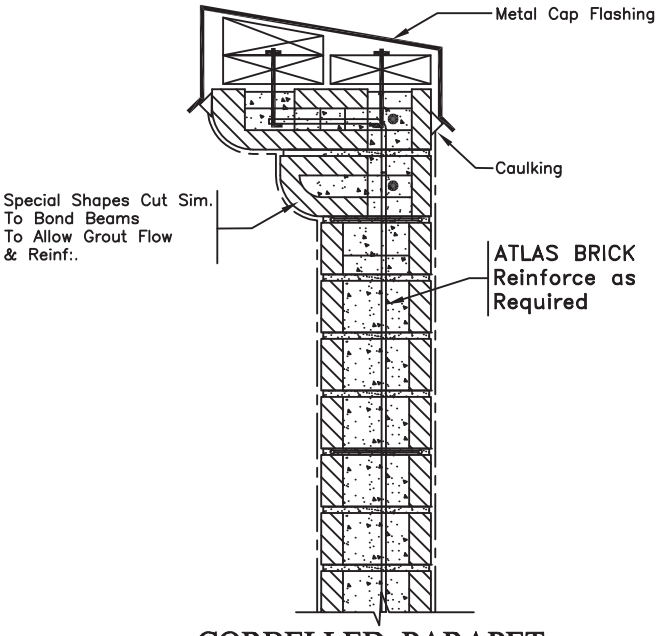


REFER TO PAGE 26
FOR SILL DETAIL
WITH BACKUP WALL

Parapet Details

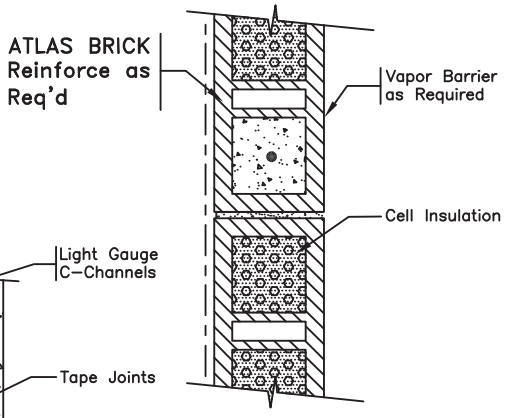


SINGLE WYTHE PARAPET

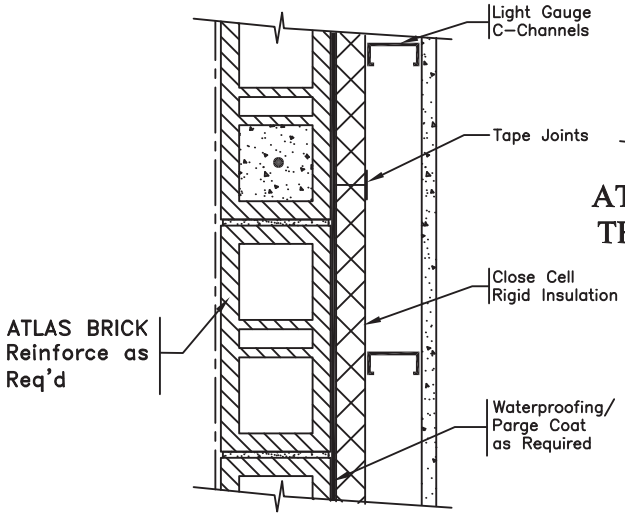


CORBELLED PARAPET

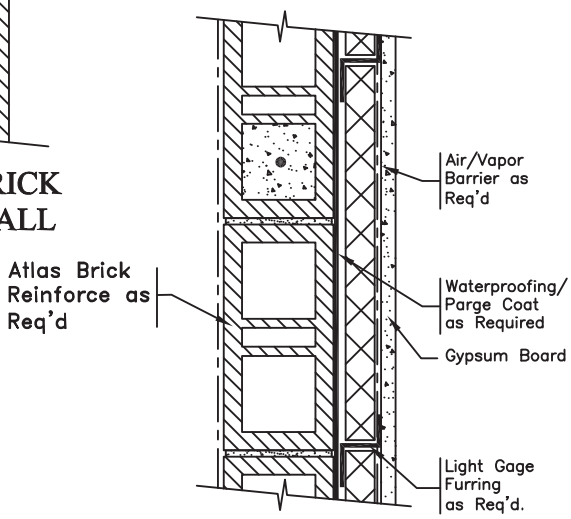
Thru-Wall Plan Details



ATLAS BRICK THRU - WALL

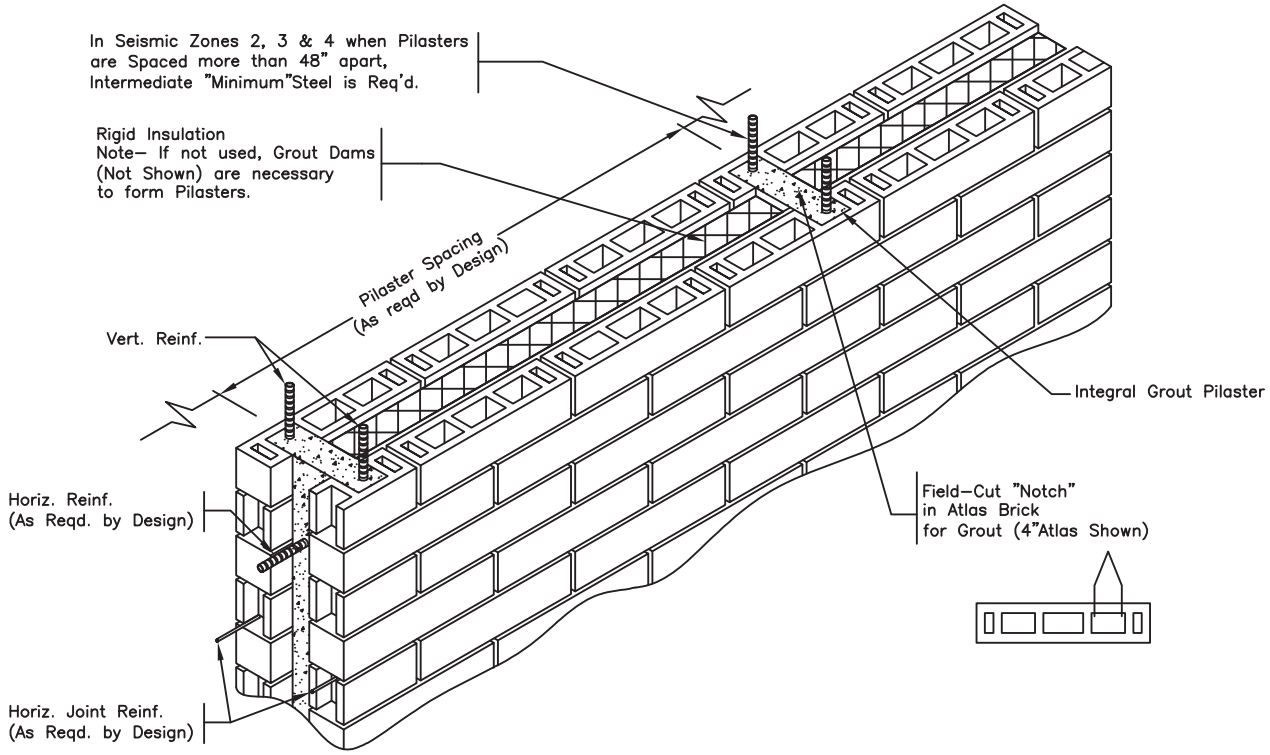


ATLAS BRICK WALL WITH THERMAL BREAK

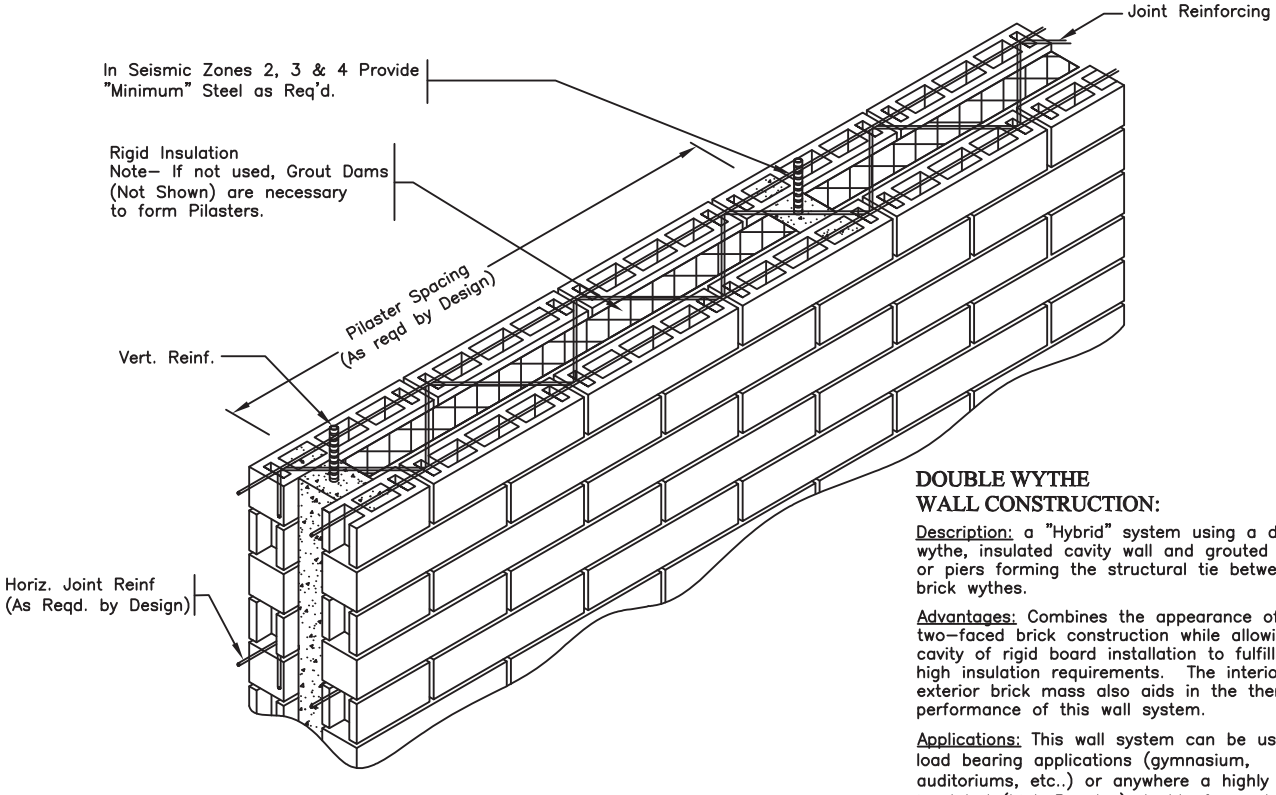


ATLAS BRICK WALL W/O THERMAL BREAK

Integral Pilaster Concept



Double Wythe Structural Wall



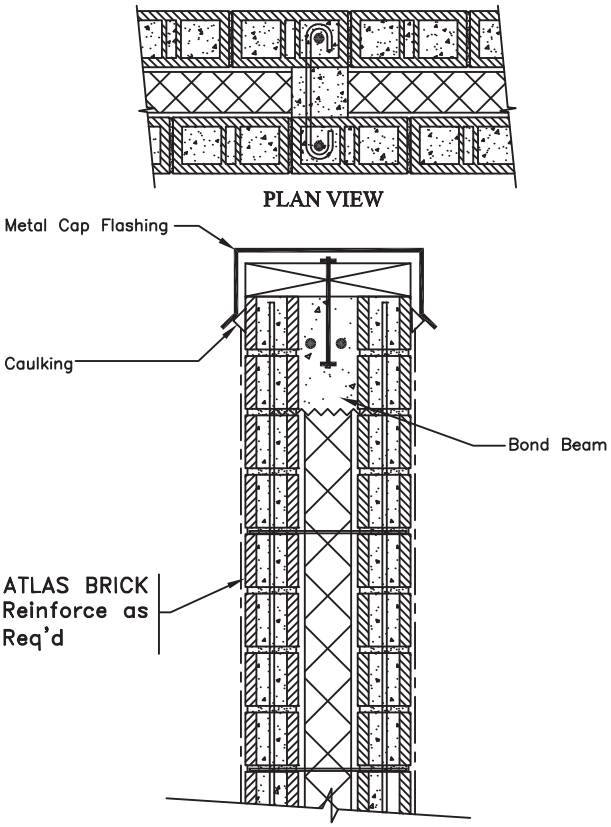
DOUBLE WYTHE WALL CONSTRUCTION:

Description: a "Hybrid" system using a double wythe, insulated cavity wall and grouted pilasters or piers forming the structural tie between the brick wythes.

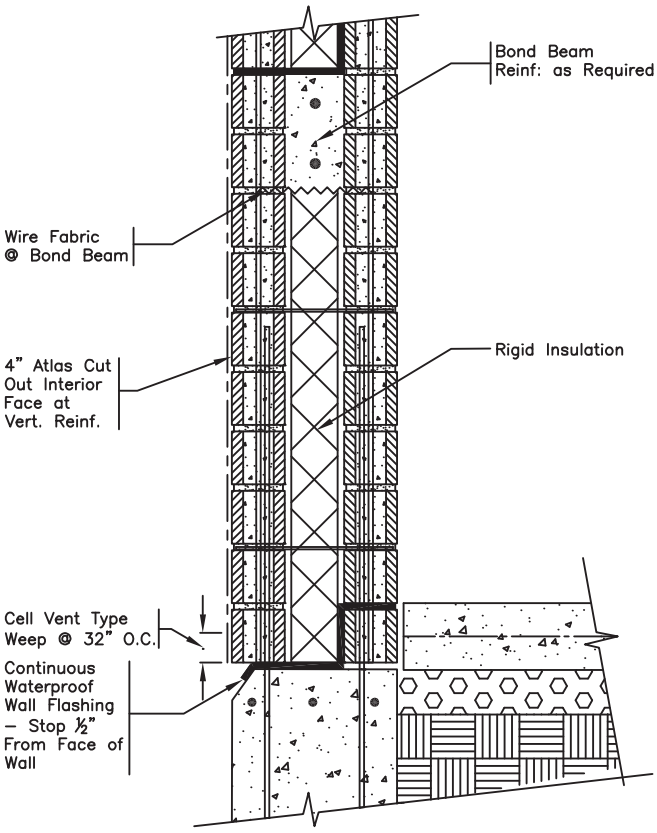
Advantages: Combines the appearance of two–faced brick construction while allowing a cavity of rigid board installation to fulfill specific high insulation requirements. The interior and exterior brick mass also aids in the thermal performance of this wall system.

Applications: This wall system can be used in load bearing applications (gymnasium, auditoriums, etc..) or anywhere a highly insulated (high R value) double face, structural brick "sandwich" wall is required.

Integral Pilaster Details

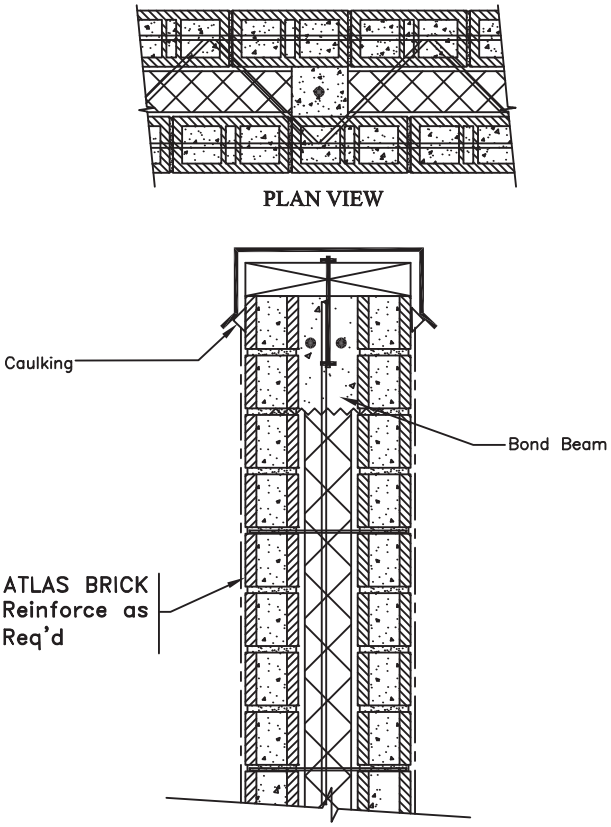


INTEGRAL PILASTER PARAPET

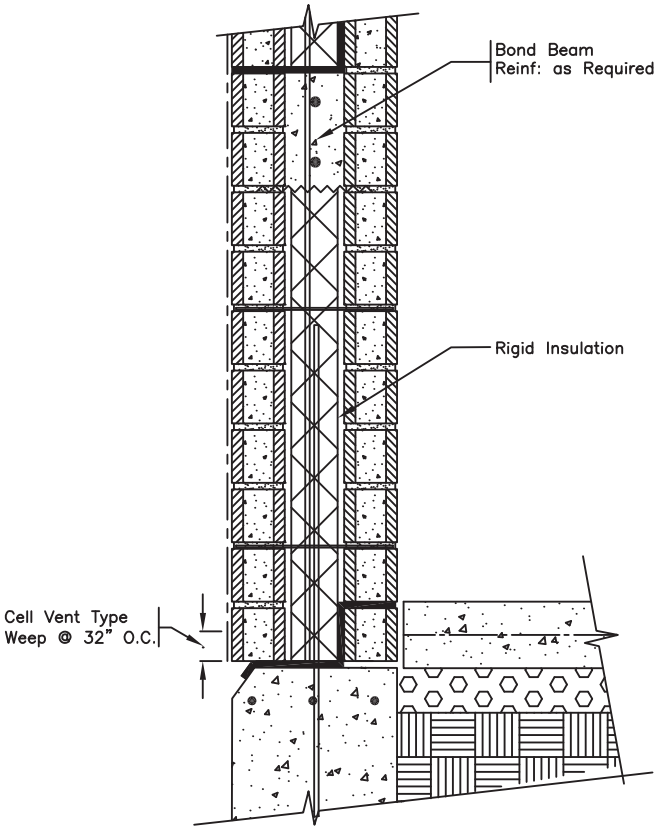


INTEGRAL PILASTER BASE FLASHING

Double Wythe Structural Wall Details

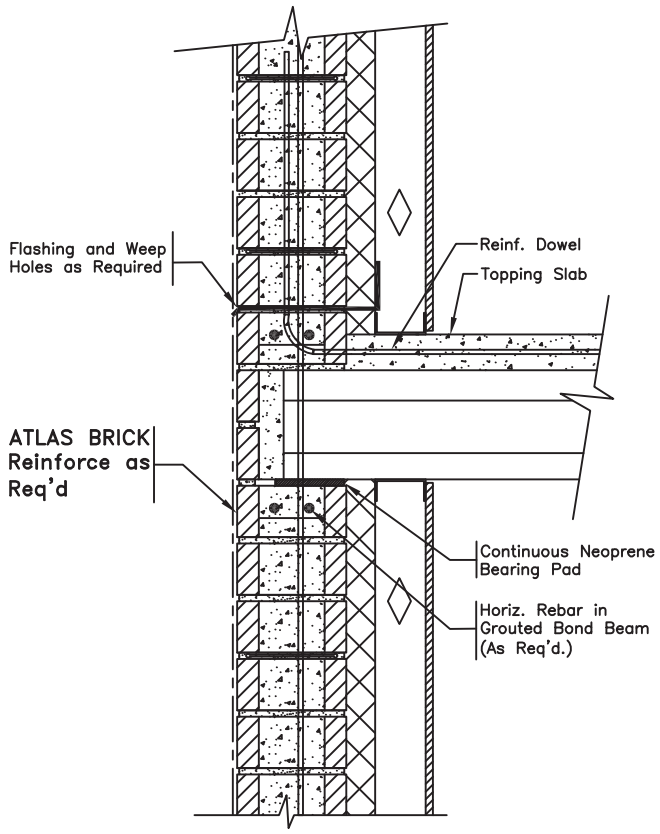


DOUBLE WYTHE PARAPET

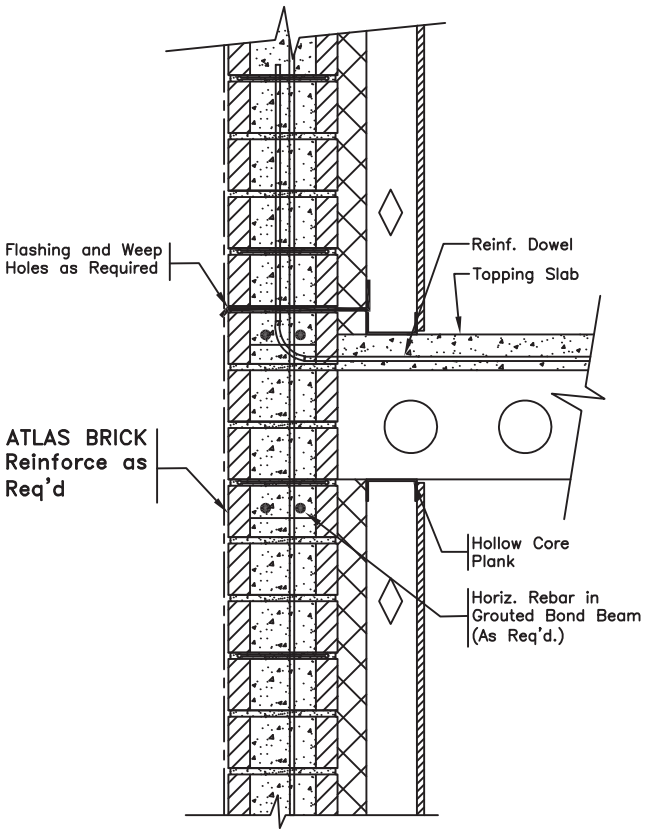


DOUBLE WYTHE BASE FLASHING

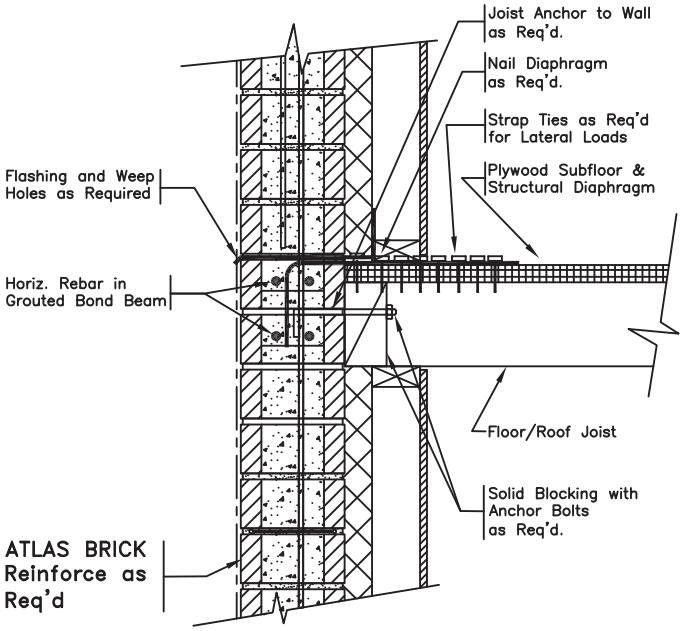
Floor Section Details



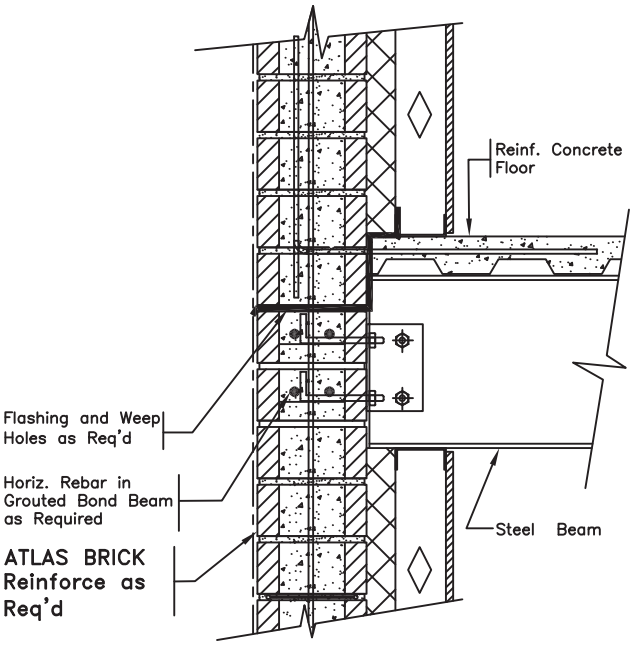
PRECAST PLANK BEARING ON WALL



PRECAST PLANK PARALLEL TO WALL

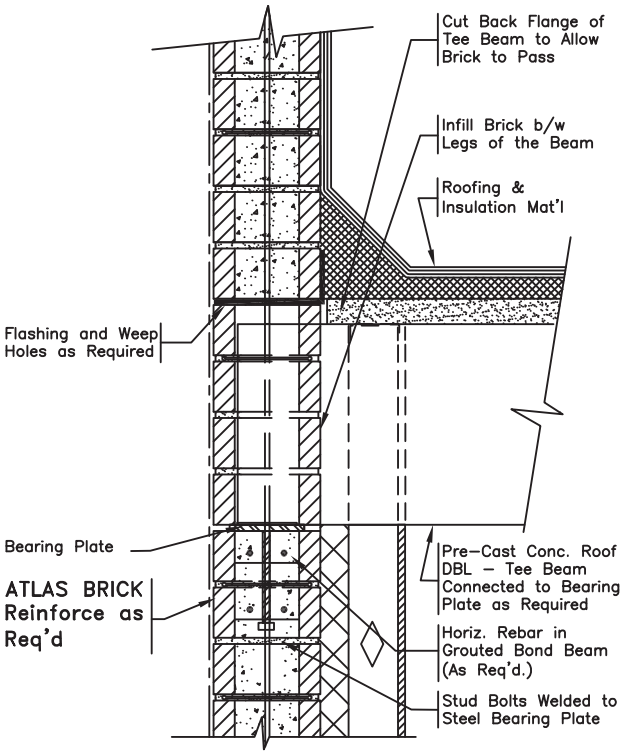


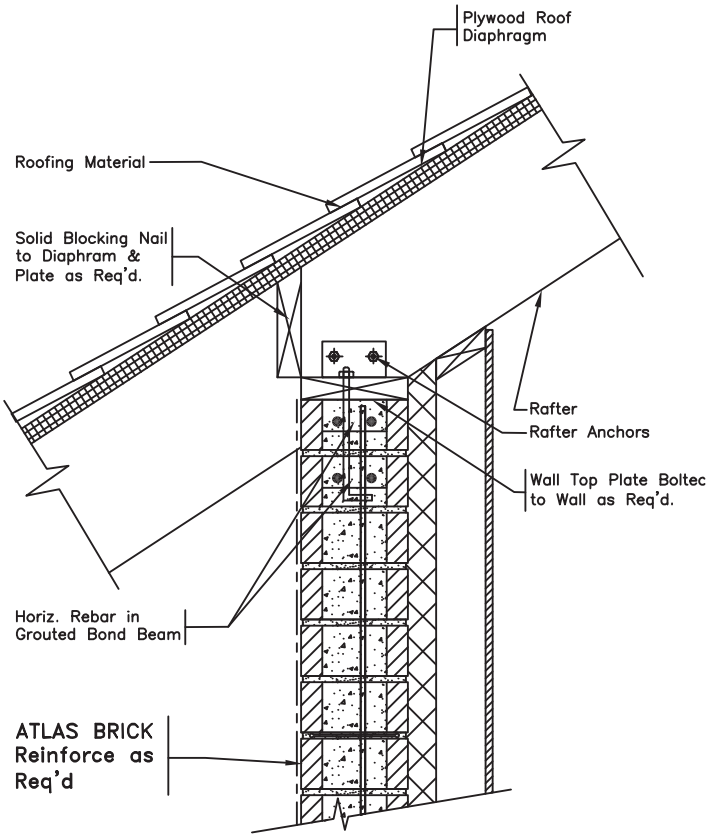
WOOD JOIST BEARING ON WALL

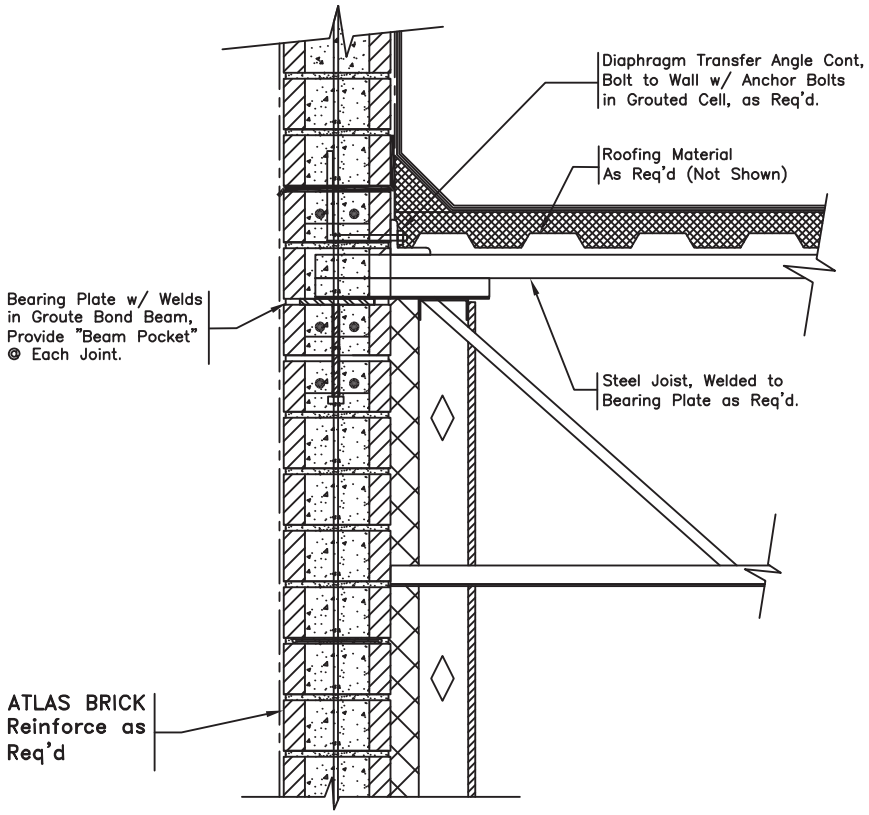


STEEL BEAM BEARING ON WALL

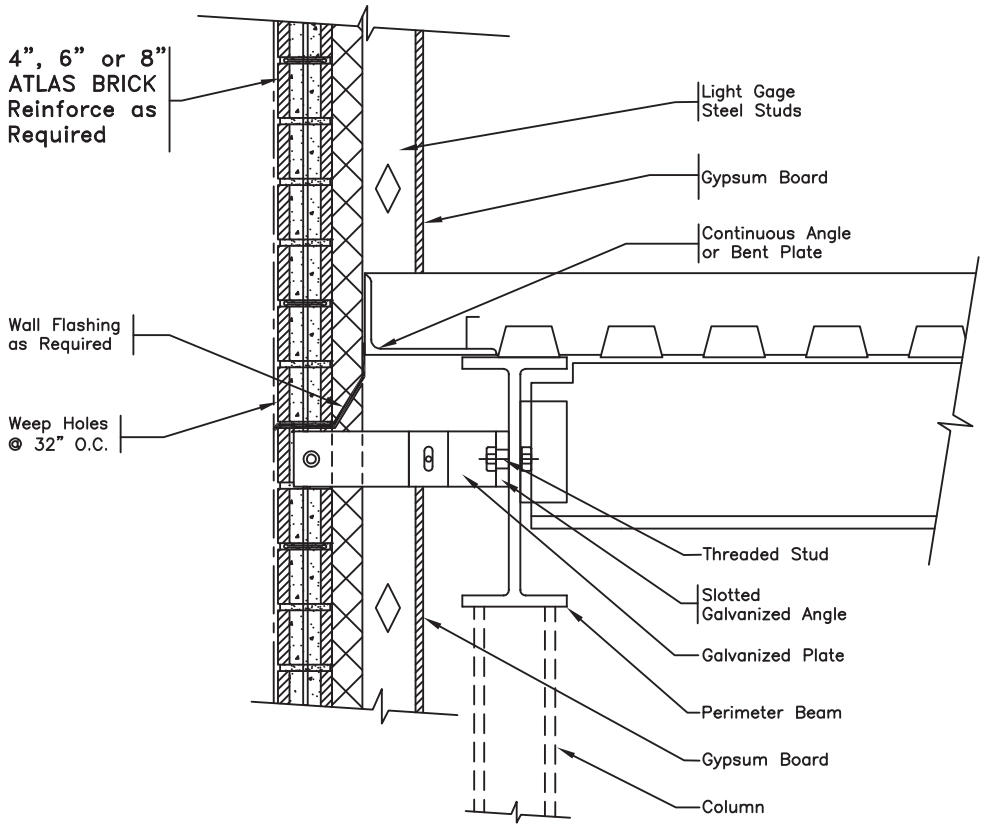
Roof Section Details



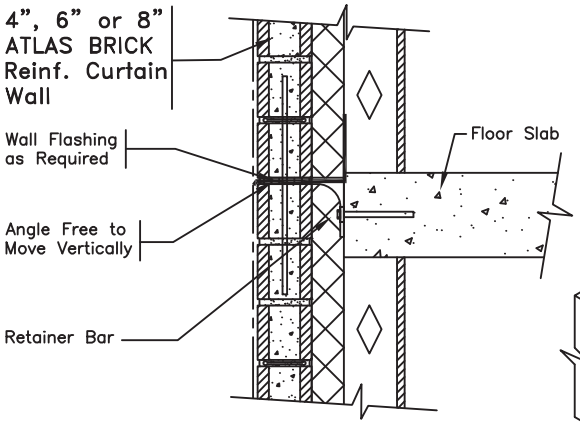




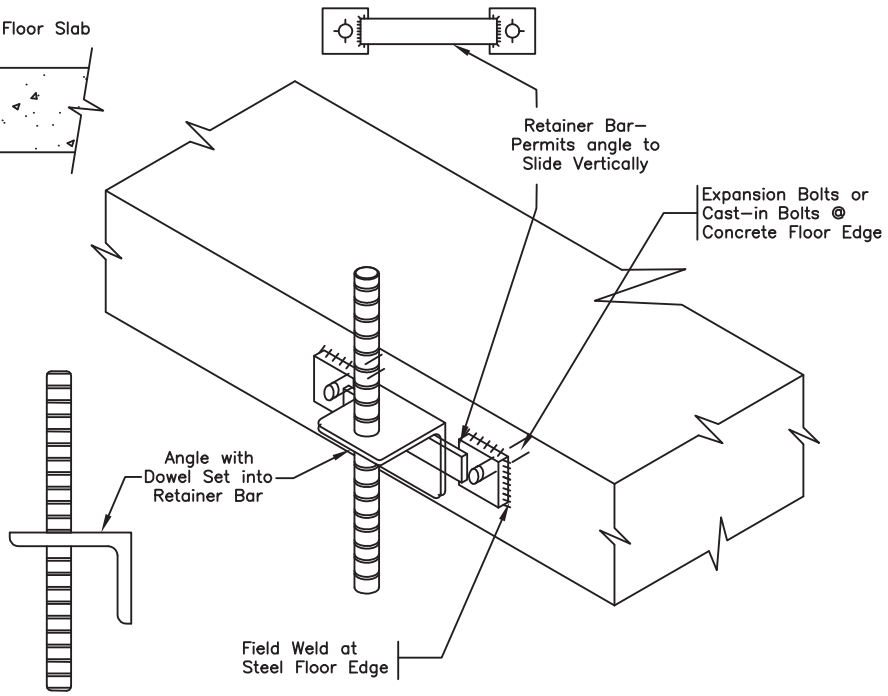
Curtain Wall Details



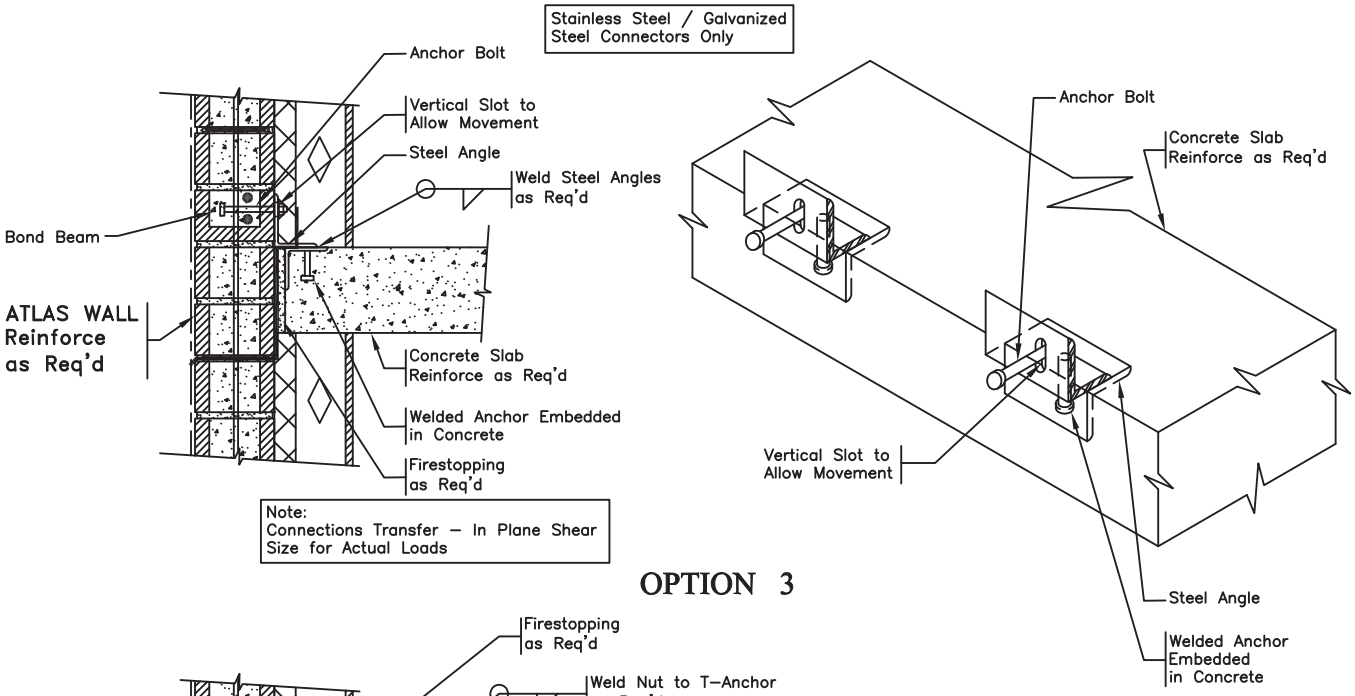
OPTION 1



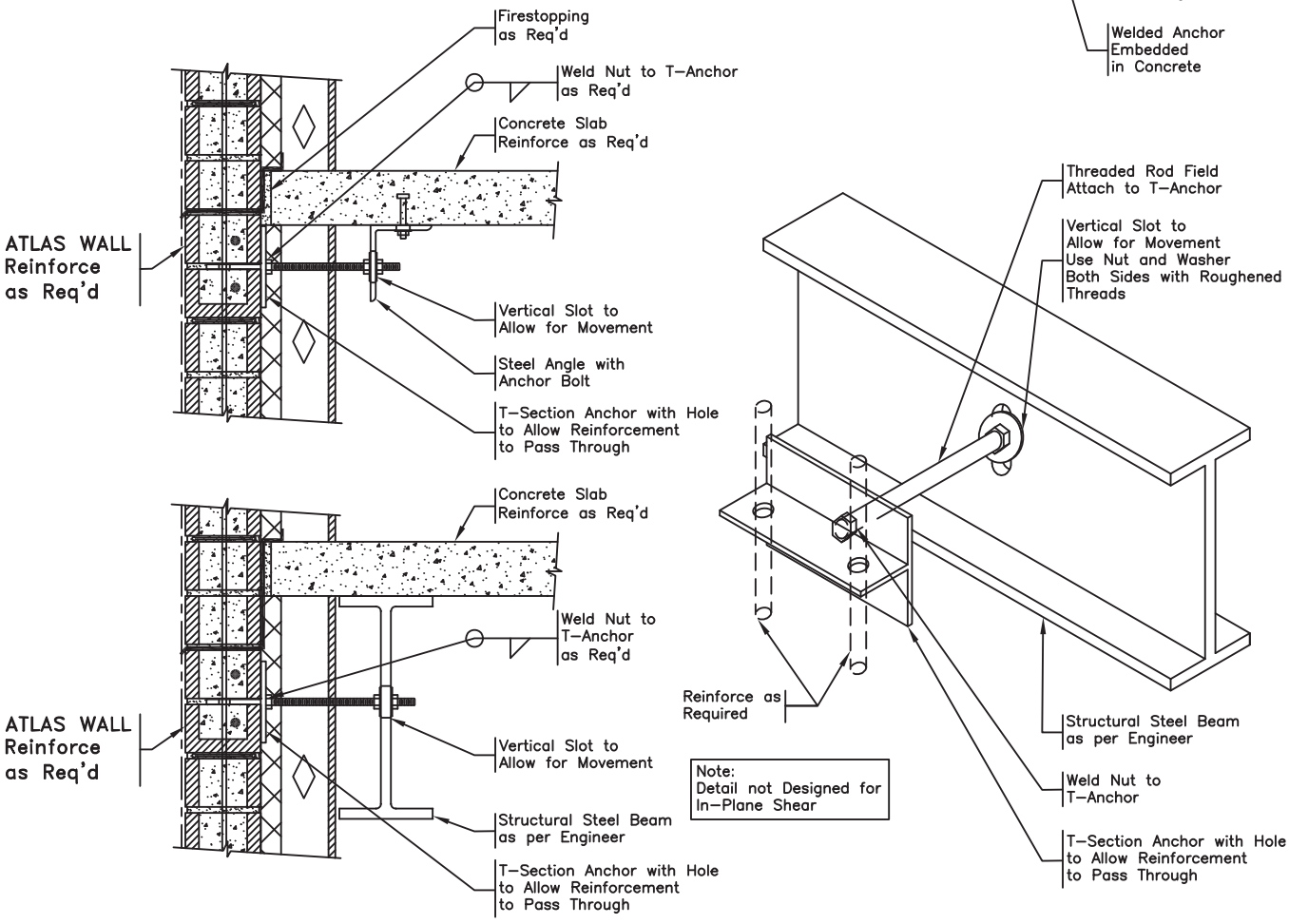
OPTION 2



Curtain Wall Details

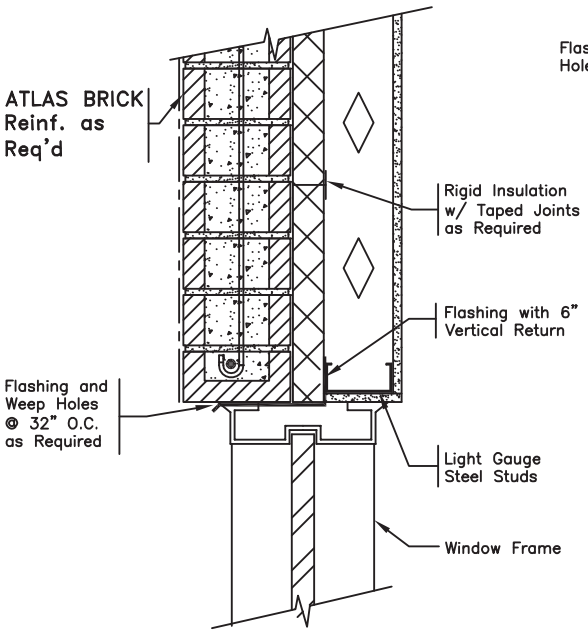


OPTION 3

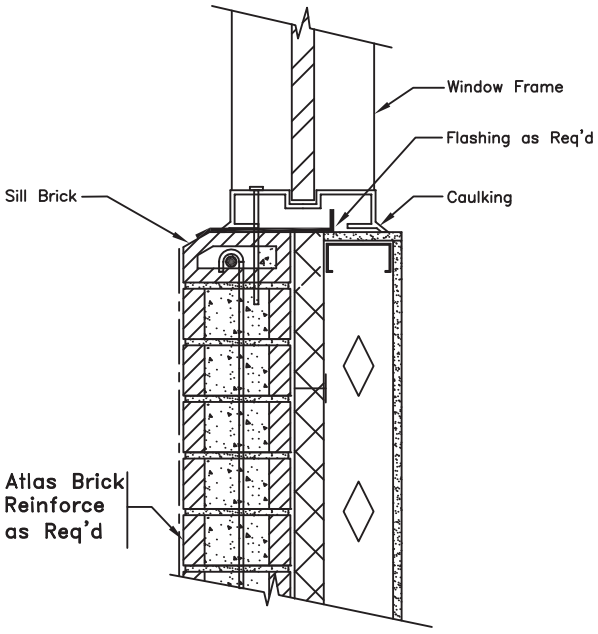


OPTION 4

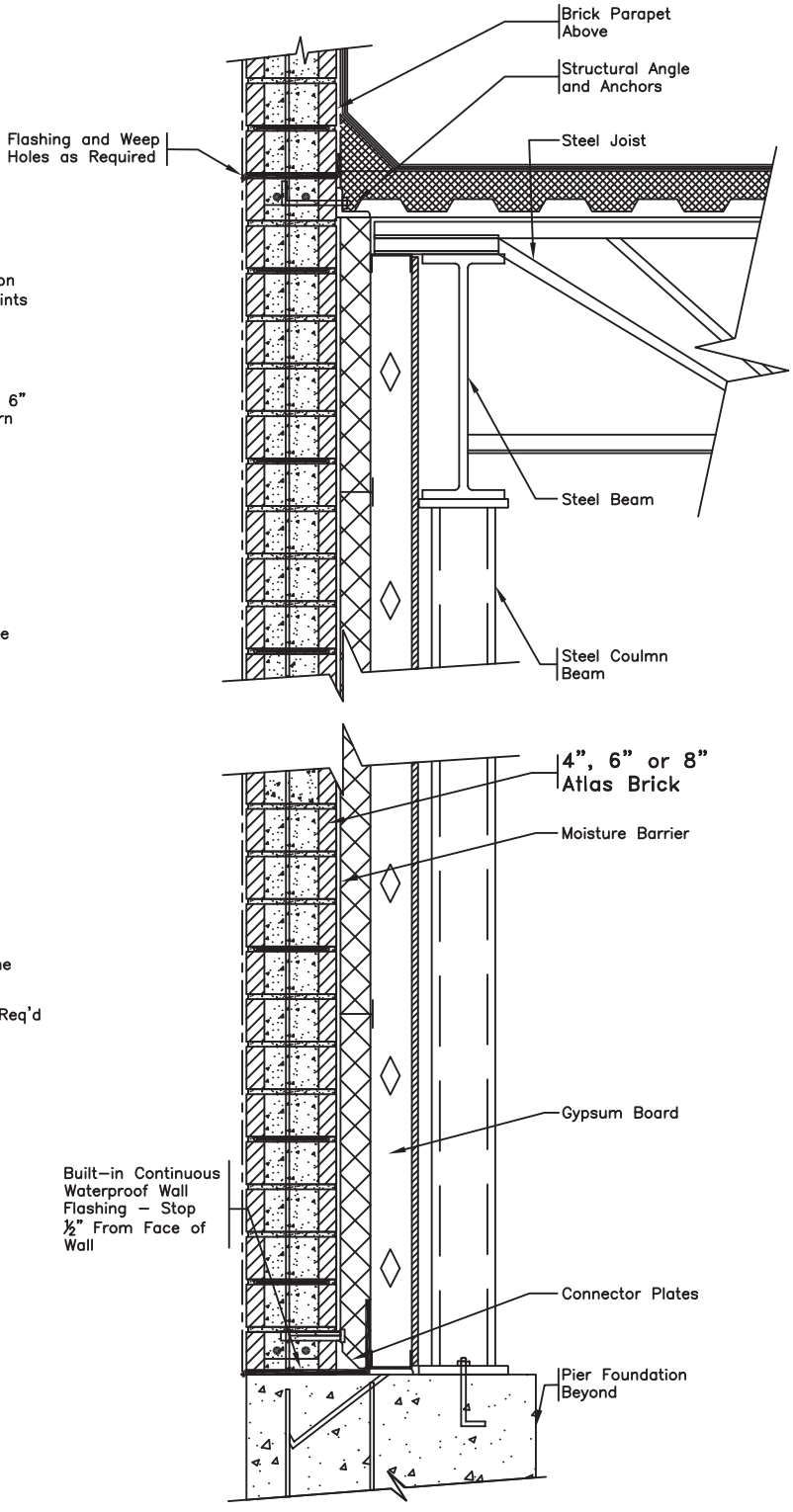
Curtain Wall Details



HEAD DETAIL

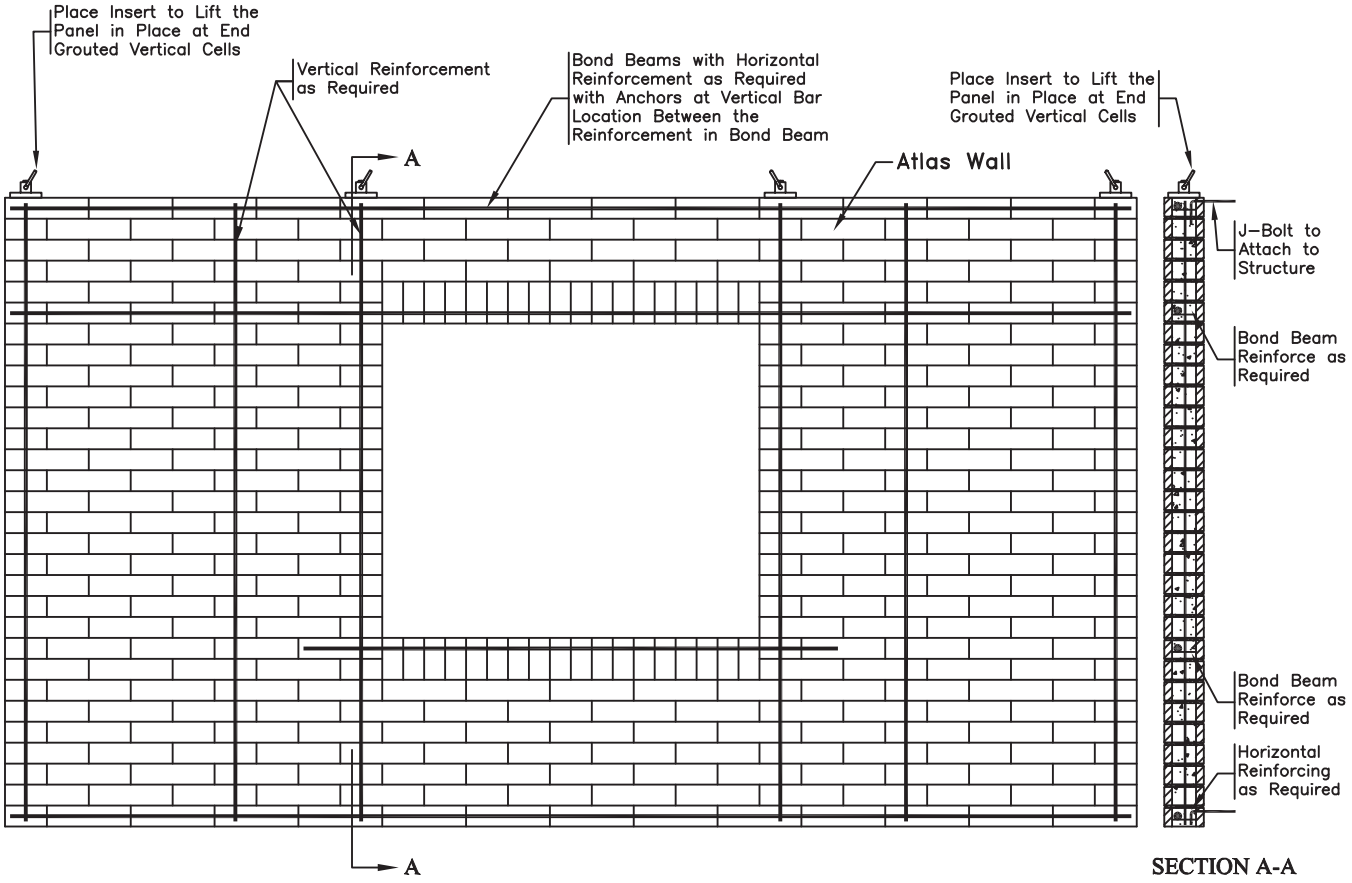


SILL DETAIL

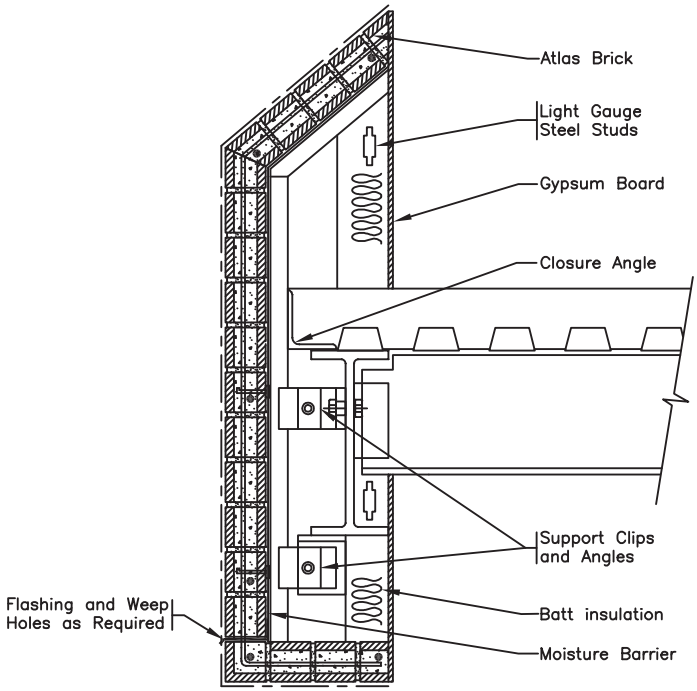


ATLAS STRUCTURAL BRICK
PREFABRICATED
NON-BEARING WALL PANEL

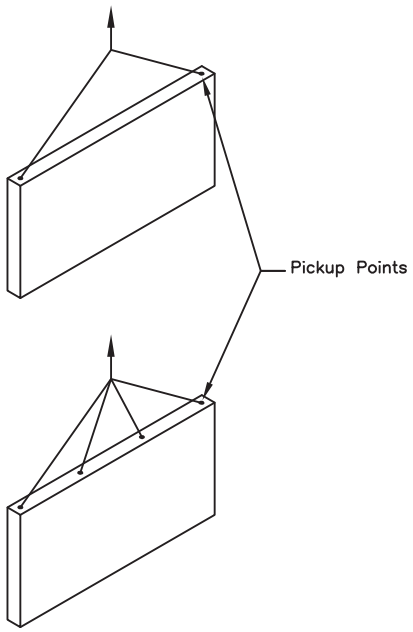
PANELIZED WALL DETAILS



ATLAS PANEL

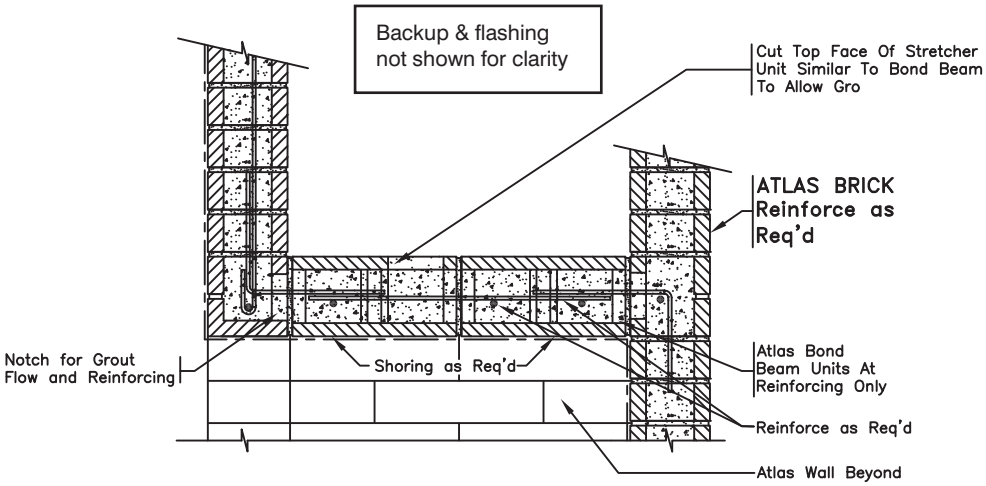


PREFABRICATED SPANDREL BEAM

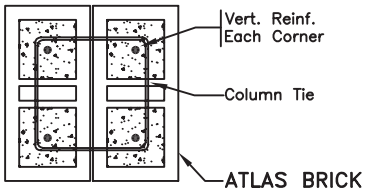


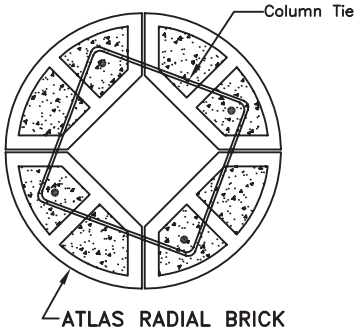
PANEL PICKUP OPTIONS

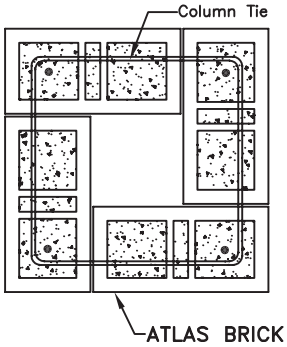
Miscellaneous Details



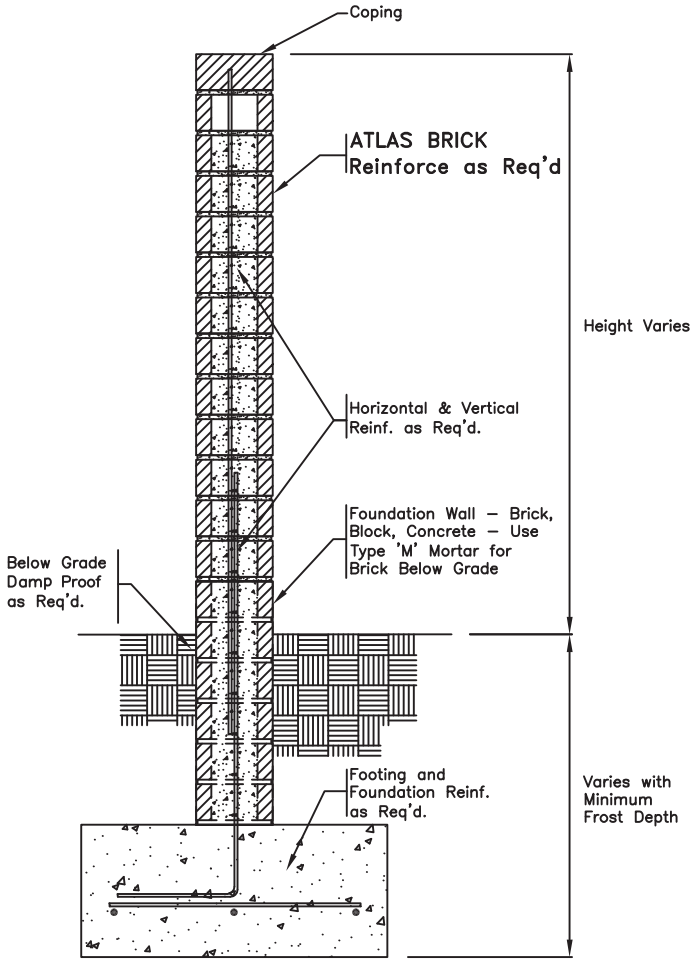
REINFORCED SOFFIT DETAIL



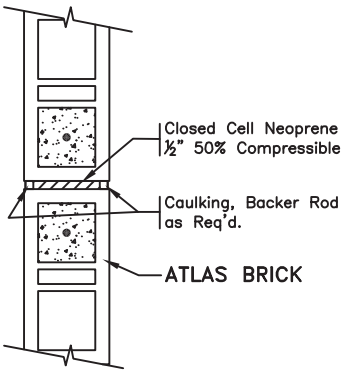




COLUMN OPTIONS

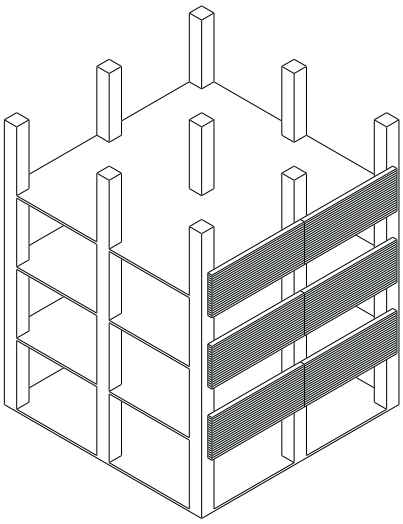


PRIVACY / SOUND WALL



EXPANSION JOINT

Typical Atlas™ Brick Construction Systems



1. Prefabricated* Panel Curtain Wall System

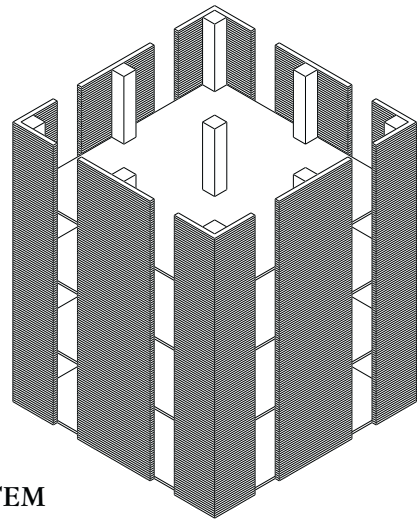
Description: Panels are "hung" from the structural frame to provide the curtain wall. All loads are transferred to the frame or load bearing system.

*The panels may be prefabricated, or laid-in-place.

Advantages:
1) Essentially a veneer system, without expensive back-up or exposed supporting steel angles required.
2) Allows frame structure and curtain wall fabrication to proceed independently.
3) Prefabrication allows off-site masonry construction for "tight" jobsites.

Applications: Most economical where there is a significant amount of repetitive design elements (i.e. spandrels, soffits, lintels, or column cover elements). Brick panels can be the entire exterior cladding, or be used in conjunction with other systems where convenient (load bearing, structural skin, pre-cast concrete systems, etc.). Panels are adaptable to any construction form.

Prefabricated panels also allow a high degree of aesthetic flexibility.

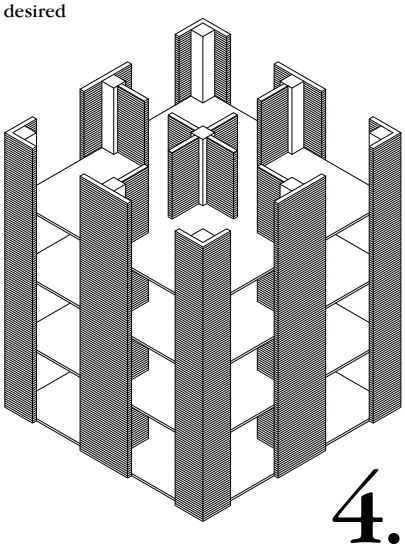


2. Structural "Skin" (Curtain Wall)

Description: The building structure is a load bearing moment-resting space frame. Reinforced, grouted Atlas Brick is supported at the foundation, and tied laterally to the building frame.

Advantages:
1) Allows independent construction of the load bearing, moment frame and brick skin, requiring less trade coordination.
2) Eliminates traditional veneer support angles and back-up wall systems.
3) Provides a more structurally stable cladding system than traditional unreinforced masonry (particularly in earthquake areas).

Applications: Universally applied on single- or multi-story buildings, wherever a frame structure is used and the economic and aesthetic demands of exposed face brick is desired



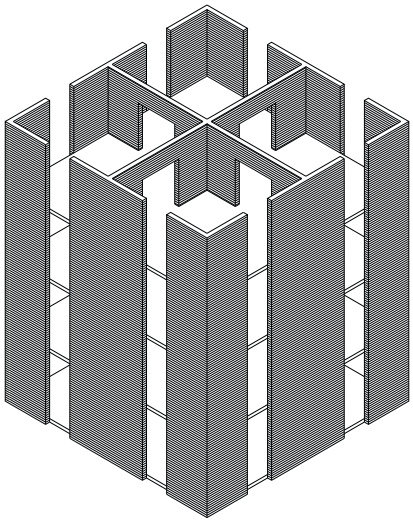
3. Dual Framing System

Description: This system uses a load bearing space frame that is designed to carry the gravity loads as well as 25% of the shear load.

Reinforced, grouted Atlas Brick walls serve as the sheer resisting elements, and are designed to carry the full lateral load.

Advantages:
1) Allows independent construction of frame and shear wall systems. Amount of trade coordination is decreased.
2) The complexity of the frame construction is decreased since only 25% of the shear load is transferred through the frame connections.

Applications: Used on any structure where there is frame and shear wall construction acting together to resist design loads.



4. Load Bearing Shear Wall System

Description: All gravity dead loads, live loads, and lateral loadings due to earthquake or wind are resisted by the reinforced grouted Atlas Brick walls, in conjunction with the structural floor diaphragm.

Advantages: Economy results from multiple use of structural elements. The brick walls serve as:
1) Structure.
2) Space Partitions (finished walls)
3) Fire Separations
4) Sound Partitions
5) Exterior Finish

Applications: Used on single & multi-story structures where there are a number of walls that can carry the vertical and horizontal loads, especially apartment buildings, hotels, single story structures like warehouses, shopping centers, etc.

For more design information
check out www.interstatebrick.com and wscpa.org

www.InterstateBrick.com

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