



CONCRETE PRODUCTS GROUP

INNOVATIVE CONCRETE MASONRY SYSTEMS

SPEC-THERMAL® Detailing Guide 2022 Edition

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800-789-0872

HI-R
HI-R-H
HI-R Half High
HI-R-H Half High

Table of Contents

[INTRODUCTION](#)

[KORFIL HI-R, HI-R-H AND SPEC-BRIK HI-R – PRODUCT FEATURES](#)

[HI-R](#)

[HI-R HALF HIGH/SPEC-BRIK HI-R](#)

[HI-R-H](#)

[HI-R-H HALF HIGH/SPEC-BRIK HI-R-H](#)

[Specialty Units](#)

[CONSTRUCTION NOTES](#)

[CONSTRUCTION DETAILS](#)

[Foundation and Base of Wall Details- Navigation Page](#)

[Figure 1. HI-R Bond Beam and Pad, Partially Grouted](#)

[Figure 2. Base of Wall, All Unit Types: Landscaping Considerations](#)

[Figure 3. Exterior, Poured Foundation and Pad](#)

[Figure 4. HI-R-H – Fully Grouted Bond Beam](#)

[Figure 5. HI-R-H Half High – Fully Grouted Bond Beam at Wall Base](#)

[Figure 6. HI-R-H Basement Wall](#)

[Figure 7. HI-R-H Stem Wall](#)

[Movement Joints and Joint Reinforcement](#)

[Figure 8. Michigan Style Joint HI-R Section](#)

[Figure 9. Michigan Style Joint HI-R Plan](#)

[Figure 10. Rapid Control Joint](#)

[Figure 11. HI-R-H or HI-R-H Half High Jamb/Corner Unit](#)

[Figure 12. Horizontal Joint Reinforcement](#)

[Window Sills Navigation Page](#)

[Figure 13. HI-R Window Sill](#)

[Figure 14. HI-R Half High Window Sill](#)

[Figure 15. HI-R-H Window Sill](#)

[Figure 16. HI-R-H Half High Window Sill](#)

[Window Jambs Navigation Page](#)

[Figure 17. HI-R Window Jamb](#)

[Figure 18. HI-R Half High Window Jamb](#)

[Figure 19. HI-R-H Window Jamb](#)

[Figure 20. HI-R-H or HI-R-H Half High Jamb Unit](#)

[Lintels Navigation Page](#)

[Figure 21. HI-R Lintel](#)

[Figure 22 HI-R Half High Lintel](#)

[Figure 23. HI-R-H Lintel](#)

[Figure 24 HI-R-H Half High Lintel](#)

[Figure 25 HI-R Insulated Lintel](#)

[HI-R-H Corners Navigation Page](#)

[Figure 26. 10" HI-R-H Corner. Exterior Soap](#)

[Figure 27. 10" HI-R-H Corner. L-Shape Veneer – course 1](#)

[Figure 28. 10" HI-R-H Corner. L-Shape Veneer – course 2](#)

[Figure 29. 10" HI-R-H Corner. L-Shape Veneer EPS/XPS – course 1](#)

[Figure 30. 10" HI-R-H Corner. L-Shape Veneer EPS/XPS – course 2](#)

[Figure 31. 12" HI-R-H Corner – Exterior Soap](#)

[Figure 32. 12" HI-R-H Corner. L-Shape Veneer – course 1](#)

[Figure 33. 12" HI-R-H Corner – L Shaped Veneer – course 2](#)

[Figure 34. 12" HI-R-H Corner. L-Shape Veneer – course 1](#)

[Figure 35. 12" HI-R-H Corner – L Shaped Veneer EPS/XPS – course 2](#)

[Figure 36 HI-R-H/HI-R-H Half High Corner/Jamb Unit](#)

[Wall Intersections Navigation Page](#)

[Figure 37. HI-R T intersection \(Non-Structural\) Option 1](#)

[Figure 38. HI-R T intersection \(Non-Structural\) Option 2](#)

[Figure 39. HI-R T intersection \(Structural\) Option 1](#)

[Figure 40. HI-R T intersection \(Structural\) Option 2](#)

[Planks Navigation Page](#)

[Figure 41. HI-R Plank Bearing Wall Fully Grouted](#)

[Figure 42. HI-R Plank Bearing Wall Partially Grouted](#)

[Figure 43. HI-R Plank Non-Bearing Wall Partially Grouted](#)

[Figure 44. HI-R Half High Plank Bearing Wall Fully Grouted](#)

[Figure 45 HI-R Half High Plank Bearing Wall Partially Grouted](#)

[Figure 46 HI-R Half High Plank Bearing Wall Partially Grouted](#)

[Figure 47 HI-R-H Plank Bearing Wall Fully Grouted](#)

[Figure 48 HI-R-H Plank Non-Bearing Wall Fully Grouted](#)

[Figure 49 HI-R-H Half High Plank Bearing Wall Fully Grouted](#)

[Figure 50 HI-R-H Half High Plank Non-Bearing Wall Fully Grouted](#)

[Roof Joist/Parapet Navigation Page](#)

[Figure 51. HI-R Roof Joist/Parapet Non-Bearing Wall Partially Grouted](#)

[Figure 52. HI-R Roof Joist/Parapet Bearing Wall Partially Grouted](#)

[Figure 53. HI-R Roof Joist/ParapetNon-Bearing Wall Fully Grouted](#)

[Figure 54. HI-R Roof Joist/Parapet Bearing Wall Fully Grouted](#)

[Figure 55 HI-R Half High Roof Joist/Parapet Non-Bearing Wall Partially Grouted](#)

[Figure 56 HI-R Half High Roof Joist/Parapet Bearing Wall Partially Grouted](#)

[Figure 57. HI-R Half High Roof Joist/ParapetNon-Bearing Wall Fully Grouted](#)

[Figure 58. HI-R Half High Roof Joist/Parapet Bearing Wall Fully Grouted](#)

[Figure 59 HI-R-H Roof Joist/Parapet Bearing Wall Fully Grouted](#)

[Figure 60 HI-R-H Roof Joist/Parapet Non-Bearing Wall Fully Grouted](#)

[Figure 61 HI-R-H Half High Roof Joist/Parapet Bearing Wall Fully Grouted](#)

[Figure 62 HI-R-H Half High Roof Joist/Parapet Non-Bearing Wall Fully Grouted](#)

[CODES AND STANDARDS REFERENCES](#)

[MEMBER LOCATION MAP](#)

Introduction

This manual focuses on how to detail wall systems using the Spec-Thermal family of pre-insulated masonry products from the Concrete Products Group. Pre-insulated concrete masonry is a masonry wall system where insulation is factory installed in the concrete masonry units so that it is in place prior to the placement of reinforcement and grout to provide integral insulation in the finished wall assembly. The products in Spec-Thermal family include the Korfil HI-R and HI-R-H pre-insulated masonry wall systems. The Korfil HI-R products are also offered in half high versions (HI-R Half High and HI-R-H Half High) that when combined with our Spec-Brik blended colors to provide brick aesthetics are called Spec-Brik HI-R and Spec-Brik HI-R-H.

Pre-insulated masonry units have these system components:

- Concrete Masonry Units specially designed to minimize thermal bridging by reducing the cross sectional area of the web(s) that cross from the exterior to the exterior of the unit.
- Insulating expandable polystyrene inserts placed inside the unit, simultaneously reducing thermal bridging. They are typically installed at the factory. The inserts constitute Code-defined integral insulation.
- The CMU, Mortar, Reinforcement and Grout act structurally in composite action (Moment of Inertia, Section Modulus, etc.) as based upon Structural Engineer's criteria for loads resistance.

The Spec-Thermal products allow the construction of insulated wall assemblies where one or both of the interior or exterior wall surfaces can offer the durability and aesthetics of masonry exposure. The systems are designed so that the insulation remains in place even where reinforcement and grout are placed so that there is no compromise to the walls thermal performance. Behind the unit's face shells and mortar (both of which have Integral Water Repellent along with a breathable penetrating sealant are the interlocking insulation inserts. The inserts also assist in resisting wind-driven rain. Where partially grouted, occasional drainage continues through the flashing and weep system.

There are numerous benefits to these systems:

- Pre-insulated masonry vastly outperforms conventional masonry's thermal performance, offering the ability to meet or exceed Energy Code requirements with single wythe walls.
- Improved dew point profile thereby assisting condensate control. Further, masonry is not only tolerant to condensate, it is also not a food for mold and does not corrode or rot.
- Improves outdoor-indoor sound transmission class.
- Insect and varmint resistance. No chemical treatments required.
- CMU mass walls offer strong Fire-resistance ratings

Pre-Insulated masonry not only meets extreme design parameters, it also offers the flexibility to design projects that balance cost concerns against typical project requirements including time of construction, Code and contractual requirements, and aesthetics.

A Note About Masonry Flashing

Properly flashing masonry walls is a key strategy for partially grouted walls to ensure that wall assemblies resist moisture penetration. There are many types of flashing available today, each with its own characteristics. This Guide assumes design and construction compliance with applicable Building Codes as amended and adopted. Further, and when applicable, the Guide assumes the use of flashing with partially grouted walls (whether generic, specialized or proprietary, partial or completely through-wall, etc). Yet it also reflects the choices and options available to the Design Community rather than insisting on any particular type of primary and secondary moisture control strategy (belt-and-suspenders approach) regarding a particular project.

For instance there are circumstances where a member of the Design Community with permission of the Certified Building Official (via Plan Review, etc.) may choose primary and secondary methods of moisture control other than the inclusion of flashing. As an example when heavy reinforcement and full grouting is required, generic flashing may be considered impractical or onerous within a multi- or single-wythe masonry wall.

Similar alternate strategies may be chosen for uniform masonry barrier wall elements. Solid grouted composite (completely grouted – including collar joints – multi-wythe masonry; see Masonry Code TMS 402 definition), solid grouted non-composite multi-wythe masonry walls, and solid grouted single-wythe walls are all considered barrier walls.

Codes and Standards References

There are numerous provisions of Code that are applicable to the construction of masonry walls, many of which are found in sections that may not intuitively seem to be related to masonry. Similarly, there are a variety of applicable standards that may relate to other building components or general areas of concern such as energy conservation. We have included a comprehensive set of references to applicable Codes and Standards for the construction of structures using masonry. These are based on Model Code provisions. As always, designers should look to the local Code requirements for guidance on particular projects.

Design Resource Center

The Concrete Products Group has a dedicated website to provide designers access to design tools, the Design Resource Center, which is a registration based site. The site includes a variety of resources including downloadable versions of the details in this manual in AutoCAD® or Revit formats, our Masonry Designer color catalog and Revit Plug-in, design and construction notes and videos, and other helpful resources. We also have provided a guide specification on the site that is available for download. You can request free registration to the site at this link:

[Design Resource Center Access Page](#)

A small thumbnail image of the Table of Contents page from the manual. It shows a list of sections and their corresponding page numbers, organized into two columns. The title "Table of Contents" is at the top right. The Concrete Products Group logo is at the bottom right.

What is High Performance Concrete Masonry?

High Performance Concrete Masonry uses state of the industry best practices relating to the construction of concrete masonry and related building envelope components to produce a building envelope that efficiently meets or exceeds project requirements in a cost-effective manner. While these techniques comply with Code, they also in many instances include additional recommendations that can deliver superior results when it comes to moisture protection, energy efficiency, or other key issues.

Comprehensive Construction Details

This Guide includes a set of Construction Details that offer high performance recommendations for how to detail a variety of common structural elements. Each detail is supported by typical notes. Designers should modify these details to suit the requirements of their design.

Table of Contents	
Introduction	1
High Performance Concrete Masonry	2
Code	3
Design	4
Construction	5
Quality Control	6
Quality Assurance	7
Construction Details	8
Notes	9
References	10
Index	11
Appendix A	12
Appendix B	13
Appendix C	14
Appendix D	15
Appendix E	16
Appendix F	17
Appendix G	18
Appendix H	19
Appendix I	20
Appendix J	21
Appendix K	22
Appendix L	23
Appendix M	24
Appendix N	25
Appendix O	26
Appendix P	27
Appendix Q	28
Appendix R	29
Appendix S	30
Appendix T	31
Appendix U	32
Appendix V	33
Appendix W	34
Appendix X	35
Appendix Y	36
Appendix Z	37
Appendix AA	38
Appendix AB	39
Appendix AC	40
Appendix AD	41
Appendix AE	42
Appendix AF	43
Appendix AG	44
Appendix AH	45
Appendix AI	46
Appendix AJ	47
Appendix AK	48
Appendix AL	49
Appendix AM	50
Appendix AN	51
Appendix AO	52
Appendix AP	53
Appendix AQ	54
Appendix AR	55
Appendix AS	56
Appendix AT	57
Appendix AU	58
Appendix AV	59
Appendix AW	60
Appendix AX	61
Appendix AY	62
Appendix AZ	63
Appendix BA	64
Appendix BB	65
Appendix BC	66
Appendix BD	67
Appendix BE	68
Appendix BF	69
Appendix BG	70
Appendix BH	71
Appendix BI	72
Appendix BJ	73
Appendix BK	74
Appendix BL	75
Appendix BM	76
Appendix BN	77
Appendix BO	78
Appendix BP	79
Appendix BQ	80
Appendix BR	81
Appendix BS	82
Appendix BT	83
Appendix BU	84
Appendix BV	85
Appendix BW	86
Appendix BX	87
Appendix BY	88
Appendix BZ	89
Appendix CA	90
Appendix CB	91
Appendix CC	92
Appendix CD	93
Appendix CE	94
Appendix CF	95
Appendix CG	96
Appendix CH	97
Appendix CI	98
Appendix CJ	99
Appendix CK	100
Appendix CL	101
Appendix CM	102
Appendix CN	103
Appendix CO	104
Appendix CP	105
Appendix CQ	106
Appendix CR	107
Appendix CS	108
Appendix CT	109
Appendix CU	110
Appendix CV	111
Appendix CW	112
Appendix CX	113
Appendix CY	114
Appendix CZ	115
Appendix DA	116
Appendix DB	117
Appendix DC	118
Appendix DD	119
Appendix DE	120
Appendix DF	121
Appendix DG	122
Appendix DH	123
Appendix DI	124
Appendix DJ	125
Appendix DK	126
Appendix DL	127
Appendix DM	128
Appendix DN	129
Appendix DO	130
Appendix DP	131
Appendix DQ	132
Appendix DR	133
Appendix DS	134
Appendix DT	135
Appendix DU	136
Appendix DV	137
Appendix DW	138
Appendix DX	139
Appendix DY	140
Appendix DZ	141
Appendix EA	142
Appendix EB	143
Appendix EC	144
Appendix ED	145
Appendix EE	146
Appendix EF	147
Appendix EG	148
Appendix EH	149
Appendix EI	150
Appendix EJ	151
Appendix EK	152
Appendix EL	153
Appendix EM	154
Appendix EN	155
Appendix EO	156
Appendix EP	157
Appendix EQ	158
Appendix ER	159
Appendix ES	160
Appendix ET	161
Appendix EU	162
Appendix EV	163
Appendix EW	164
Appendix EX	165
Appendix EY	166
Appendix EZ	167
Appendix FA	168
Appendix FB	169
Appendix FC	170
Appendix FD	171
Appendix FE	172
Appendix FF	173
Appendix FG	174
Appendix FH	175
Appendix FI	176
Appendix FJ	177
Appendix FK	178
Appendix FL	179
Appendix FM	180
Appendix FN	181
Appendix FO	182
Appendix FP	183
Appendix FQ	184
Appendix FR	185
Appendix FS	186
Appendix FT	187
Appendix FU	188
Appendix FV	189
Appendix FW	190
Appendix FX	191
Appendix FY	192
Appendix FZ	193
Appendix GA	194
Appendix GB	195
Appendix GC	196
Appendix GD	197
Appendix GE	198
Appendix GF	199
Appendix GG	200
Appendix GH	201
Appendix GI	202
Appendix GJ	203
Appendix GK	204
Appendix GL	205
Appendix GM	206
Appendix GN	207
Appendix GO	208
Appendix GP	209
Appendix GQ	210
Appendix GR	211
Appendix GS	212
Appendix GT	213
Appendix GU	214
Appendix GV	215
Appendix GW	216
Appendix GX	217
Appendix GY	218
Appendix GZ	219
Appendix HA	220
Appendix HB	221
Appendix HC	222
Appendix HD	223
Appendix HE	224
Appendix HF	225
Appendix HG	226
Appendix HH	227
Appendix HI	228
Appendix HJ	229
Appendix HK	230
Appendix HL	231
Appendix HM	232
Appendix HN	233
Appendix HO	234
Appendix HP	235
Appendix HQ	236
Appendix HR	237
Appendix HS	238
Appendix HT	239
Appendix HU	240
Appendix HV	241
Appendix HW	242
Appendix HX	243
Appendix HY	244
Appendix HZ	245
Appendix IA	246
Appendix IB	247
Appendix IC	248
Appendix ID	249
Appendix IE	250
Appendix IF	251
Appendix IG	252
Appendix IH	253
Appendix II	254
Appendix IJ	255
Appendix IK	256
Appendix IL	257
Appendix IM	258
Appendix IN	259
Appendix IO	260
Appendix IP	261
Appendix IQ	262
Appendix IR	263
Appendix IS	264
Appendix IT	265
Appendix IU	266
Appendix IV	267
Appendix IW	268
Appendix IX	269
Appendix IY	270
Appendix IZ	271
Appendix JA	272
Appendix JB	273
Appendix JC	274
Appendix JD	275
Appendix JE	276
Appendix JF	277
Appendix JG	278
Appendix JH	279
Appendix JI	280
Appendix JJ	281
Appendix JK	282
Appendix JL	283
Appendix JM	284
Appendix JN	285
Appendix JO	286
Appendix JP	287
Appendix JQ	288
Appendix JR	289
Appendix JS	290
Appendix JT	291
Appendix JU	292
Appendix JV	293
Appendix JW	294
Appendix JX	295
Appendix JY	296
Appendix JZ	297
Appendix KA	298
Appendix KB	299
Appendix KC	300
Appendix KD	301
Appendix KE	302
Appendix KF	303
Appendix KG	304
Appendix KH	305
Appendix KI	306
Appendix KJ	307
Appendix KK	308
Appendix KL	309
Appendix KM	310
Appendix KN	311
Appendix KO	312
Appendix KP	313
Appendix KQ	314
Appendix KR	315
Appendix KS	316
Appendix KT	317
Appendix KU	318
Appendix KV	319
Appendix KW	320
Appendix KX	321
Appendix KY	322
Appendix KZ	323
Appendix LA	324
Appendix LB	325
Appendix LC	326
Appendix LD	327
Appendix LE	328
Appendix LF	329
Appendix LG	330
Appendix LH	331
Appendix LI	332
Appendix LJ	333
Appendix LK	334
Appendix LL	335
Appendix LM	336
Appendix LN	337
Appendix LO	338
Appendix LP	339
Appendix LQ	340
Appendix LR	341
Appendix LS	342
Appendix LT	343
Appendix LU	344
Appendix LV	345
Appendix LW	346
Appendix LX	347
Appendix LY	348
Appendix LZ	349
Appendix MA	350
Appendix MB	351
Appendix MC	352
Appendix MD	353
Appendix ME	354
Appendix MF	355
Appendix MG	356
Appendix MH	357
Appendix MI	358
Appendix MJ	359
Appendix MK	360
Appendix ML	361
Appendix MM	362
Appendix MN	363
Appendix MO	364
Appendix MP	365
Appendix MQ	366
Appendix MR	367
Appendix MS	368
Appendix MT	369
Appendix MU	370
Appendix MV	371
Appendix MW	372
Appendix MX	373
Appendix MY	374
Appendix MZ	375
Appendix NA	376
Appendix NB	377
Appendix NC	378
Appendix ND	379
Appendix NE	380
Appendix NF	381
Appendix NG	382
Appendix NH	383
Appendix NI	384
Appendix NJ	385
Appendix NK	386
Appendix NL	387
Appendix NM	388
Appendix NN	389
Appendix NO	390
Appendix NP	391
Appendix NQ	392
Appendix NR	393
Appendix NS	394
Appendix NT	395
Appendix NU	396
Appendix NV	397
Appendix NW	398
Appendix NX	399
Appendix NY	400
Appendix NZ	401
Appendix OA	402
Appendix OB	403
Appendix OC	404
Appendix OD	405
Appendix OE	406
Appendix OF	407
Appendix OG	408
Appendix OH	409
Appendix OI	410
Appendix OJ	411
Appendix OK	412
Appendix OL	413
Appendix OM	414
Appendix ON	415
Appendix OO	416
Appendix OP	417
Appendix OQ	418
Appendix OR	419
Appendix OS	420
Appendix OT	421
Appendix OU	422
Appendix OV	423
Appendix OW	424
Appendix OX	425
Appendix OY	426
Appendix OZ	427
Appendix PA	428
Appendix PB	429
Appendix PC	430
Appendix PD	431
Appendix PE	432
Appendix PF	433
Appendix PG	434
Appendix PH	435
Appendix PI	436
Appendix PJ	437
Appendix PK	438
Appendix PL	439
Appendix PM	440
Appendix PN	441
Appendix PO	442
Appendix PP	443
Appendix PQ	444
Appendix PR	445
Appendix PS	446
Appendix PT	447
Appendix PU	448
Appendix PV	449
Appendix PW	450
Appendix PX	451
Appendix PY	452
Appendix PZ	453
Appendix QA	454
Appendix QB	455
Appendix QC	456
Appendix QD	457
Appendix QE	458
Appendix QF	459
Appendix QG	460
Appendix QH	461
Appendix QI	462
Appendix QJ	463
Appendix QK	464
Appendix QL	465
Appendix QM	466
Appendix QN	467
Appendix QO	468
Appendix QP	469
Appendix QQ	470
Appendix QR	471
Appendix QS	472
Appendix QT	473
Appendix QU	474
Appendix QV	475
Appendix QW	476
Appendix QX	477
Appendix QY	478
Appendix QZ	479
Appendix RA	480
Appendix RB	481
Appendix RC	482
Appendix RD	483
Appendix RE	484
Appendix RF	485
Appendix RG	486
Appendix RH	487
Appendix RI	488
Appendix RJ	489
Appendix RK	490
Appendix RL	491
Appendix RM	492
Appendix RN	493
Appendix RO	494
Appendix RP	495
Appendix RQ	496
Appendix RR	497
Appendix RS	498
Appendix RT	499
Appendix RU	500
Appendix RV	501
Appendix RW	502
Appendix RX	503
Appendix RY	504
Appendix RZ	505
Appendix SA	506
Appendix SB	507
Appendix SC	508
Appendix SD	509
Appendix SE	510
Appendix SF	511
Appendix SG	512
Appendix SH	513
Appendix SI	514
Appendix SJ	515
Appendix SK	516
Appendix SL	517
Appendix SM	518
Appendix SN	519
Appendix SO	520
Appendix SP	521
Appendix SQ	522
Appendix SR	523
Appendix SS	524
Appendix ST	525
Appendix SU	526
Appendix SV	527
Appendix SW	528
Appendix SX	529
Appendix SY	530
Appendix SZ	531
Appendix TA	532
Appendix TB	533
Appendix TC	534
Appendix TD	535
Appendix TE	536
Appendix TF	537
Appendix TG	538
Appendix TH	539
Appendix TI	540
Appendix TJ	541
Appendix TK	542
Appendix TL	543
Appendix TM	544
Appendix TN	545
Appendix TO	546
Appendix TP	547
Appendix TQ	548
Appendix TR	549
Appendix TS	550
Appendix TT	551
Appendix TU	552
Appendix TV	553
Appendix TW	554
Appendix TX	555
Appendix TY	556
Appendix TZ	557
Appendix UA	558
Appendix UB	559
Appendix UC	560
Appendix UD	561
Appendix UE	562
Appendix UF	563
Appendix UG	564
Appendix UH	565
Appendix UI	566
Appendix UJ	567
Appendix UK	568
Appendix UL	569
Appendix UM	570
Appendix UN	571
Appendix UO	572
Appendix UP	573
Appendix UQ	574
Appendix UR	575
Appendix US	576
Appendix UT	577
Appendix UU	578
Appendix UV	579
Appendix UW	580
Appendix UX	581
Appendix UY	582
Appendix UZ	583
Appendix VA	584
Appendix VB	585
Appendix VC	586
Appendix VD	587
Appendix VE	588
Appendix VF	589
Appendix VG	590
Appendix VH	591
Appendix VI	592
Appendix VJ	593
Appendix VK	594
Appendix VL	595
Appendix VM	596
Appendix VN	597
Appendix VO	598
Appendix VP	599
Appendix VQ	600
Appendix VR	601
Appendix VS	602
Appendix VT	603
Appendix VU	604
Appendix VV	605
Appendix VW	60



Korfil HI-R
Korfil HI-R-H
Spec-Brik HI-R

Product Features

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Pre-insulated Masonry

Pre-insulated masonry allows the construction of insulated wall assemblies where one or both of the interior or exterior wall surfaces can offer the durability and aesthetics of masonry exposure. The systems are designed so that the insulation remains in place even where reinforcement and grout are placed so that there is no compromise to the wall's thermal performance. The International Energy Conservation Code does not require either an additional exterior wall envelope or a vapor barrier for these moisture tolerant load bearing systems.

For moisture control, these walls use a "belt and suspenders" approach. Multiple measures resist moisture penetration. The Spec Thermal units and the mortar contain integral water repellent. A Post-Applied clear breathable water repellent sealer is applied to the exterior of the wall system. The interlocking insulation inserts provide additional resistance to wind driven rain. When partially grouted, drainage is provided in the cores to the flashing and weep systems. When fully grouted, no flashing or weeps are necessary except adjacent to certain openings in the wall.

The wall systems presented in this manual can be fully grouted or partially grouted (the HI-R-H system is available only with full grout). Typically the two approaches will be similar in cost, and fully grouted structures may offer a simpler approach to moisture control. When fully grouted, the system is deemed to comply with the International Energy Conservation Code's air barrier requirements. Fully grouted structures also do not require flashing, weeps, drainage tubes or vents except possibly adjacent to certain wall openings.

When partially grouted, several Code-based methods, including application of block fillers, paints or sealants can be employed to provide an air barrier.

Both approaches will yield excellent results when properly detailed.

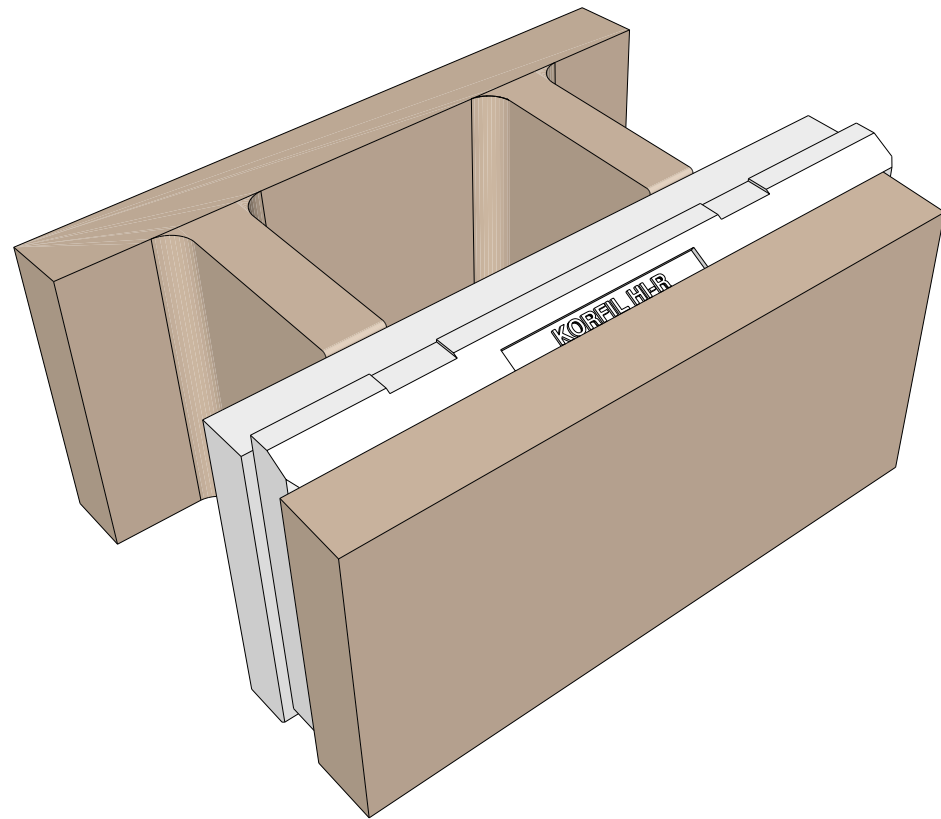


Many Aesthetic Options

Table of Contents	
Introduction	1
Chapter 1: Pre-Insulated Masonry	2
Chapter 2: Insulated Concrete Forms	3
Chapter 3: Autoclaved Aerated Concrete	4
Chapter 4: Structural Insulated Panels	5
Chapter 5: Insulated Concrete Blocks	6
Chapter 6: Insulated Concrete Panels	7
Chapter 7: Insulated Concrete Blocks	8
Chapter 8: Insulated Concrete Panels	9
Chapter 9: Insulated Concrete Blocks	10
Chapter 10: Insulated Concrete Panels	11
Chapter 11: Insulated Concrete Blocks	12
Chapter 12: Insulated Concrete Panels	13
Chapter 13: Insulated Concrete Blocks	14
Chapter 14: Insulated Concrete Panels	15
Chapter 15: Insulated Concrete Blocks	16
Chapter 16: Insulated Concrete Panels	17
Chapter 17: Insulated Concrete Blocks	18
Chapter 18: Insulated Concrete Panels	19
Chapter 19: Insulated Concrete Blocks	20
Chapter 20: Insulated Concrete Panels	21
Chapter 21: Insulated Concrete Blocks	22
Chapter 22: Insulated Concrete Panels	23
Chapter 23: Insulated Concrete Blocks	24
Chapter 24: Insulated Concrete Panels	25
Chapter 25: Insulated Concrete Blocks	26
Chapter 26: Insulated Concrete Panels	27
Chapter 27: Insulated Concrete Blocks	28
Chapter 28: Insulated Concrete Panels	29
Chapter 29: Insulated Concrete Blocks	30
Chapter 30: Insulated Concrete Panels	31
Chapter 31: Insulated Concrete Blocks	32
Chapter 32: Insulated Concrete Panels	33
Chapter 33: Insulated Concrete Blocks	34
Chapter 34: Insulated Concrete Panels	35
Chapter 35: Insulated Concrete Blocks	36
Chapter 36: Insulated Concrete Panels	37
Chapter 37: Insulated Concrete Blocks	38
Chapter 38: Insulated Concrete Panels	39
Chapter 39: Insulated Concrete Blocks	40
Chapter 40: Insulated Concrete Panels	41
Chapter 41: Insulated Concrete Blocks	42
Chapter 42: Insulated Concrete Panels	43
Chapter 43: Insulated Concrete Blocks	44
Chapter 44: Insulated Concrete Panels	45
Chapter 45: Insulated Concrete Blocks	46
Chapter 46: Insulated Concrete Panels	47
Chapter 47: Insulated Concrete Blocks	48
Chapter 48: Insulated Concrete Panels	49
Chapter 49: Insulated Concrete Blocks	50
Chapter 50: Insulated Concrete Panels	51
Chapter 51: Insulated Concrete Blocks	52
Chapter 52: Insulated Concrete Panels	53
Chapter 53: Insulated Concrete Blocks	54
Chapter 54: Insulated Concrete Panels	55
Chapter 55: Insulated Concrete Blocks	56
Chapter 56: Insulated Concrete Panels	57
Chapter 57: Insulated Concrete Blocks	58
Chapter 58: Insulated Concrete Panels	59
Chapter 59: Insulated Concrete Blocks	60
Chapter 60: Insulated Concrete Panels	61
Chapter 61: Insulated Concrete Blocks	62
Chapter 62: Insulated Concrete Panels	63
Chapter 63: Insulated Concrete Blocks	64
Chapter 64: Insulated Concrete Panels	65
Chapter 65: Insulated Concrete Blocks	66
Chapter 66: Insulated Concrete Panels	67
Chapter 67: Insulated Concrete Blocks	68
Chapter 68: Insulated Concrete Panels	69
Chapter 69: Insulated Concrete Blocks	70
Chapter 70: Insulated Concrete Panels	71
Chapter 71: Insulated Concrete Blocks	72
Chapter 72: Insulated Concrete Panels	73
Chapter 73: Insulated Concrete Blocks	74
Chapter 74: Insulated Concrete Panels	75
Chapter 75: Insulated Concrete Blocks	76
Chapter 76: Insulated Concrete Panels	77
Chapter 77: Insulated Concrete Blocks	78
Chapter 78: Insulated Concrete Panels	79
Chapter 79: Insulated Concrete Blocks	80
Chapter 80: Insulated Concrete Panels	81
Chapter 81: Insulated Concrete Blocks	82
Chapter 82: Insulated Concrete Panels	83
Chapter 83: Insulated Concrete Blocks	84
Chapter 84: Insulated Concrete Panels	85
Chapter 85: Insulated Concrete Blocks	86
Chapter 86: Insulated Concrete Panels	87
Chapter 87: Insulated Concrete Blocks	88
Chapter 88: Insulated Concrete Panels	89
Chapter 89: Insulated Concrete Blocks	90
Chapter 90: Insulated Concrete Panels	91
Chapter 91: Insulated Concrete Blocks	92
Chapter 92: Insulated Concrete Panels	93
Chapter 93: Insulated Concrete Blocks	94
Chapter 94: Insulated Concrete Panels	95
Chapter 95: Insulated Concrete Blocks	96
Chapter 96: Insulated Concrete Panels	97
Chapter 97: Insulated Concrete Blocks	98
Chapter 98: Insulated Concrete Panels	99
Chapter 99: Insulated Concrete Blocks	100
Chapter 100: Insulated Concrete Panels	101
Chapter 101: Insulated Concrete Blocks	102
Chapter 102: Insulated Concrete Panels	103
Chapter 103: Insulated Concrete Blocks	104
Chapter 104: Insulated Concrete Panels	105
Chapter 105: Insulated Concrete Blocks	106
Chapter 106: Insulated Concrete Panels	107
Chapter 107: Insulated Concrete Blocks	108
Chapter 108: Insulated Concrete Panels	109
Chapter 109: Insulated Concrete Blocks	110
Chapter 110: Insulated Concrete Panels	111
Chapter 111: Insulated Concrete Blocks	112
Chapter 112: Insulated Concrete Panels	113
Chapter 113: Insulated Concrete Blocks	114
Chapter 114: Insulated Concrete Panels	115
Chapter 115: Insulated Concrete Blocks	116
Chapter 116: Insulated Concrete Panels	117
Chapter 117: Insulated Concrete Blocks	118
Chapter 118: Insulated Concrete Panels	119
Chapter 119: Insulated Concrete Blocks	120
Chapter 120: Insulated Concrete Panels	121
Chapter 121: Insulated Concrete Blocks	122
Chapter 122: Insulated Concrete Panels	123
Chapter 123: Insulated Concrete Blocks	124
Chapter 124: Insulated Concrete Panels	125
Chapter 125: Insulated Concrete Blocks	126
Chapter 126: Insulated Concrete Panels	127
Chapter 127: Insulated Concrete Blocks	128
Chapter 128: Insulated Concrete Panels	129
Chapter 129: Insulated Concrete Blocks	130
Chapter 130: Insulated Concrete Panels	131
Chapter 131: Insulated Concrete Blocks	132
Chapter 132: Insulated Concrete Panels	133
Chapter 133: Insulated Concrete Blocks	134
Chapter 134: Insulated Concrete Panels	135
Chapter 135: Insulated Concrete Blocks	136
Chapter 136: Insulated Concrete Panels	137
Chapter 137: Insulated Concrete Blocks	138
Chapter 138: Insulated Concrete Panels	139
Chapter 139: Insulated Concrete Blocks	140
Chapter 140: Insulated Concrete Panels	141
Chapter 141: Insulated Concrete Blocks	142
Chapter 142: Insulated Concrete Panels	143
Chapter 143: Insulated Concrete Blocks	144
Chapter 144: Insulated Concrete Panels	145
Chapter 145: Insulated Concrete Blocks	146
Chapter 146: Insulated Concrete Panels	147
Chapter 147: Insulated Concrete Blocks	148
Chapter 148: Insulated Concrete Panels	149
Chapter 149: Insulated Concrete Blocks	150
Chapter 150: Insulated Concrete Panels	151
Chapter 151: Insulated Concrete Blocks	152
Chapter 152: Insulated Concrete Panels	153
Chapter 153: Insulated Concrete Blocks	154
Chapter 154: Insulated Concrete Panels	155
Chapter 155: Insulated Concrete Blocks	156
Chapter 156: Insulated Concrete Panels	157
Chapter 157: Insulated Concrete Blocks	158
Chapter 158: Insulated Concrete Panels	159
Chapter 159: Insulated Concrete Blocks	160
Chapter 160: Insulated Concrete Panels	161
Chapter 161: Insulated Concrete Blocks	162
Chapter 162: Insulated Concrete Panels	163
Chapter 163: Insulated Concrete Blocks	164
Chapter 164: Insulated Concrete Panels	165
Chapter 165: Insulated Concrete Blocks	166
Chapter 166: Insulated Concrete Panels	167
Chapter 167: Insulated Concrete Blocks	168
Chapter 168: Insulated Concrete Panels	169
Chapter 169: Insulated Concrete Blocks	170
Chapter 170: Insulated Concrete Panels	171
Chapter 171: Insulated Concrete Blocks	172
Chapter 172: Insulated Concrete Panels	173
Chapter 173: Insulated Concrete Blocks	174
Chapter 174: Insulated Concrete Panels	175
Chapter 175: Insulated Concrete Blocks	176
Chapter 176: Insulated Concrete Panels	177
Chapter 177: Insulated Concrete Blocks	178
Chapter 178: Insulated Concrete Panels	179
Chapter 179: Insulated Concrete Blocks	180
Chapter 180: Insulated Concrete Panels	181
Chapter 181: Insulated Concrete Blocks	182
Chapter 182: Insulated Concrete Panels	183
Chapter 183: Insulated Concrete Blocks	184
Chapter 184: Insulated Concrete Panels	185
Chapter 185: Insulated Concrete Blocks	186
Chapter 186: Insulated Concrete Panels	187
Chapter 187: Insulated Concrete Blocks	188
Chapter 188: Insulated Concrete Panels	189
Chapter 189: Insulated Concrete Blocks	190
Chapter 190: Insulated Concrete Panels	191
Chapter 191: Insulated Concrete Blocks	192
Chapter 192: Insulated Concrete Panels	193
Chapter 193: Insulated Concrete Blocks	194
Chapter 194: Insulated Concrete Panels	195
Chapter 195: Insulated Concrete Blocks	196
Chapter 196: Insulated Concrete Panels	197
Chapter 197: Insulated Concrete Blocks	198
Chapter 198: Insulated Concrete Panels	199
Chapter 199: Insulated Concrete Blocks	200
Chapter 200: Insulated Concrete Panels	201
Chapter 201: Insulated Concrete Blocks	202
Chapter 202: Insulated Concrete Panels	203
Chapter 203: Insulated Concrete Blocks	204
Chapter 204: Insulated Concrete Panels	205
Chapter 205: Insulated Concrete Blocks	206
Chapter 206: Insulated Concrete Panels	207
Chapter 207: Insulated Concrete Blocks	208
Chapter 208: Insulated Concrete Panels	209
Chapter 209: Insulated Concrete Blocks	210
Chapter 210: Insulated Concrete Panels	211
Chapter 211: Insulated Concrete Blocks	212
Chapter 212: Insulated Concrete Panels	213
Chapter 213: Insulated Concrete Blocks	214
Chapter 214: Insulated Concrete Panels	215
Chapter 215: Insulated Concrete Blocks	216
Chapter 216: Insulated Concrete Panels	217
Chapter 217: Insulated Concrete Blocks	218
Chapter 218: Insulated Concrete Panels	219
Chapter 219: Insulated Concrete Blocks	220
Chapter 220: Insulated Concrete Panels	221
Chapter 221: Insulated Concrete Blocks	222
Chapter 222: Insulated Concrete Panels	223
Chapter 223: Insulated Concrete Blocks	224
Chapter 224: Insulated Concrete Panels	225
Chapter 225: Insulated Concrete Blocks	226
Chapter 226: Insulated Concrete Panels	227
Chapter 227: Insulated Concrete Blocks	228
Chapter 228: Insulated Concrete Panels	229
Chapter 229: Insulated Concrete Blocks	230
Chapter 230: Insulated Concrete Panels	231
Chapter 231: Insulated Concrete Blocks	232
Chapter 232: Insulated Concrete Panels	233
Chapter 233: Insulated Concrete Blocks	234
Chapter 234: Insulated Concrete Panels	235
Chapter 235: Insulated Concrete Blocks	236
Chapter 236: Insulated Concrete Panels	237
Chapter 237: Insulated Concrete Blocks	238
Chapter 238: Insulated Concrete Panels	239
Chapter 239: Insulated Concrete Blocks	240
Chapter 240: Insulated Concrete Panels	241
Chapter 241: Insulated Concrete Blocks	242
Chapter 242: Insulated Concrete Panels	243
Chapter 243: Insulated Concrete Blocks	244
Chapter 244: Insulated Concrete Panels	245
Chapter 245: Insulated Concrete Blocks	246
Chapter 246: Insulated Concrete Panels	247
Chapter 247: Insulated Concrete Blocks	248
Chapter 248: Insulated Concrete Panels	249
Chapter 249: Insulated Concrete Blocks	250
Chapter 250: Insulated Concrete Panels	251
Chapter 251: Insulated Concrete Blocks	252
Chapter 252: Insulated Concrete Panels	253
Chapter 253: Insulated Concrete Blocks	254
Chapter 254: Insulated Concrete Panels	255
Chapter 255: Insulated Concrete Blocks	256
Chapter 256: Insulated Concrete Panels	257
Chapter 257: Insulated Concrete Blocks	258
Chapter 258: Insulated Concrete Panels	259
Chapter 259: Insulated Concrete Blocks	260
Chapter 260: Insulated Concrete Panels	261
Chapter 261: Insulated Concrete Blocks	262
Chapter 262: Insulated Concrete Panels	263
Chapter 263: Insulated Concrete Blocks	264
Chapter 264: Insulated Concrete Panels	265
Chapter 265: Insulated Concrete Blocks	266
Chapter 266: Insulated Concrete Panels	267
Chapter 267: Insulated Concrete Blocks	268
Chapter 268: Insulated Concrete Panels	269
Chapter 269: Insulated Concrete Blocks	270
Chapter 270: Insulated Concrete Panels	271
Chapter 271: Insulated Concrete Blocks	272
Chapter 272: Insulated Concrete Panels	273
Chapter 273: Insulated Concrete Blocks	274
Chapter 274: Insulated Concrete Panels	275
Chapter 275: Insulated Concrete Blocks	276
Chapter 276: Insulated Concrete Panels	277
Chapter 277: Insulated Concrete Blocks	278
Chapter 278: Insulated Concrete Panels	279
Chapter 279: Insulated Concrete Blocks	280
Chapter 280: Insulated Concrete Panels	281
Chapter 281: Insulated Concrete Blocks	282
Chapter 282: Insulated Concrete Panels	283
Chapter 283: Insulated Concrete Blocks	284
Chapter 284: Insulated Concrete Panels	285
Chapter 285: Insulated Concrete Blocks	286
Chapter 286: Insulated Concrete Panels	287
Chapter 287: Insulated Concrete Blocks	288
Chapter 288: Insulated Concrete Panels	289
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Chapter 291: Insulated Concrete Blocks	292
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Chapter 295: Insulated Concrete Blocks	296
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Chapter 307: Insulated Concrete Blocks	308
Chapter 308: Insulated Concrete Panels	309
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Chapter 310: Insulated Concrete Panels	311
Chapter 311: Insulated Concrete Blocks	312
Chapter 312: Insulated Concrete Panels	313
Chapter 313: Insulated Concrete Blocks	314
Chapter 314: Insulated Concrete Panels	315
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Chapter 316: Insulated Concrete Panels	317
Chapter 317: Insulated Concrete Blocks	318
Chapter 318: Insulated Concrete Panels	319
Chapter 319: Insulated Concrete Blocks	320
Chapter 320: Insulated Concrete Panels	321
Chapter 321: Insulated Concrete Blocks	322
Chapter 322: Insulated Concrete Panels	323
Chapter 323: Insulated Concrete Blocks	324
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Chapter 327: Insulated Concrete Blocks	328
Chapter 328: Insulated Concrete Panels	329
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Chapter 331: Insulated Concrete Blocks	332
Chapter 332: Insulated Concrete Panels	333
Chapter 333: Insulated Concrete Blocks	334
Chapter 334: Insulated Concrete Panels	335
Chapter 335: Insulated Concrete Blocks	336
Chapter 336: Insulated Concrete Panels	337
Chapter 337: Insulated Concrete Blocks	338
Chapter 338: Insulated Concrete Panels	339
Chapter 339: Insulated Concrete Blocks	340
Chapter 340: Insulated Concrete Panels	341
Chapter 341: Insulated Concrete Blocks	342
Chapter 342: Insulated Concrete Panels	343
Chapter 343: Insulated Concrete Blocks	344
Chapter 344: Insulated Concrete Panels	345
Chapter 345: Insulated Concrete Blocks	346
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Chapter 351: Insulated Concrete Blocks	352
Chapter 352: Insulated Concrete Panels	353
Chapter 353: Insulated Concrete Blocks	354
Chapter 354: Insulated Concrete Panels	355
Chapter 355: Insulated Concrete Blocks	356
Chapter 356: Insulated Concrete Panels	357
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Chapter 361: Insulated Concrete Blocks	362
Chapter 362: Insulated Concrete Panels	363
Chapter 363: Insulated Concrete Blocks	364
Chapter 364: Insulated Concrete Panels	365
Chapter 365: Insulated Concrete Blocks	366
Chapter 366: Insulated Concrete Panels	367
Chapter 367: Insulated Concrete Blocks	368
Chapter 368: Insulated Concrete Panels	369
Chapter 369: Insulated Concrete Blocks	370
Chapter 370: Insulated Concrete Panels	371
Chapter 371: Insulated Concrete Blocks	372
Chapter 372: Insulated Concrete Panels	373
Chapter 373: Insulated Concrete Blocks	374
Chapter 374: Insulated Concrete Panels	375
Chapter 375: Insulated Concrete Blocks	376
Chapter 376: Insulated Concrete Panels	377
Chapter 377: Insulated Concrete Blocks	378
Chapter 378: Insulated Concrete Panels	379
Chapter 379: Insulated Concrete Blocks	380
Chapter 380: Insulated Concrete Panels	381
Chapter 381: Insulated Concrete Blocks	382
Chapter 382: Insulated Concrete Panels	383
Chapter 383: Insulated Concrete Blocks	384
Chapter 384: Insulated Concrete Panels	385
Chapter 385: Insulated Concrete Blocks	386
Chapter 386: Insulated Concrete Panels	387
Chapter 387: Insulated Concrete Blocks	388
Chapter 388: Insulated Concrete Panels	389
Chapter 389: Insulated Concrete Blocks	390
Chapter 390: Insulated Concrete Panels	391
Chapter 391: Insulated Concrete Blocks	392
Chapter 392: Insulated Concrete Panels	393
Chapter 393: Insulated Concrete Blocks	394
Chapter 394: Insulated Concrete Panels	395
Chapter 395: Insulated Concrete Blocks	396
Chapter 396: Insulated Concrete Panels	397
Chapter 397: Insulated Concrete Blocks	398
Chapter 398: Insulated Concrete Panels	399
Chapter 399: Insulated Concrete Blocks	400
Chapter 400: Insulated Concrete Panels	401
Chapter 401: Insulated Concrete Blocks	402
Chapter 402: Insulated Concrete Panels	403
Chapter 403: Insulated Concrete Blocks	404
Chapter 404: Insulated Concrete Panels	405
Chapter 405: Insulated Concrete Blocks	406
Chapter 406: Insulated Concrete Panels	407
Chapter 407: Insulated Concrete Blocks	408
Chapter 408: Insulated Concrete Panels	409
Chapter 409: Insulated Concrete Blocks	410
Chapter 410: Insulated Concrete Panels	411
Chapter 411: Insulated Concrete Blocks	412
Chapter 412: Insulated Concrete Panels	413
Chapter 413: Insulated Concrete Blocks	414
Chapter 414: Insulated Concrete Panels	415
Chapter 415: Insulated Concrete Blocks	416
Chapter 416: Insulated Concrete Panels	417
Chapter 417: Insulated Concrete Blocks	418
Chapter 418: Insulated Concrete Panels	419
Chapter 419: Insulated Concrete Blocks	420
Chapter 420: Insulated Concrete Panels	421
Chapter 421: Insulated Concrete Blocks	422
Chapter 422: Insulated Concrete Panels	423
Chapter 423: Insulated Concrete Blocks	424
Chapter 424: Insulated Concrete Panels	

Korfil HI-R®

Korfil HI-R® is a proven solution for the construction of energy efficient structures with a track record of several decades of successful performance. The insulation inserts and reduced web profiles provide HI-R with significant advantages over conventional masonry, while offering the durability, simplicity and aesthetic appeal of double exposed masonry. Korfil HI-R provides designers with the flexibility to meet demanding energy Codes with proven performance.



12×8×16 Korfil HI-R Unit

Table of Contents	
Introduction	1
Key Features	2
Energy Efficiency	3
Construction Efficiency	4
Compatibility and Flexibility	5
Moisture Penetration Resistance	6
Air Barrier Requirements	7
Aesthetic Choices	8
Table of Contents	9

Key Features

Energy Efficiency. The HI-R System offers thermal performance that gives designers the flexibility to meet Code requirements with a masonry wall system that uses integral insulation.

Construction Efficiency. The HI-R wall system is an efficient single wythe wall system where the insulation and interior and exterior wall finishes are all constructed in a single construction step. HI-R is an excellent choice for partially grouted walls so that materials usage efficiency is optimized.

Compatibility and Flexibility. The HI-R wall system is fully compatible with standard masonry fittings and interfaces seamlessly with other building components giving the designer unlimited detailing flexibility.

Moisture Penetration Resistance. Multiple measures resist moisture penetration. SPEC-BRIK HI-R units and the mortar contain integral water repellent. A Post-Applied clear breathable water repellent sealer is applied to the wall system. The interlocking insulation inserts provide increased resistance to wind driven rain. When partially grouted, drainage is provided in the cores to the flashing and weep systems. When fully grouted, no flashing or weeps are necessary except adjacent to certain openings in the wall.

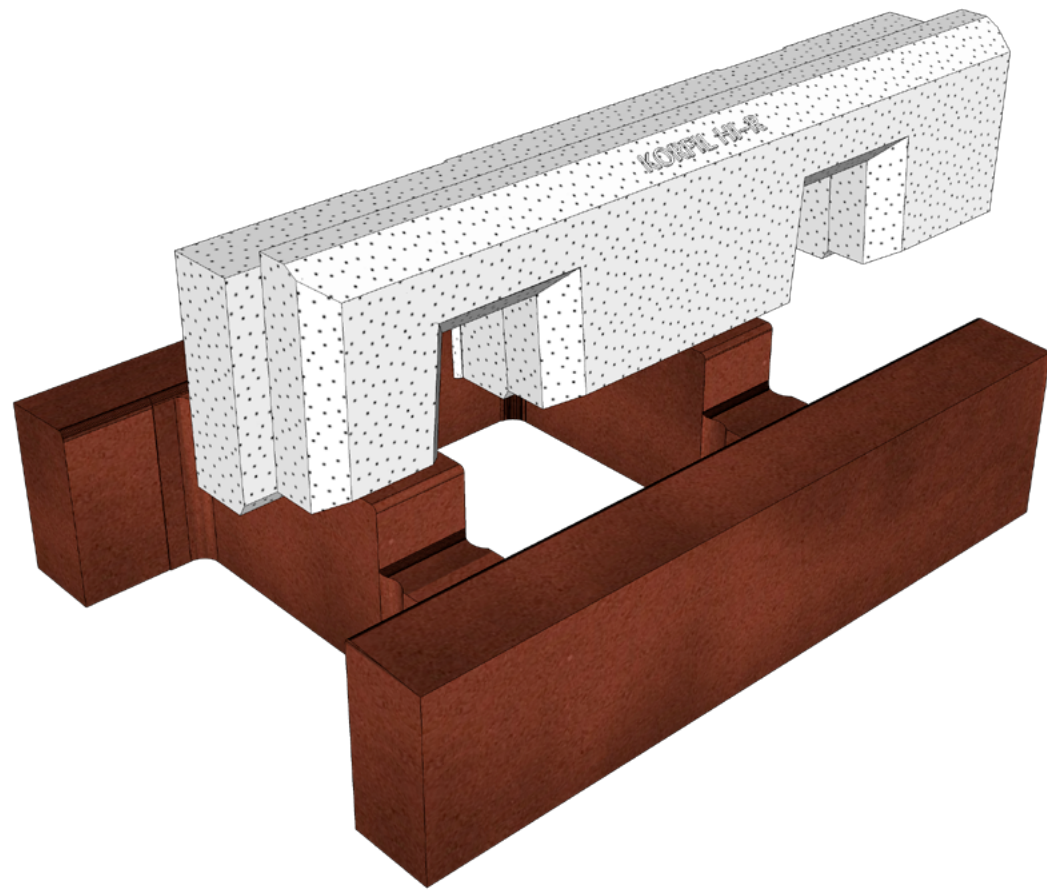
Air Barrier Requirements. When partially grouted, several Code-based methods, including application of block fillers, paints or sealants can be employed for this system. When fully grouted, the system is deemed to comply with the International Energy Conservation Code's air barrier requirements. Fully grouted structures also do not require flashing, weeps, drainage tubes or vents except possibly adjacent to certain wall openings.

Aesthetic Choices. HI-R units are available in the full range of masonry finishes and colors.



HI-R® Half High (Spec-Brik HI-R)

The **SPEC-BRIK HI-R Wall System** adds SPEC-BRIK color blends to a half high H-R unit configuration with individually molded insulation inserts. This allows the construction of walls that offer the look of brick and provide superior thermal performance to assist in meeting prevailing Codes and Standards. The **SPEC-BRIK HI-R** Masonry Unit has been designed to provide reduced thermal bridging. The system gives the designer choices for a wall system capable of achieving higher thermal R-values than conventional masonry and Code compliant designs for load resistance purposes. SPEC-BRIK HI-R units may be used in both fully and partially grouted wall assemblies with no need to remove the insulation inserts so thermal performance is uncompromised.



Spec-Brik® HI-R™

Table of Contents	
Introduction	1
Product Description	2
Installation	3
Performance	4
Specifications	5
Technical Data	6
Quality Assurance	7
Warranty	8
Contact Information	9

Key Features

Enhanced Thermal Protection. SPEC-BRIK HI-R units provide the same level of thermal performance as full height Korfil HI-R units in terms of thermal mass and insulation, providing a considerable advantage over conventional masonry and other wall systems.

Beauty. SPEC-BRIK HI-R units are offered in dimensions and blended colors that provide the look of brick at affordable costs.

Durability and Resilience. SPEC-BRIK HI-R offers the durability of double exposed masonry to protect the insulation inserts and provide a long-lasting and resilient building envelope.

Ease of Installation. SPEC-BRIK HI-R is installed using standard methods. The units come pre-assembled with the insulation inserts. Construction of standard masonry details is straightforward. Units may be saw cut to reduce web height for use as knock out bond beam units.

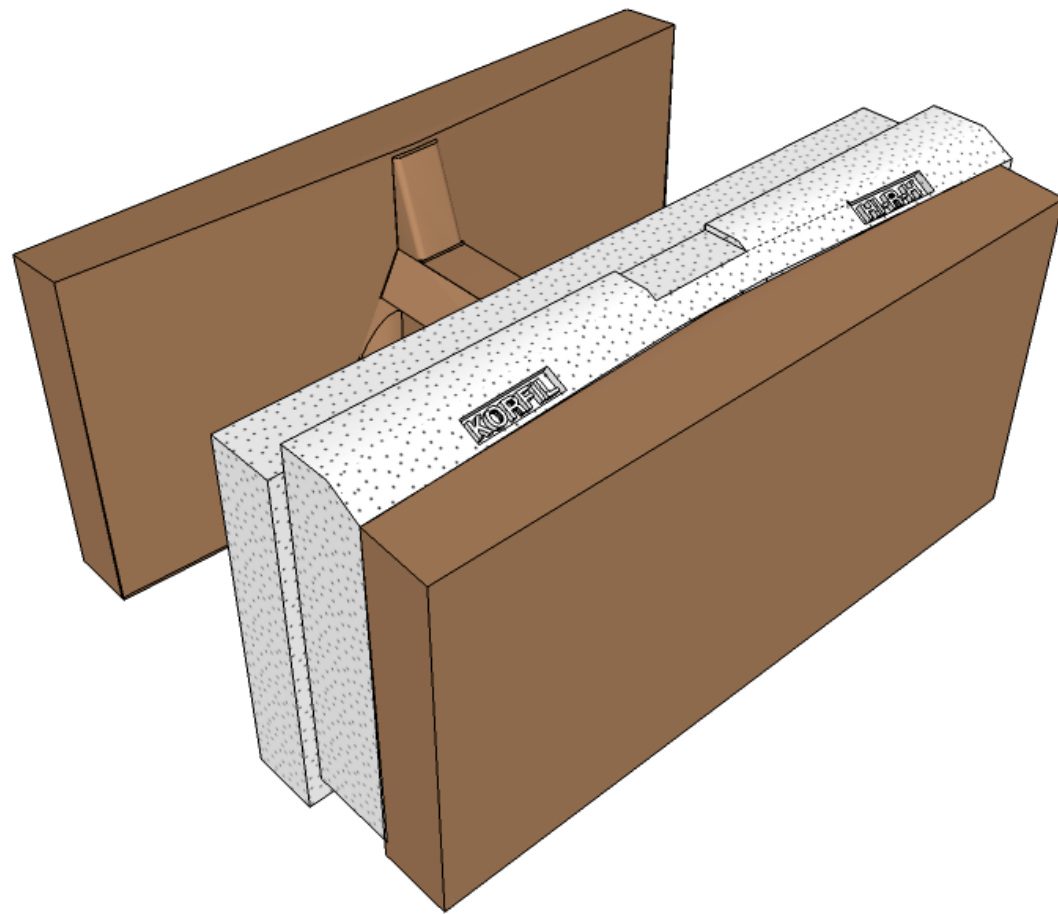
Consistent Insulation. SPEC-BRIK HI-R units can be partially or fully grouted without removing the insulation inserts, so that thermal performance is consistent through the wall structure.

Moisture Control. Multiple measures resist moisture penetration. SPEC-BRIK HI-R units and the mortar contain integral water repellent. A Post-Applied clear breathable water repellent sealer is applied to the wall system. The interlocking insulation inserts provide increased resistance to wind driven rain. When partially grouted, drainage is provided in the cores to the flashing and weep systems. When fully grouted, no flashing or weeps are necessary except adjacent to certain openings in the wall.



Korfil HI-R-H®

The HI-R-H Wall System is a high performance pre-insulated wall system intended for the most demanding climates and structural needs. The HI-R-H Masonry Unit has been designed to provide reduced thermal bridging even compared to other HI-R designs by having only a single web, and a two thicker insulation insert options. The block and the insulation are combined at the block manufacturing plant prior to delivery to the job site. The system gives the designer choices for a wall system capable of achieving higher thermal R-values than conventional masonry and Code compliant designs for load resistance purposes.



**12×8×16 Korfil HI-R-H Unit
Fully Grouted Wall Assemblies**

Table of Contents	
Introduction	1
Key Features	2
Enhanced Thermal Protection	3
Aesthetic Options	4
Structural Performance	5
Ease of Installation	6
Uncompromised Insulation	7
Table of Contents	8

Key Features

Enhanced Thermal Protection. The single web and thicker insulation insert in the HI-R-H units minimizes thermal bridging to provide the highest level of thermal performance in the Korfil HI-R product family, making HI-R-H wall systems suitable for all climate zones.

Aesthetic Options. HI-R-H units are available in a wide variety of finishes and colors, including our Spec-Brik color blends, allowing the designer unlimited choices.

Structural Performance. The HI-R-H wall system is designed for use in fully grouted wall assemblies and is a great choice for use in regions where highly reinforced walls are necessary to meet structural requirements. Its double open-ended "H" configuration eases unit installation even with tightly spaced vertical reinforcement since the units may be placed without the need to lift them over the top of the vertical reinforcement steel.

Ease of Installation. HI-R-H units are installed using standard methods. The units come pre-assembled with the insulation inserts. Construction of standard masonry details is straightforward since the units are compatible with standard masonry fittings, which may also be pre-insulated with insulation inserts. Units are suitable for construction of bond beam courses without the need for special units, modification of the masonry unit, or removal of the insulation insert.

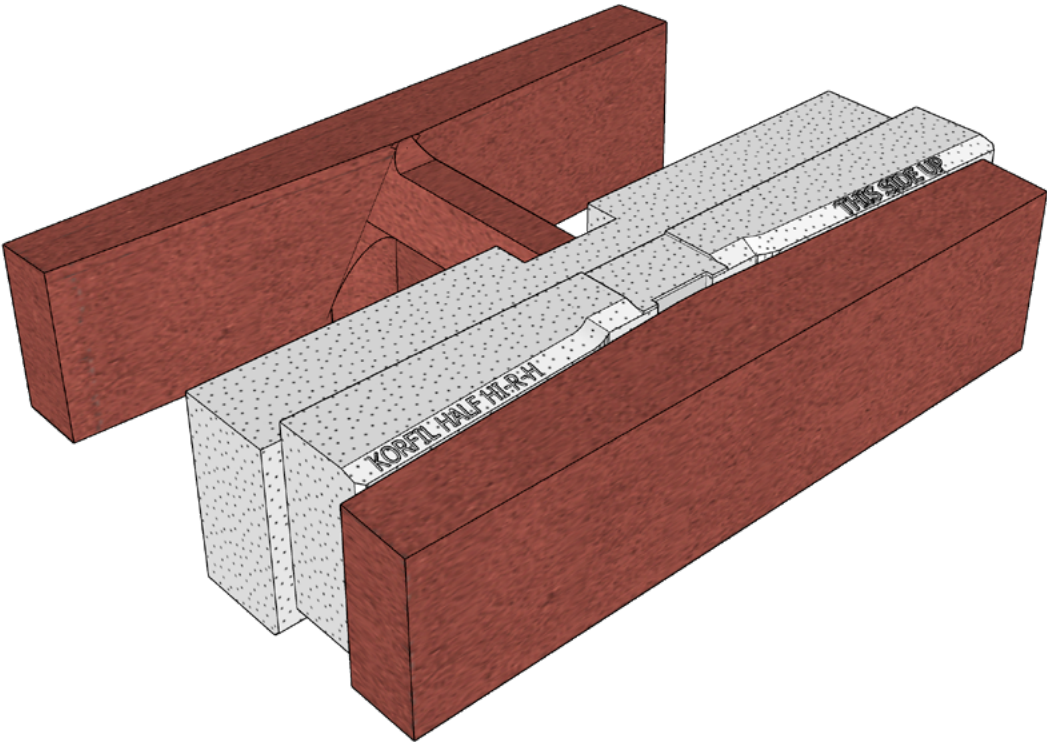
Uncompromised Insulation. HI-R-H units are designed to be fully grouted without removing the insulation inserts, so that thermal performance is uncompromised through the wall structure.



Korfil HI-R-H® Half High (Spec-Brik HI-R-H)

HI-R-H Half High is a single web pre-insulated masonry unit with 4" x 16" face dimension that is suitable for fully grouted walls intended for the most demanding climates and structural needs. When made with Spec-Brik colors, the product is called Spec-Brik HI-R-H

HI-R-H Half High has the thickest (4") inserts in the HI-R-H product line, and offers the highest level of thermal performance.



12×4×16 Korfil HI-R-H Half High Unit
Fully Grouted Wall Assemblies

Table of Contents	
Introduction	1
Product Overview	2
Technical Specifications	3
Installation Instructions	4
Quality Assurance	5
Warranty Information	6
Company Information	7
Index	8

Key Features

Aesthetics. Double exposed masonry with brick aesthetics -durable architectural finishes inside and out.

Thermal Performance. Two-part 4" nominal offset interlocking insulation insert – thickest insert currently available. Interlocking insulation covers all mortar joints. Insert uses higher density EPS to enhance thermal performance. Single partial height web for reduced thermal bridging. Thermal mass exposed to the interior, conditioned space for optimal thermal performance Fully Grouted Wall System.

Fully Grouted Wall Benefits. Barrier wall performance resists moisture penetration/condensation issues with use of integral water repellent in block and mortar and post-applied sealant. Fire resistance: Four hour fire rating is typical. No additional air barrier or vapor retarder is required with fully grouted masonry walls (assumes use of integral water repellent in unit and mortar). Great choice for structures designed to be resilient against natural hazards and for demanding applications requiring extensive reinforcement.

Construction Efficiency. Shape eases placement even with tight reinforcement spacing. No modification to stretcher unit required for bond beam construction. Utilities (plumbing and electrical) readily fit in unit cores and horizontal voids. Single trade installs interior and exterior finishes, structure and insulation in one step- no separate construction of framing, exterior veneer and insulation is required.



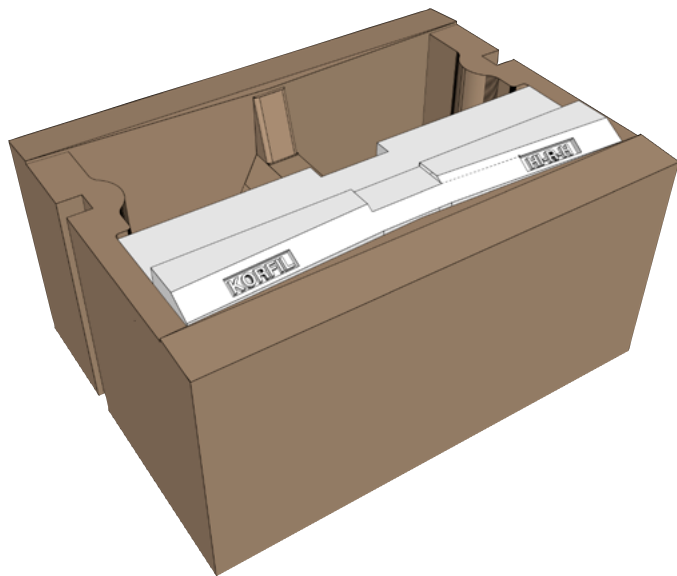
Durable Masonry Beauty – Inside and Out

Specialty Units

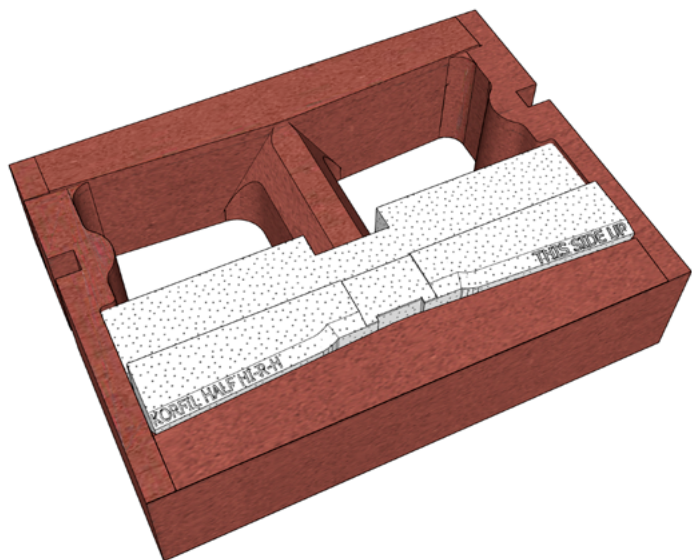
HI-R-H and HI-R-H Half High Jamb/Corner Units

Specialty Jamb and Corner Units are available for both full high and half high HI-R-H walls. When calculating the thermal values for the wall as a whole, the values associated with movement joints, jambs, corners, lintels and sills should be taken into account as part of the overall wall assembly. S

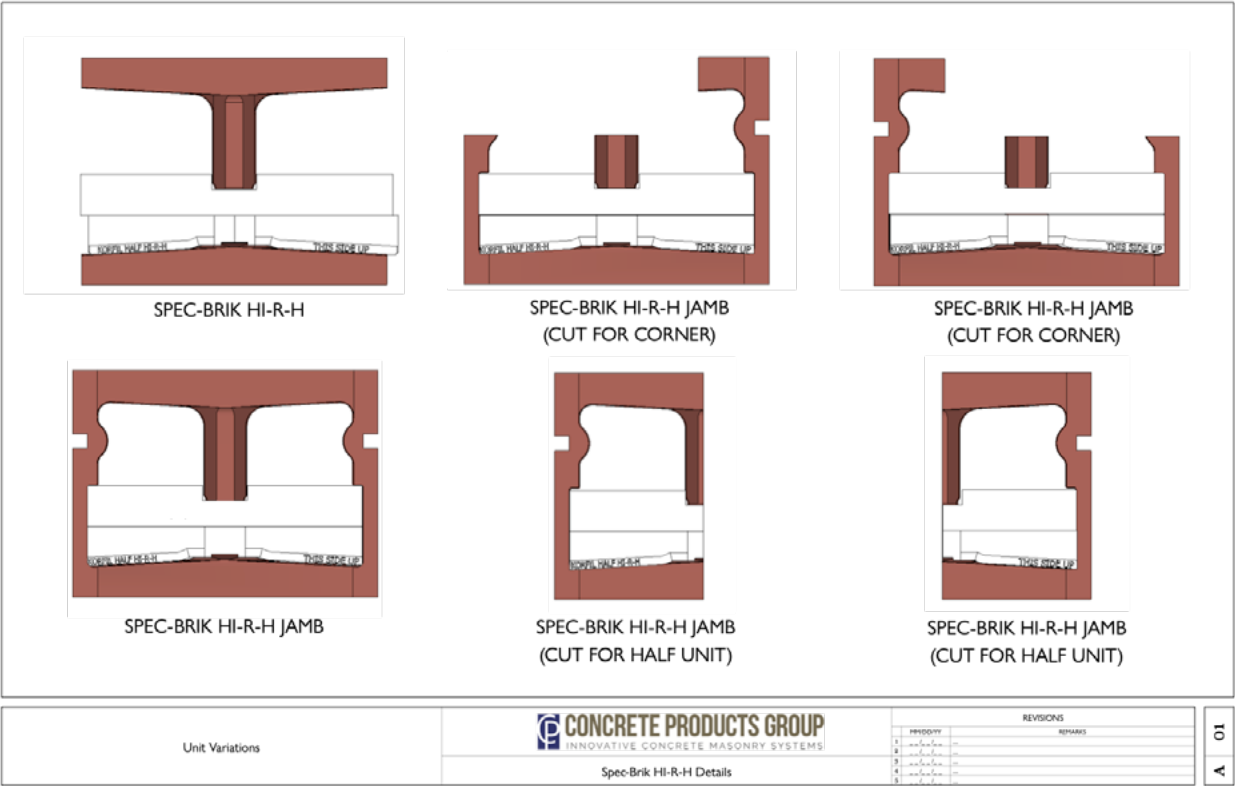
Limited to Regional Availability: check with your local manufacturer prior to specification.



12×8×16 HI-R-H Jamb/Corner Unit



12×4×16 HI-R-H Half High Jamb/Corner Unit



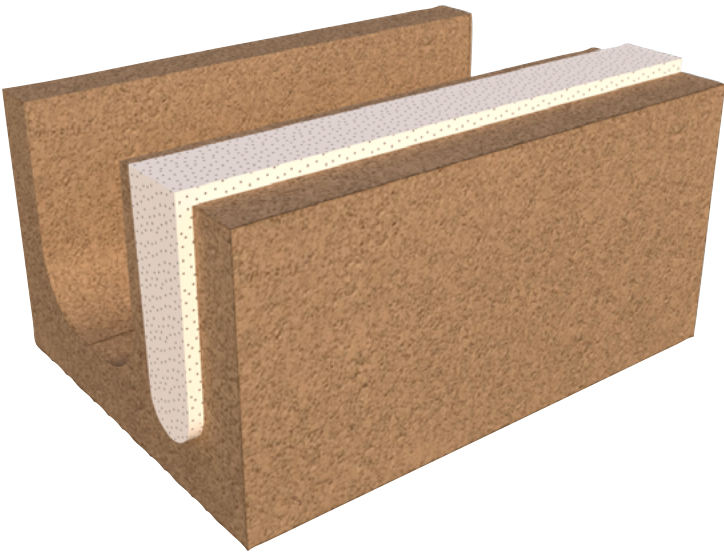
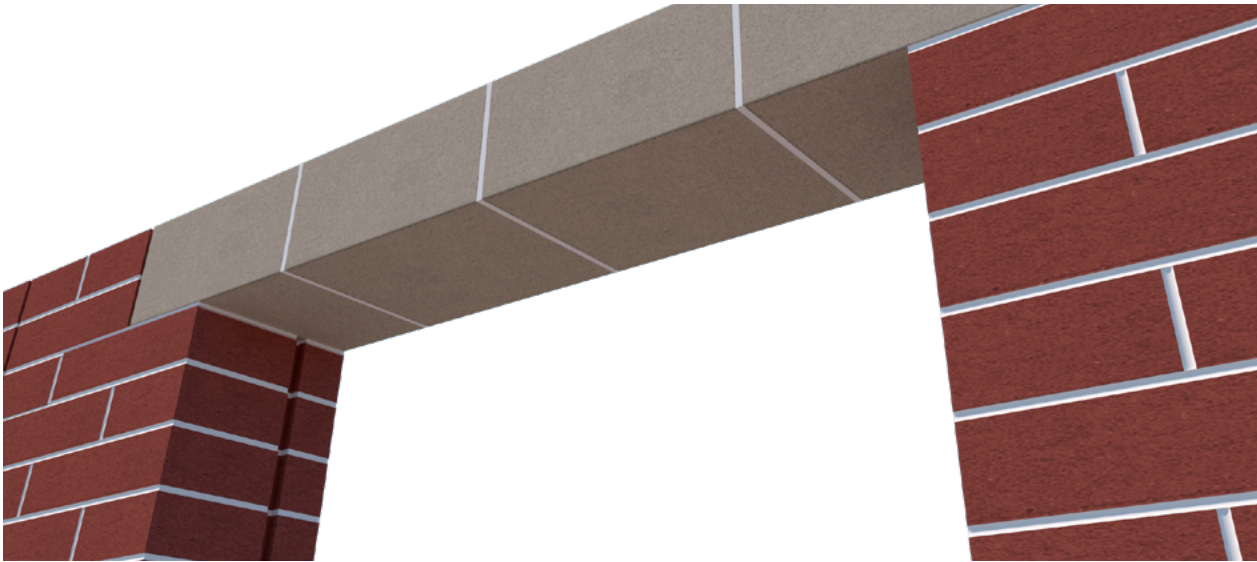
Configurations for corners, ends and jambs

Table of Contents	
1. Introduction	1
2. General Information	2
3. Product Description	3
4. Installation Instructions	4
5. Maintenance	5
6. Warranty	6
7. Contact Information	7
8. Appendix	8
9. Glossary	9
10. Index	10

Specialty Units

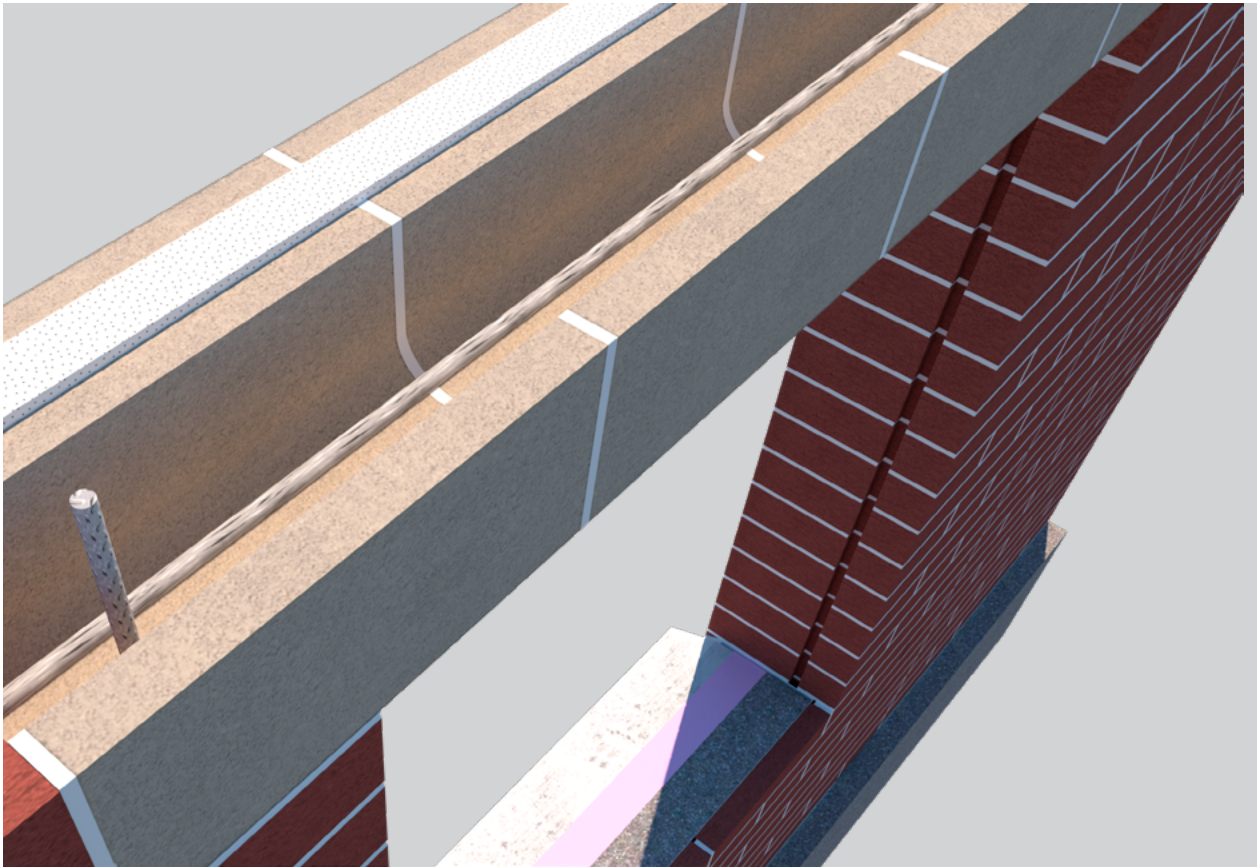
HI-R Closed Bottom Lintel Unit

This is a closed bottom, architectural lintel masonry unit that is insulated with an EPS insert to provide superior thermal performance to uninsulated traditional lintel designs. See Table X for thermal values that should be entered for the portions of the walls where this product is used. **Regional availability only: please check with your local CPG producer for local availability prior to specification.**



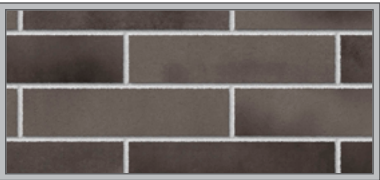
12x8x16 HI-R Lintel Unit

Table of Contents	
1. Introduction	1
2. Product Description	2
3. Installation Instructions	3
4. Technical Specifications	4
5. Thermal Performance	5
6. Environmental Impact	6
7. Safety and Handling	7
8. Maintenance	8
9. Warranty	9
10. Contact Information	10

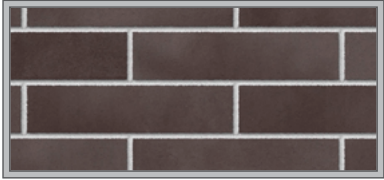


SPEC-BRIK HI-R/HI-R-H Colors

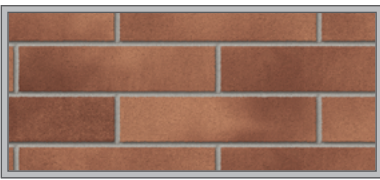
SPEC-BRIK HI-R/HI-R-H is available in 12 standard colors and custom colors are available by special order.



Basalt Blend



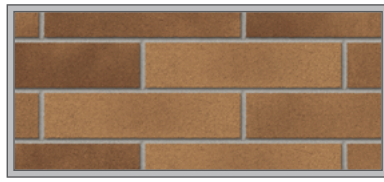
Chesapeake Blend



Delaware Blend



Flint Blend



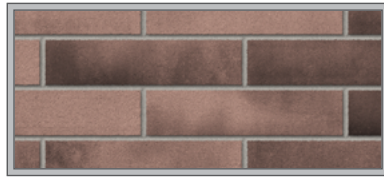
Dixon Blend



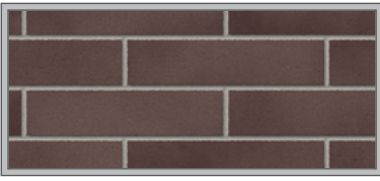
Gardner Blend



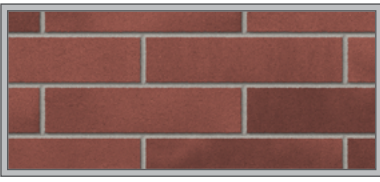
Houston Blend



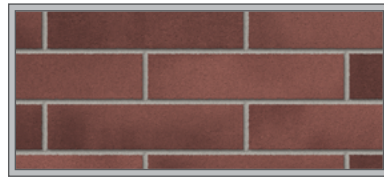
Jefferson City Blend



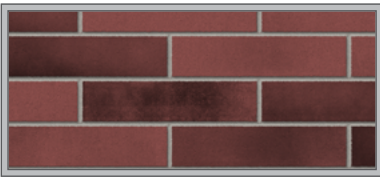
Panama City Blend



Philadelphia Blend



St. Cloud Blend



Stanton Blend

SPEC-BRIK® Colors

Other Accessory Items

Icon® insulation inserts are often used to insulate masonry fittings used with pre-insulated Korfil HI-R or HI-R-H units, for the construction of corners, jambs, wall ends or movement joints. Icon inserts are available from Concrete Block Insulating Systems, Inc.

Some of the details show the use of **Extruded Polystyrene** insulation cut to fit masonry fittings at corners, jambs, wall ends and movement joints. This is an alternative approach to provide insulation at these areas of the wall.

Flashing and Weep System. The details illustrate use of **Blockflash®** integrated pan flashing and weep system to provide drainage of moisture in the ungrouted cells of partially grouted walls. Blockflash® is a product available from Mortarnet, Inc.

We also recommend the use of a **clear, breathable post-applied sealant** along with the use of **integral water repellent** in both the mortar and block for single wythe masonry walls as part of a comprehensive strategy including proper detailing of the walls for best results to prevent of moisture penetration. The Aquaseal ME-12 sealant from Monopole, Inc. is one example of a suitable post-applied sealant.

Masonry Designer Software and Revit® Plug-in.

Masonry Designer Software is available at www.concreteproducts.com. This software allows designers to render wall sections with all CPG products and colors, including Spec-Brik, Spec-Block (grey CMU), and Spec-Split (Architectural Split face CMU). The program allows selection of both block and mortar colors, and allows experimentation with combinations of different colors and textures. A Revit® Plug-in is available from the same site to facilitate rendering models with the Spec-Brik colors.

Table of Contents	
Introduction	1
Product Overview	2
Colors	3
Textures	4
Installation	5
Accessories	6
Software	7
Revit Plug-in	8
Index	9
CONCRETE PRODUCTS GROUP	



**CONCRETE
PRODUCTS
GROUP**

Construction Notes

Table of Contents	
Introduction	1
General Information	2
Product Description	3
Installation	4
Finishing	5
Sealing	6
Maintenance	7
Technical Data	8
Index	9
CONCRETE PRODUCTS GROUP	

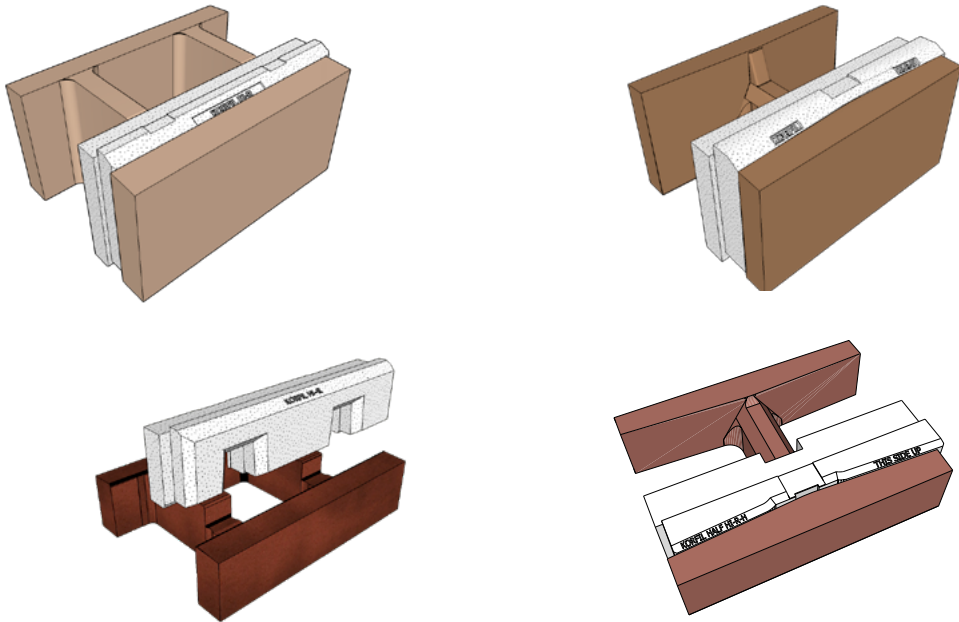
Korfil HI-R and HI-R-H Construction Notes

The following tips should be used for best results when building walls using Korfil® Hi-R and Hi-R H Wall Systems.

1.

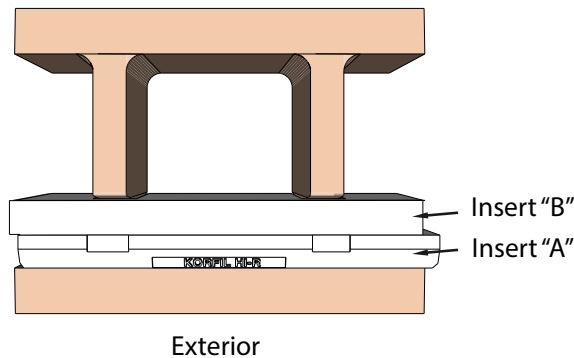
Unit and Mortar Dimensions. The Hi-R and Hi-R H systems are designed to use a 3/8" mortar joint, head and bed. The units are 1/8" taller at the inside of the face shell (7-3/4") than at the face (7-5/8") so less mortar will be required for the bed joints than conventional CMU.
2.

Install the Units "Right Side Up". Korfil Hi-R/Hi-R-H Units are pre-insulated at the manufacturer and will arrive at the job site with the insulation in place. Unlike standard CMU, these units are not inverted for installation. When the units are correctly oriented, the insert will rest on top of the webs as shown below.



3.

Locate Insulation Inserts toward the Exterior of the Wall. Typically the blocks should be oriented so that the inserts are located toward the exterior of the wall, as shown below. If your plans indicate a different orientation, check with the designer to confirm that it was intentional.



4.

After Laying Block, Tap Insert Into Place. You will notice that the inserts have two interlocking parts which are referred to as the "A" insert (located toward the exterior of the block) and the "B" Insert (located toward the interior of the block). The inserts are designed to form lapping joints when placed in the wall both with blocks located above and below and to both sides to provide superior insulation. As you build each course, be sure to tap or push the "B" Insert downwards to position it correctly to form a tight joint with the inserts below. At the end of each work day, make sure

the "B" Inserts on the top course are tapped down into place to avoid a height gain when work is recommenced due to excess mortar getting Handling Inserts on the Starter Course. Either carefully avoid leaving excess mortar under the "B" insert or remove the "B" insert on the starter course. This is done to make certain any mortar that may have fallen under the inner insert does not prevent inserts on the next course from being pushed downward.

5.

Grouting and Reinforcing Hi-R and Hi-R H Walls. The Hi-R product is suitable for both full and partial grouting. The Hi-R H products is designed for only for fully grouted walls. The webs in Hi-R blocks will align when they are placed in either a running bond or stack bond pattern providing an unobstructed cavity for grouting and re-bar placement. The reduced height of the Hi-R H single web will allow grout to flow between units and is suitable for fully grouted walls in either running or stack bond patterns. When building partially grouted Hi-R Walls, request that the webs be full height. This will eliminate the need to mortar the reduced height webs. under the insert and hardening.

Grout Information

Unit	Grout volume per unit (cubic inches)	Grout ft3 per ft2 of wall area (fully grouted)
Hi-R 8-8-16 Smooth	215.2 in ³	.140 ft ³
Hi-R 8-8-16 Split	215.2 in ³	.140 ft ³
Hi-R 10-8-16 Smooth/Split	398.8 in ³	.260 ft ³
Hi-R 12-8-16 smooth/split	582 in ³	.379 ft ³
Hi-R-12-4-16	291 in ³	.379 ft ³
Hi-R-H 12-8-16 Smooth	551 in ³	.358 ft ³
Hi-R-H 12-8-16 Split	551 in ³	.358 ft ³
Hi-R-H 10-8-16 smooth	325 in ³	.211 ft ³
Hi-R-H 10-8-16 split	325 in ³	.211 ft ³
Hi-R-H 12-4-16	241.5 in ³	.315 ft ³
Hi-R-H 12-4-16 Jamb unit	182.1 in ³	.237 ft ³

6.

Building Bond Beams. For Korfil Hi-R units, check with your local manufacturer for available bond beam units. For Hi-R H units, the standard Hi-R H unit may be used as a bond beam unit without the need for any modifications.
7.

Anticipate Vertical Rebar Placement. Provide the General Contractor information on the proper spacing and location for vertical rebar placement in grade beam to avoid having to bend rods or cut block.
8.

Joint Reinforcement Placement. The Hi-R and Hi-R H Systems work with 9-gauge Ladder Type Wall Reinforcing with butt welded center cross ties at 16 inch increments. The ties should be placed directly over webs of blocks to allow the innermost insert to be pushed down to lock with the insert below it.

Table of Contents

1

2

3

4

5

6

7

8

9

10

11

12

13

14

15

16

17

18

19

20

21

22

23

24

25

26

27

28

29

30

31

32

33

34

35

36

37

38

39

40

41

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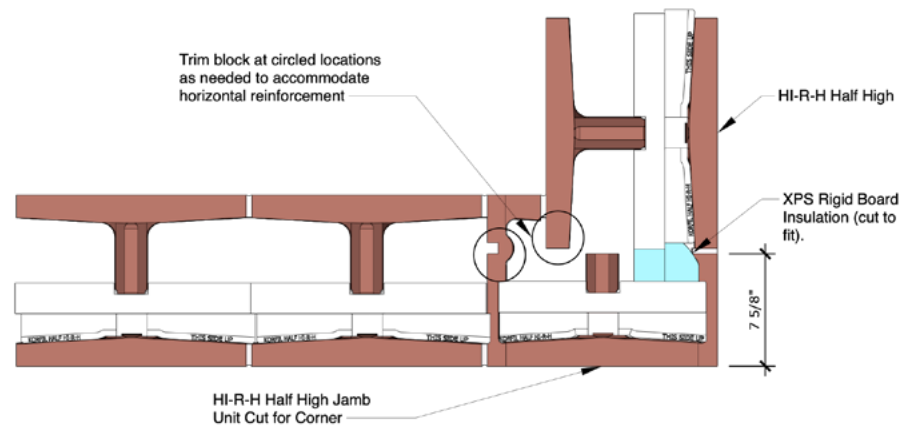
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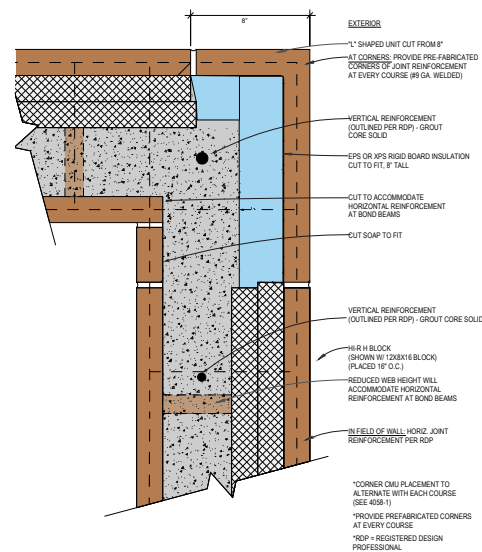
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9. **Corners.** These details can be constructed using specialty units (available regionally – check on availability) or standard masonry fittings and rigid insulation.



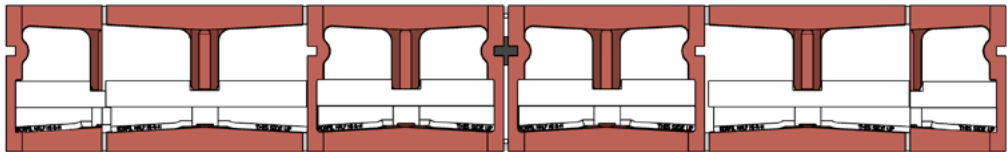
Corner Constructed Using Specialty HI-R-H Jamb and Corner Unit



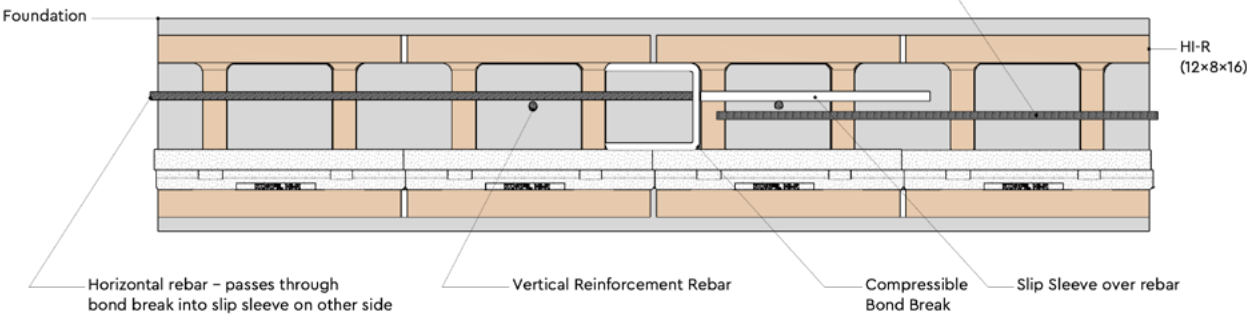
Corner Constructed Using Concrete Masonry Unit Fittings

Table of Contents	
Introduction	1
General Notes	2
Materials	3
Construction	4
Details	5
Index	6

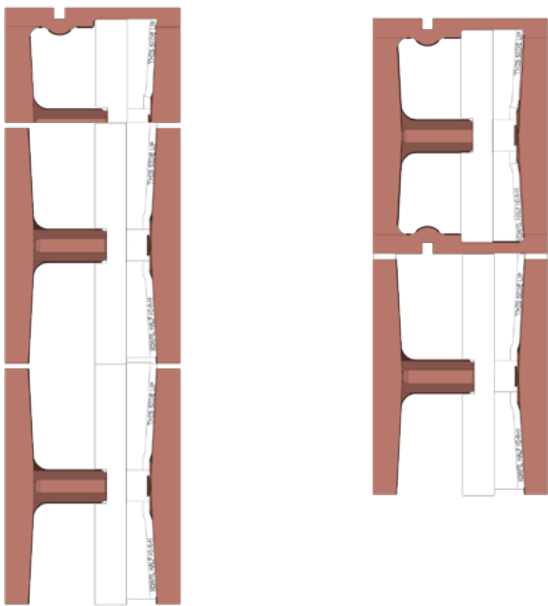
10. **Joints and Jamb.** These details can be constructed using specialty units (available regionally – check with your local manufacturer) or standard masonry fittings and rigid insulation. The HI-R-H Jamb and Corner Unit is only available in some regional markets – please check availability before specifying.



Movement Joint Constructed Using Specialty HI-R-H Jamb and Corner Unit



Michigan Style Soft Joint Constructed Using HI-R Units (Not Feasible with HI-R-H style units)



Jamb Constructed with HI-R-H/HI-R-H Half High Jamb Unit

Mortar Joints. Tool joints when mortar has reached thumbprint hardness. Avoid use of raked joints on exterior sides of walls because raked joints will encourage moisture penetration. Concave joints will offer better weather protection.

Avoid Chippage. Care should be taken in job site handling to avoid chippage and breakage. Your forklift operator should exercise caution on rough terrain.

Loadbearing Points. Delete inserts at load-bearing points directly under bar joist, pre-cast beams, etc. Consult your project architect and engineer for approval

Store or Dispose of Loose Inserts. Since the inserts are relatively light and can be moved by wind, collect and secure any loose inserts on the job site.

Architectural Masonry Construction Best Practices. For Architectural Masonry, please refer to "Spec-Brik® Construction Best Practices" available from the Concrete Products Group LLC.

For more information, contact CPG at 1-800-789-0872 or info@concreteproductsgroup.com

Table of Contents

INTRODUCTION	1
1.0 GENERAL NOTES	2
2.0 MATERIALS	3
3.0 WORKMANSHIP	4
4.0 DETAILS	5
5.0 INSTALLATION	6
6.0 MAINTENANCE	7
7.0 SAFETY	8
8.0 ENVIRONMENTAL	9
9.0 QUALITY CONTROL	10
10.0 APPENDIX	11
11.0 GLOSSARY	12
12.0 INDEX	13
13.0 REVISION HISTORY	14
14.0 CONTACT INFORMATION	15
15.0 OTHER DOCUMENTS	16
16.0 DRAWINGS	17
17.0 SPECIFICATIONS	18
18.0 SUBMITTALS	19
19.0 CONSTRUCTION SCHEDULE	20
20.0 CLOSEOUT	21
21.0 WARRANTY	22
22.0 DISCLAIMERS	23
23.0 ACKNOWLEDGMENTS	24
24.0 REFERENCES	25
25.0 OTHER	26
26.0 REVISION HISTORY	27
27.0 CONTACT INFORMATION	28
28.0 OTHER DOCUMENTS	29
29.0 DRAWINGS	30
30.0 SPECIFICATIONS	31
31.0 SUBMITTALS	32
32.0 CONSTRUCTION SCHEDULE	33
33.0 CLOSEOUT	34
34.0 WARRANTY	35
35.0 DISCLAIMERS	36
36.0 ACKNOWLEDGMENTS	37
37.0 REFERENCES	38
38.0 OTHER	39
39.0 REVISION HISTORY	40
40.0 CONTACT INFORMATION	41
41.0 OTHER DOCUMENTS	42
42.0 DRAWINGS	43
43.0 SPECIFICATIONS	44
44.0 SUBMITTALS	45
45.0 CONSTRUCTION SCHEDULE	46
46.0 CLOSEOUT	47
47.0 WARRANTY	48
48.0 DISCLAIMERS	49
49.0 ACKNOWLEDGMENTS	50
50.0 REFERENCES	51
51.0 OTHER	52
52.0 REVISION HISTORY	53
53.0 CONTACT INFORMATION	54
54.0 OTHER DOCUMENTS	55
55.0 DRAWINGS	56
56.0 SPECIFICATIONS	57
57.0 SUBMITTALS	58
58.0 CONSTRUCTION SCHEDULE	59
59.0 CLOSEOUT	60
60.0 WARRANTY	61
61.0 DISCLAIMERS	62
62.0 ACKNOWLEDGMENTS	63
63.0 REFERENCES	64
64.0 OTHER	65
65.0 REVISION HISTORY	66
66.0 CONTACT INFORMATION	67
67.0 OTHER DOCUMENTS	68
68.0 DRAWINGS	69
69.0 SPECIFICATIONS	70
70.0 SUBMITTALS	71
71.0 CONSTRUCTION SCHEDULE	72
72.0 CLOSEOUT	73
73.0 WARRANTY	74
74.0 DISCLAIMERS	75
75.0 ACKNOWLEDGMENTS	76
76.0 REFERENCES	77
77.0 OTHER	78
78.0 REVISION HISTORY	79
79.0 CONTACT INFORMATION	80
80.0 OTHER DOCUMENTS	81
81.0 DRAWINGS	82
82.0 SPECIFICATIONS	83
83.0 SUBMITTALS	84
84.0 CONSTRUCTION SCHEDULE	85
85.0 CLOSEOUT	86
86.0 WARRANTY	87
87.0 DISCLAIMERS	88
88.0 ACKNOWLEDGMENTS	89
89.0 REFERENCES	90
90.0 OTHER	91
91.0 REVISION HISTORY	92
92.0 CONTACT INFORMATION	93
93.0 OTHER DOCUMENTS	94
94.0 DRAWINGS	95
95.0 SPECIFICATIONS	96
96.0 SUBMITTALS	97
97.0 CONSTRUCTION SCHEDULE	98
98.0 CLOSEOUT	99
99.0 WARRANTY	100
100.0 DISCLAIMERS	101
101.0 ACKNOWLEDGMENTS	102
102.0 REFERENCES	103
103.0 OTHER	104
104.0 REVISION HISTORY	105
105.0 CONTACT INFORMATION	106
106.0 OTHER DOCUMENTS	107
107.0 DRAWINGS	108
108.0 SPECIFICATIONS	109
109.0 SUBMITTALS	110
110.0 CONSTRUCTION SCHEDULE	111
111.0 CLOSEOUT	112
112.0 WARRANTY	113
113.0 DISCLAIMERS	114
114.0 ACKNOWLEDGMENTS	115
115.0 REFERENCES	116
116.0 OTHER	117
117.0 REVISION HISTORY	118
118.0 CONTACT INFORMATION	119
119.0 OTHER DOCUMENTS	120
120.0 DRAWINGS	121
121.0 SPECIFICATIONS	122
122.0 SUBMITTALS	123
123.0 CONSTRUCTION SCHEDULE	124
124.0 CLOSEOUT	125
125.0 WARRANTY	126
126.0 DISCLAIMERS	127
127.0 ACKNOWLEDGMENTS	128
128.0 REFERENCES	129
129.0 OTHER	130
130.0 REVISION HISTORY	131
131.0 CONTACT INFORMATION	132
132.0 OTHER DOCUMENTS	133
133.0 DRAWINGS	134
134.0 SPECIFICATIONS	135
135.0 SUBMITTALS	136
136.0 CONSTRUCTION SCHEDULE	137
137.0 CLOSEOUT	138
138.0 WARRANTY	139
139.0 DISCLAIMERS	140
140.0 ACKNOWLEDGMENTS	141
141.0 REFERENCES	142
142.0 OTHER	143
143.0 REVISION HISTORY	144
144.0 CONTACT INFORMATION	145
145.0 OTHER DOCUMENTS	146
146.0 DRAWINGS	147
147.0 SPECIFICATIONS	148
148.0 SUBMITTALS	149
149.0 CONSTRUCTION SCHEDULE	150
150.0 CLOSEOUT	151
151.0 WARRANTY	152
152.0 DISCLAIMERS	153
153.0 ACKNOWLEDGMENTS	154
154.0 REFERENCES	155
155.0 OTHER	156
156.0 REVISION HISTORY	157
157.0 CONTACT INFORMATION	158
158.0 OTHER DOCUMENTS	159
159.0 DRAWINGS	160
160.0 SPECIFICATIONS	161
161.0 SUBMITTALS	162
162.0 CONSTRUCTION SCHEDULE	163
163.0 CLOSEOUT	164
164.0 WARRANTY	165
165.0 DISCLAIMERS	166
166.0 ACKNOWLEDGMENTS	167
167.0 REFERENCES	168
168.0 OTHER	169
169.0 REVISION HISTORY	170
170.0 CONTACT INFORMATION	171
171.0 OTHER DOCUMENTS	172
172.0 DRAWINGS	173
173.0 SPECIFICATIONS	174
174.0 SUBMITTALS	175
175.0 CONSTRUCTION SCHEDULE	176
176.0 CLOSEOUT	177
177.0 WARRANTY	178
178.0 DISCLAIMERS	179
179.0 ACKNOWLEDGMENTS	180
180.0 REFERENCES	181
181.0 OTHER	182
182.0 REVISION HISTORY	183
183.0 CONTACT INFORMATION	184
184.0 OTHER DOCUMENTS	185
185.0 DRAWINGS	186
186.0 SPECIFICATIONS	187
187.0 SUBMITTALS	188
188.0 CONSTRUCTION SCHEDULE	189
189.0 CLOSEOUT	190
190.0 WARRANTY	191
191.0 DISCLAIMERS	192
192.0 ACKNOWLEDGMENTS	193
193.0 REFERENCES	194
194.0 OTHER	195
195.0 REVISION HISTORY	196
196.0 CONTACT INFORMATION	197
197.0 OTHER DOCUMENTS	198
198.0 DRAWINGS	199
199.0 SPECIFICATIONS	200
200.0 SUBMITTALS	201
201.0 CONSTRUCTION SCHEDULE	202
202.0 CLOSEOUT	203
203.0 WARRANTY	204
204.0 DISCLAIMERS	205
205.0 ACKNOWLEDGMENTS	206
206.0 REFERENCES	207
207.0 OTHER	208
208.0 REVISION HISTORY	209
209.0 CONTACT INFORMATION	210
210.0 OTHER DOCUMENTS	211
211.0 DRAWINGS	212
212.0 SPECIFICATIONS	213
213.0 SUBMITTALS	214
214.0 CONSTRUCTION SCHEDULE	215
215.0 CLOSEOUT	216
216.0 WARRANTY	217
217.0 DISCLAIMERS	218
218.0 ACKNOWLEDGMENTS	219
219.0 REFERENCES	220
220.0 OTHER	221
221.0 REVISION HISTORY	222
222.0 CONTACT INFORMATION	223
223.0 OTHER DOCUMENTS	224
224.0 DRAWINGS	225
225.0 SPECIFICATIONS	226
226.0 SUBMITTALS	227
227.0 CONSTRUCTION SCHEDULE	228
228.0 CLOSEOUT	229
229.0 WARRANTY	230
230.0 DISCLAIMERS	231
231.0 ACKNOWLEDGMENTS	232
232.0 REFERENCES	233
233.0 OTHER	234
234.0 REVISION HISTORY	235
235.0 CONTACT INFORMATION	236
236.0 OTHER DOCUMENTS	237
237.0 DRAWINGS	238
238.0 SPECIFICATIONS	239
239.0 SUBMITTALS	240
240.0 CONSTRUCTION SCHEDULE	241
241.0 CLOSEOUT	242
242.0 WARRANTY	243
243.0 DISCLAIMERS	244
244.0 ACKNOWLEDGMENTS	245
245.0 REFERENCES	246
246.0 OTHER	247
247.0 REVISION HISTORY	248
248.0 CONTACT INFORMATION	249
249.0 OTHER DOCUMENTS	250
250.0 DRAWINGS	251
251.0 SPECIFICATIONS	252
252.0 SUBMITTALS	253
253.0 CONSTRUCTION SCHEDULE	254
254.0 CLOSEOUT	255
255.0 WARRANTY	256
256.0 DISCLAIMERS	257
257.0 ACKNOWLEDGMENTS	258
258.0 REFERENCES	259
259.0 OTHER	260
260.0 REVISION HISTORY	261
261.0 CONTACT INFORMATION	262
262.0 OTHER DOCUMENTS	263
263.0 DRAWINGS	264
264.0 SPECIFICATIONS	265
265.0 SUBMITTALS	266
266.0 CONSTRUCTION SCHEDULE	267
267.0 CLOSEOUT	268
268.0 WARRANTY	269
269.0 DISCLAIMERS	270
270.0 ACKNOWLEDGMENTS	271
271.0 REFERENCES	272
272.0 OTHER	273
273.0 REVISION HISTORY	274
274.0 CONTACT INFORMATION	275
275.0 OTHER DOCUMENTS	276
276.0 DRAWINGS	277
277.0 SPECIFICATIONS	278
278.0 SUBMITTALS	279
279.0 CONSTRUCTION SCHEDULE	280
280.0 CLOSEOUT	281
281.0 WARRANTY	282
282.0 DISCLAIMERS	283
283.0 ACKNOWLEDGMENTS	284
284.0 REFERENCES	285
285.0 OTHER	286
286.0 REVISION HISTORY	287
287.0 CONTACT INFORMATION	288
288.0 OTHER DOCUMENTS	289
289.0 DRAWINGS	290
290.0 SPECIFICATIONS	291
291.0 SUBMITTALS	292
292.0 CONSTRUCTION SCHEDULE	293
293.0 CLOSEOUT	294
294.0 WARRANTY	295
295.0 DISCLAIMERS	296
296.0 ACKNOWLEDGMENTS	297
297.0 REFERENCES	298
298.0 OTHER	299
299.0 REVISION HISTORY	300
300.0 CONTACT INFORMATION	301
301.0 OTHER DOCUMENTS	302
302.0 DRAWINGS	303
303.0 SPECIFICATIONS	304
304.0 SUBMITTALS	305
305.0 CONSTRUCTION SCHEDULE	306
306.0 CLOSEOUT	307
307.0 WARRANTY	308
308.0 DISCLAIMERS	309
309.0 ACKNOWLEDGMENTS	310
310.0 REFERENCES	311
311.0 OTHER	312
312.0 REVISION HISTORY	313
313.0 CONTACT INFORMATION	314
314.0 OTHER DOCUMENTS	315
315.0 DRAWINGS	316
316.0 SPECIFICATIONS	317
317.0 SUBMITTALS	318
318.0 CONSTRUCTION SCHEDULE	319
319.0 CLOSEOUT	320
320.0 WARRANTY	321
321.0 DISCLAIMERS	322
322.0 ACKNOWLEDGMENTS	323
323.0 REFERENCES	324
324.0 OTHER	325
325.0 REVISION HISTORY	326
326.0 CONTACT INFORMATION	327
327.0 OTHER DOCUMENTS	328
328.0 DRAWINGS	329
329.0 SPECIFICATIONS	330
330.0 SUBMITTALS	331
331.0 CONSTRUCTION SCHEDULE	332
332.0 CLOSEOUT	333
333.0 WARRANTY	334
334.0 DISCLAIMERS	335
335.0 ACKNOWLEDGMENTS	336
336.0 REFERENCES	337
337.0 OTHER	338
338.0 REVISION HISTORY	339
339.0 CONTACT INFORMATION	340
340.0 OTHER DOCUMENTS	341
341.0 DRAWINGS	342
342.0 SPECIFICATIONS	343
343.0 SUBMITTALS	344
344.0 CONSTRUCTION SCHEDULE	345
345.0 CLOSEOUT	346
346.0 WARRANTY	347
347.0 DISCLAIMERS	348
348.0 ACKNOWLEDGMENTS	349
349.0 REFERENCES	350
350.0 OTHER	351
351.0 REVISION HISTORY	352
352.0 CONTACT INFORMATION	353
353.0 OTHER DOCUMENTS	354
354.0 DRAWINGS	355
355.0 SPECIFICATIONS	356
356.0 SUBMITTALS	357
357.0 CONSTRUCTION SCHEDULE	358
358.0 CLOSEOUT	359
359.0 WARRANTY	360
360.0 DISCLAIMERS	361
361.0 ACKNOWLEDGMENTS	362
362.0 REFERENCES	363
363.0 OTHER	364
364.0 REVISION HISTORY	365
365.0 CONTACT INFORMATION	366
366.0 OTHER DOCUMENTS	367
367.0 DRAWINGS	368
368.0 SPECIFICATIONS	369
369.0 SUBMITTALS	370
370.0 CONSTRUCTION SCHEDULE	371
371.0 CLOSEOUT	372
372.0 WARRANTY	373
373.0 DISCLAIMERS	374
374.0 ACKNOWLEDGMENTS	375
375.0 REFERENCES	376
376.0 OTHER	377
377.0 REVISION HISTORY	378
378.0 CONTACT INFORMATION	379
379.0 OTHER DOCUMENTS	380
380.0 DRAWINGS	381
381.0 SPECIFICATIONS	382
382.0 SUBMITTALS	383
383.0 CONSTRUCTION SCHEDULE	384
384.0 CLOSEOUT	385
385.0 WARRANTY	386
386.0 DISCLAIMERS	387
387.0 ACKNOWLEDGMENTS	388
388.0 REFERENCES	389
389.0 OTHER	390
390.0 REVISION HISTORY	391
391.0 CONTACT INFORMATION	392
392.0 OTHER DOCUMENTS	393
393.0 DRAWINGS	394
394.0 SPECIFICATIONS	395
395.0 SUBMITTALS	396
396.0 CONSTRUCTION SCHEDULE	397
397.0 CLOSEOUT	398
398.0 WARRANTY	399
399.0 DISCLAIMERS	400
400.0 ACKNOWLEDGMENTS	401
401.0 REFERENCES	402
402.0 OTHER	403
403.0 REVISION HISTORY	404
404.0 CONTACT INFORMATION	405
405.0 OTHER DOCUMENTS	406
406.0 DRAWINGS	407
407.0 SPECIFICATIONS	408
408.0 SUBMITTALS	409
409.0 CONSTRUCTION SCHEDULE	410
410.0 CLOSEOUT	411
411.0 WARRANTY	412
412.0 DISCLAIMERS	413
413.0 ACKNOWLEDGMENTS	414
414.0 REFERENCES	415
415.0 OTHER	416
416.0 REVISION HISTORY	417
417.0 CONTACT INFORMATION	418
418.0 OTHER DOCUMENTS	419
419.0 DRAWINGS	420
420.0 SPECIFICATIONS	421
421.0 SUBMITTALS	422
422.0 CONSTRUCTION SCHEDULE	423
423.0 CLOSEOUT	424
424.0 WARRANTY	425
425.0 DISCLAIMERS	426
426.0 ACKNOWLEDGMENTS	427
427.0 REFERENCES	428
428.0 OTHER	429
429.0 REVISION HISTORY	430
430.0 CONTACT INFORMATION	431
431.0 OTHER DOCUMENTS	432
432.0 DRAWINGS	433
433.0 SPECIFICATIONS	434
434.0 SUBMITTALS	435
435.0 CONSTRUCTION SCHEDULE	436
436.0 CLOSEOUT	437
437.0 WARRANTY	438
438.0 DISCLAIMERS	439
439.0 ACKNOWLEDGMENTS	440
440.0 REFERENCES	441
441.0 OTHER	442
442.0 REVISION HISTORY	443
443.0 CONTACT INFORMATION	444
444.0 OTHER DOCUMENTS	445
445.0 DRAWINGS	446
446.0 SPECIFICATIONS	447
447.0 SUBMITTALS	448
448.0 CONSTRUCTION SCHEDULE	449
449.0 CLOSEOUT	450
450.0 WARRANTY	451
451.0 DISCLAIMERS	452
452.0 ACKNOWLEDGMENTS	453
453.0 REFERENCES	454
454.0 OTHER	455
455.0 REVISION HISTORY	456
456.0 CONTACT INFORMATION	457
457.0 OTHER DOCUMENTS	458
458.0 DRAWINGS	459
459.0 SPECIFICATIONS	460
460.0 SUBMITTALS	461
461.0 CONSTRUCTION SCHEDULE	462
462.0 CLOSEOUT	463
463.0 WARRANTY	464
464.0 DISCLAIMERS	465
465.0 ACKNOWLEDGMENTS	466
466.0 REFERENCES	467
467.0 OTHER	468
468.0 REVISION HISTORY	469
469.0 CONTACT INFORMATION	470
470.0 OTHER DOCUMENTS	471
471.0 DRAWINGS	472
472.0 SPECIFICATIONS	473
473.0 SUBMITTALS	474
474.0 CONSTRUCTION SCHEDULE	475
475.0 CLOSEOUT	476
476.0 WARRANTY	477
477.0 DISCLAIMERS	478
478.0 ACKNOWLEDGMENTS	479
479.0 REFERENCES	480
480.0 OTHER	481
481.0 REVISION HISTORY	482
482.0 CONTACT INFORMATION	483
483.0 OTHER DOCUMENTS	484
484.0 DRAWINGS	485
485.0 SPECIFICATIONS	486
486.0 SUBMITTALS	487
487.0 CONSTRUCTION SCHEDULE	488
488.0 CLOSEOUT	489
489.0 WARRANTY	490
490.0 DISCLAIMERS	491
491.0 ACKNOWLEDGMENTS	492
492.0 REFERENCES	493
493.0 OTHER	494
494.0 REVISION HISTORY	495
495.0 CONTACT INFORMATION	496
496.0 OTHER DOCUMENTS	497
497.0 DRAWINGS	498
498.0 SPECIFICATIONS	499
499.0 SUBMITTALS	500
500.0 CONSTRUCTION SCHEDULE	501
501.0 CLOSEOUT	502
502.0 WARRANTY	503
503.0 DISCLAIMERS	504
504.0 ACKNOWLEDGMENTS	505
505.0 REFERENCES	506
506.0 OTHER	507
507.0 REVISION HISTORY	508
508.0 CONTACT INFORMATION	509
509.0 OTHER DOCUMENTS	510
510.0 DRAWINGS	511
511.0 SPECIFICATIONS	512
512.0 SUBMITTALS	513
513.0 CONSTRUCTION SCHEDULE	514
514.0 CLOSEOUT	515
515.0 WARRANTY	516
516.0	



**CONCRETE
PRODUCTS
GROUP**

Construction Details

Table of Contents	
Introduction	1
General Information	2
Construction Details	3
Product Information	4
Technical Data	5
Installation Instructions	6
Quality Assurance	7
Warranty	8
Index	9
Appendix	10
References	11
Notes	12
Drawings	13
Specifications	14
Contracts	15
Agreements	16
Forms	17
Tools	18
Materials	19
Equipment	20
Personnel	21
Training	22
Documentation	23
Communication	24
Collaboration	25
Coordination	26
Compliance	27
Consistency	28
Control	29
Cost	30
Quality	31
Quantity	32
Time	33
Value	34
Verifiability	35
Visibility	36
Vulnerability	37
Warranty	38
Workmanship	39
Workload	40
Workplace	41
Workforce	42
Worklife	43
Workload	44
Workplace	45
Workforce	46
Worklife	47
Workload	48
Workplace	49
Workforce	50
Worklife	51
Workload	52
Workplace	53
Workforce	54
Worklife	55
Workload	56
Workplace	57
Workforce	58
Worklife	59
Workload	60
Workplace	61
Workforce	62
Worklife	63
Workload	64
Workplace	65
Workforce	66
Worklife	67
Workload	68
Workplace	69
Workforce	70
Worklife	71
Workload	72
Workplace	73
Workforce	74
Worklife	75
Workload	76
Workplace	77
Workforce	78
Worklife	79
Workload	80
Workplace	81
Workforce	82
Worklife	83
Workload	84
Workplace	85
Workforce	86
Worklife	87
Workload	88
Workplace	89
Workforce	90
Worklife	91
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Workforce	94
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Workload	96
Workplace	97
Workforce	98
Worklife	99
Workload	100

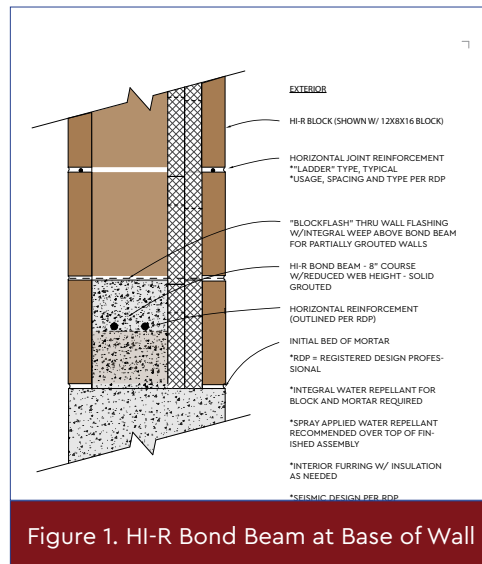


Figure 1. HI-R Bond Beam at Base of Wall

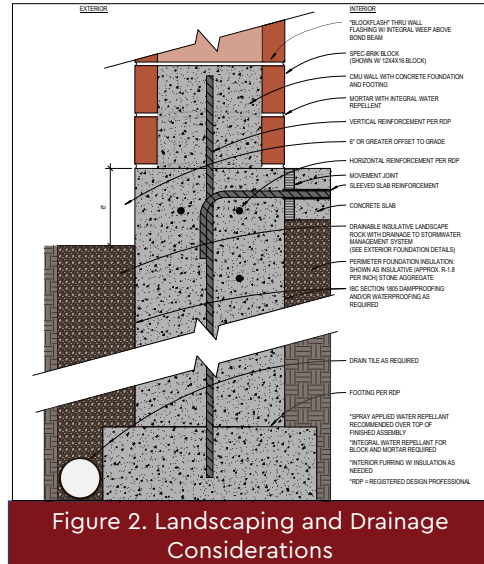


Figure 2. Landscaping and Drainage Considerations

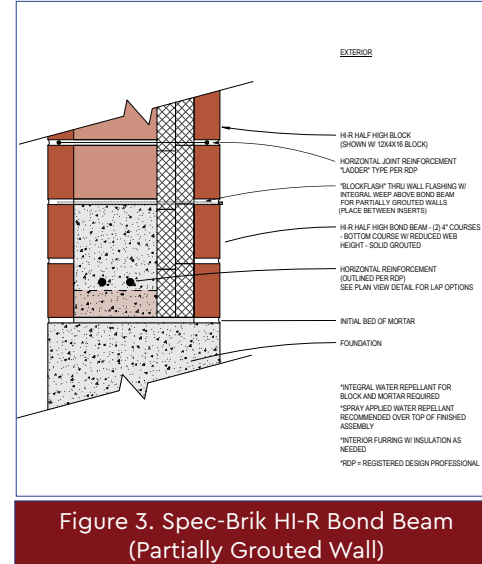


Figure 3. Spec-Brik HI-R Bond Beam (Partially Grouted Wall)

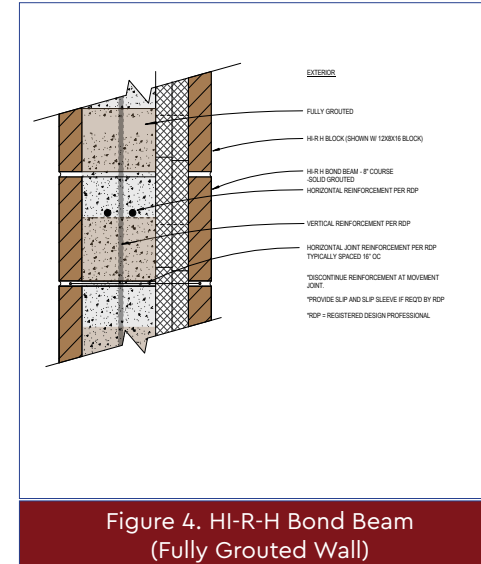


Figure 4. HI-R-H Bond Beam (Fully Grouted Wall)

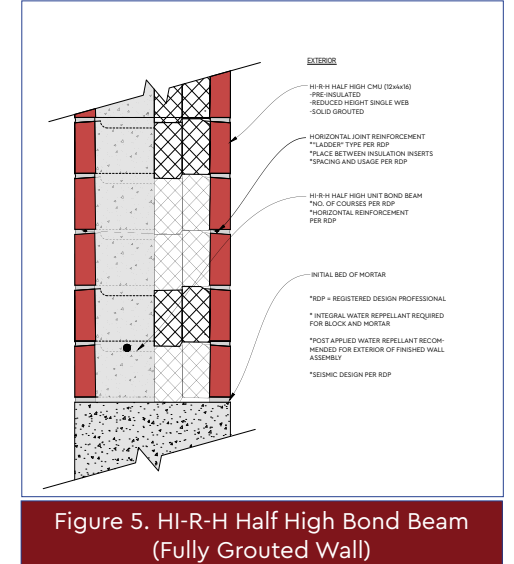


Figure 5. HI-R-H Half High Bond Beam (Fully Grouted Wall)

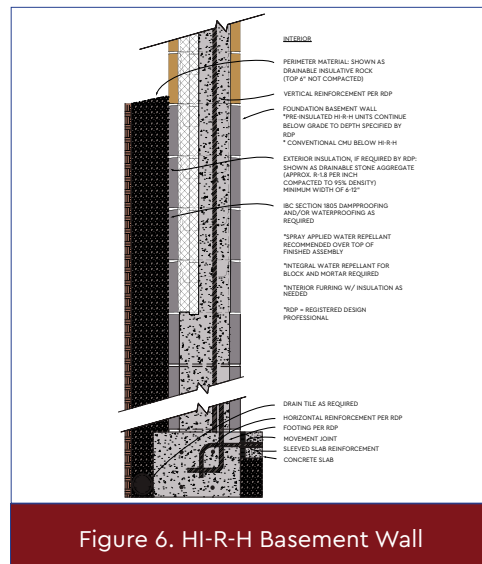


Figure 6. HI-R-H Basement Wall

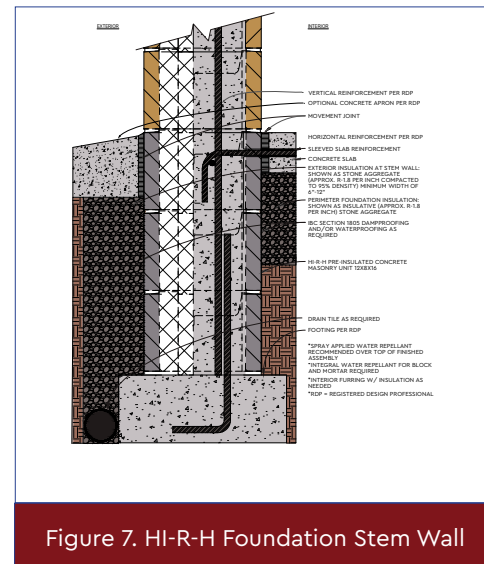


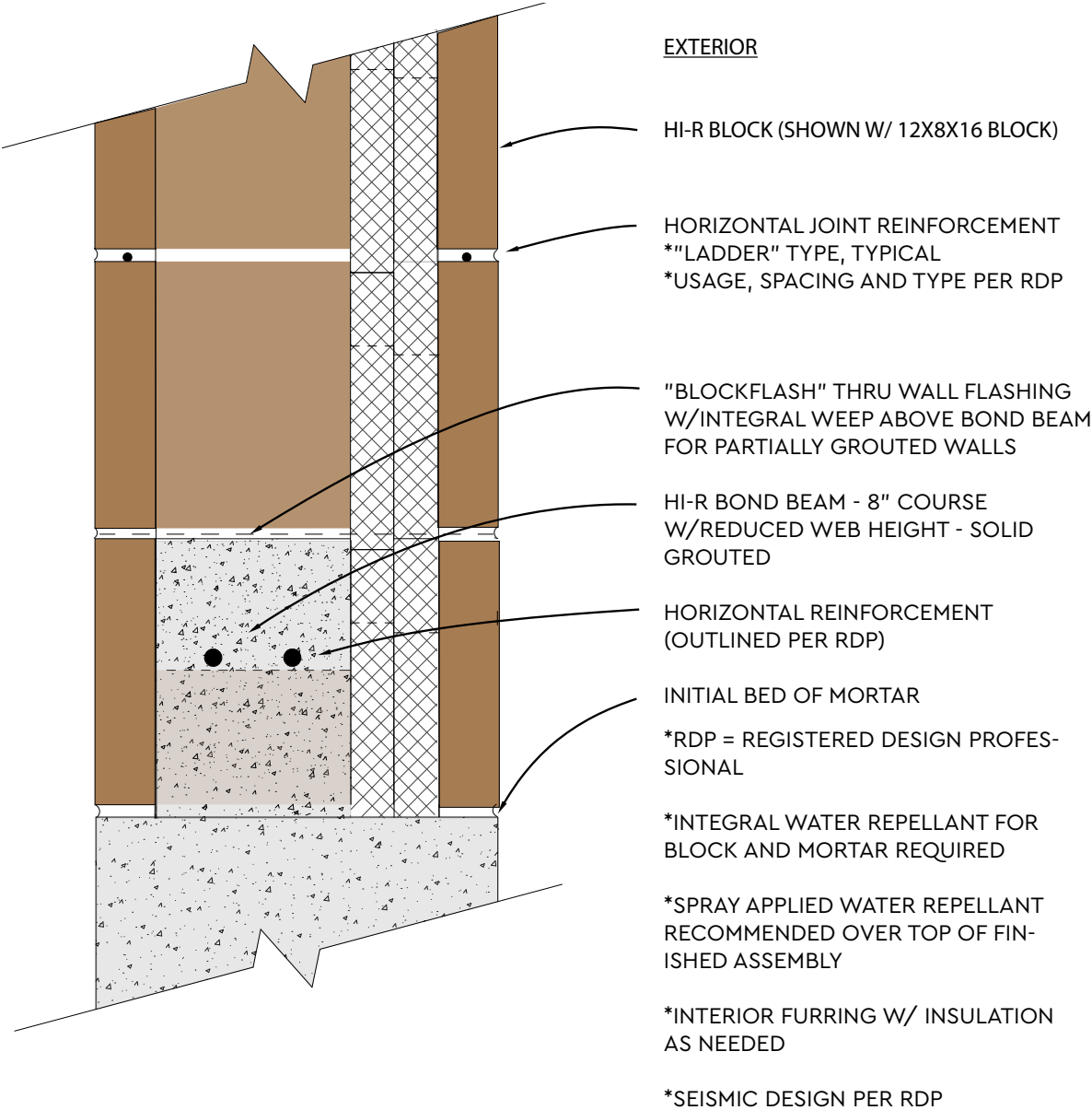
Figure 7. HI-R-H Foundation Stem Wall

Table of Contents	
1. HI-R Bond Beam at Base of Wall	1
2. Landscaping and Drainage Considerations	2
3. Spec-Brik HI-R Bond Beam (Partially Grouted Wall)	3
4. HI-R-H Bond Beam (Fully Grouted Wall)	4
5. HI-R-H Half High Bond Beam (Fully Grouted Wall)	5
6. HI-R-H Basement Wall	6
7. HI-R-H Foundation Stem Wall	7
8. HI-R-H Foundation Wall	8
9. HI-R-H Foundation Wall (Partially Grouted)	9
10. HI-R-H Foundation Wall (Fully Grouted)	10
11. HI-R-H Foundation Wall (Half High)	11
12. HI-R-H Foundation Wall (Full High)	12
13. HI-R-H Foundation Wall (Full High, Insulated)	13
14. HI-R-H Foundation Wall (Full High, Insulated, Grouted)	14
15. HI-R-H Foundation Wall (Full High, Insulated, Grouted, Reinforced)	15
16. HI-R-H Foundation Wall (Full High, Insulated, Grouted, Reinforced, Sealed)	16
17. HI-R-H Foundation Wall (Full High, Insulated, Grouted, Reinforced, Sealed, Reinforced)	17
18. HI-R-H Foundation Wall (Full High, Insulated, Grouted, Reinforced, Sealed, Reinforced, Sealed)	18
19. HI-R-H Foundation Wall (Full High, Insulated, Grouted, Reinforced, Sealed, Reinforced, Sealed, Reinforced)	19
20. HI-R-H Foundation Wall (Full High, Insulated, Grouted, Reinforced, Sealed, Reinforced, Sealed, Reinforced, Sealed)	20

Click on drawings to enlarge

Base of Wall and Bond Beam

Figure 1. HI-R Bond Beam and Pad, Partially Grouted



Notes

1. Consult with Structural and/or Geotechnical Engineers for appropriate below-grade insula-
tion material and placement.
2. For weather protection, use Integral Water Repellent (IWR) in the block and mortar. Some
exceptions may apply such as for California shear wall testing. Partially grouted walls require an air
barrier to meet Code requirements.
3. Fully grouted masonry walls are a cost-effective alternative to partially grouted walls. In many
areas of the country where seismic design considerations are important, highly reinforced and fully
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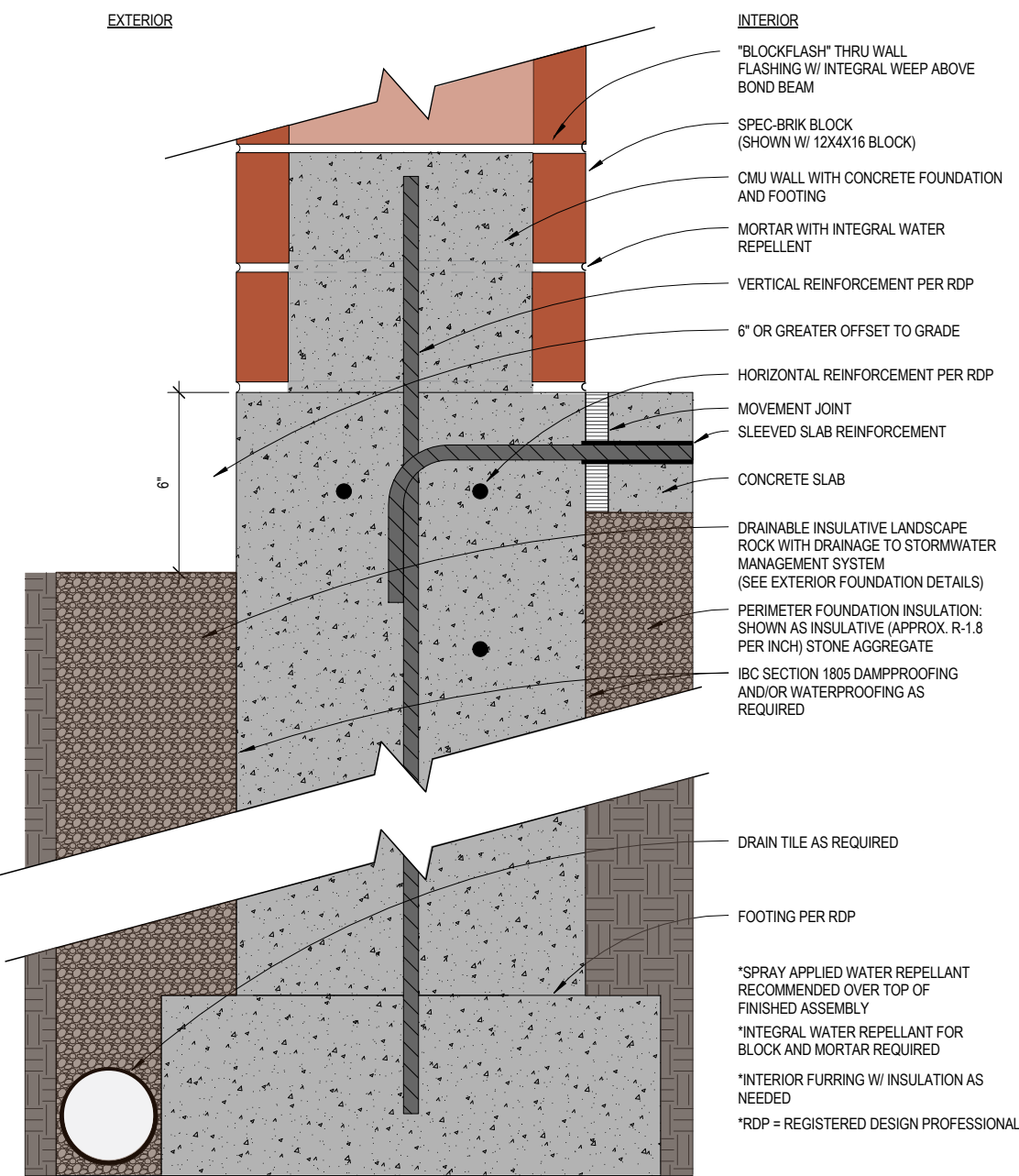
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SIGN CONSIDERATIONS. SUCH CONDITIONS MAY INCLUDE SEISMIC ACTIVITY, LOCAL CLIMATE, WIND LOAD AND
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Figure 2. Base of Wall, All Unit Types: Landscaping Considerations



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1. If the zone near the base of wall is to be landscaped, do not place plant life, roots, irrigation, fertilizers or other chemicals within 3 feet of the footing, foundation wall, foundation, and slab. Isolate the footing, foundation and slab from such elements. The height of the soil and nearby draining curbs should be at least 6 inches below top of finished floor to prevent damage from accumulated mulch, and absorption, pooling or flooding of water.
2. Minimum 6" soil/top of finished floor/footing elevation offset. Within this 6" deep offset, a drainable landscape layer of lightweight insulative aggregate may be placed. This in turn can be combined with a minimum 6" – 12" wide 95% compacted lightweight insulative aggregate zone extending down to spread footing with perforated drainage collection pipe at spread footing. The drainage collection pipe leads to a stormwater drainage system.
3. If landscaping is to be used near the structure, maintain a minimum distance of five feet between the vegetation and irrigation from any lightweight insulative aggregate zone. Trees minimum distance 30'.
4. Isolate the zone near the wall from landscape sprinklers or irrigation.

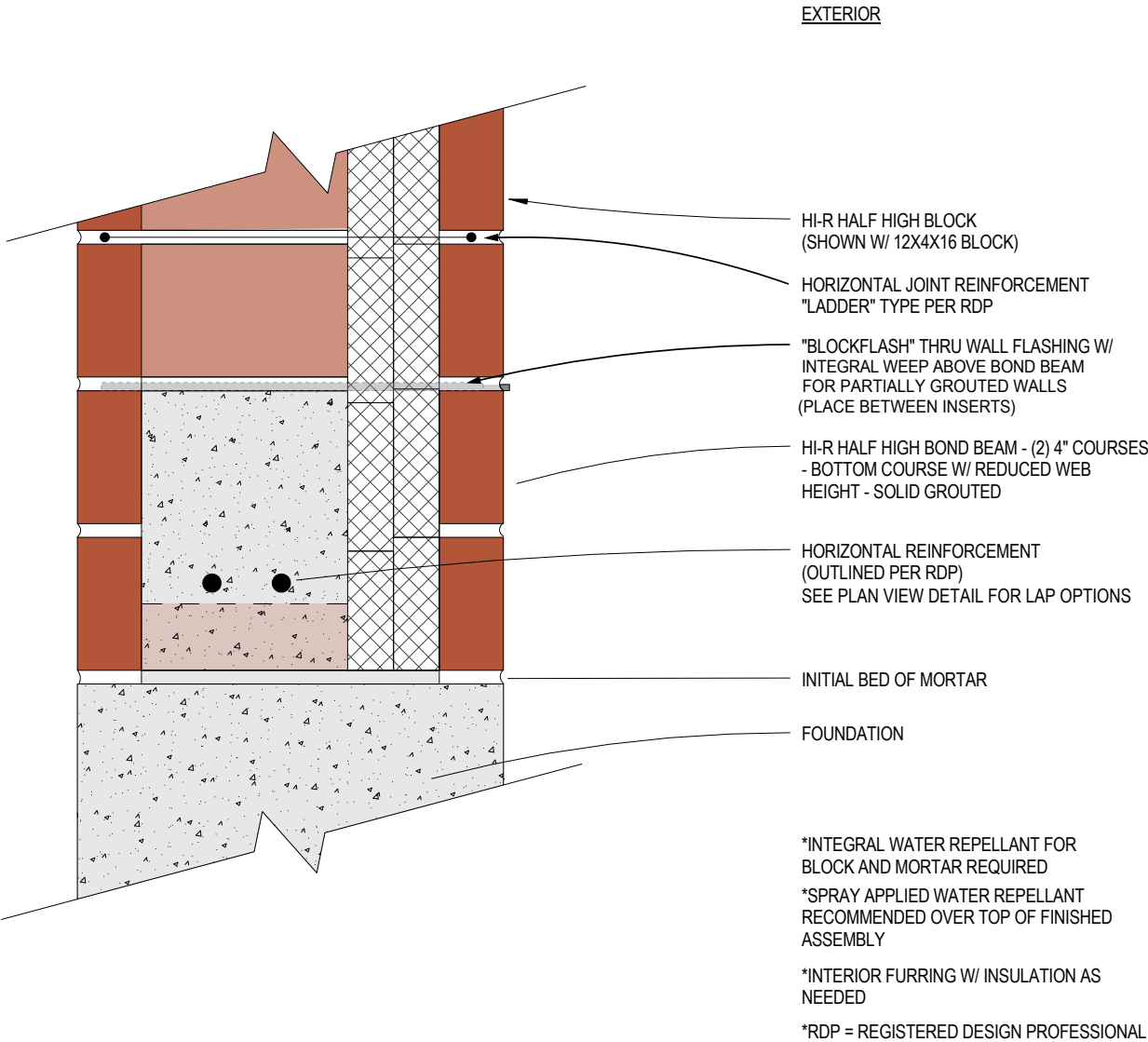
Table of Contents

1. Introduction	1.1. About This Manual
2. General Information	2.1. About This Manual
3. Foundation	3.1. Foundation
4. Wall	4.1. Wall
5. Floor	5.1. Floor
6. Roof	6.1. Roof
7. Exterior	7.1. Exterior
8. Interior	8.1. Interior
9. Appendix	9.1. Appendix

CONCRETE PRODUCTS GROUP

1. Introduction	1.1. About This Manual
2. General Information	2.1. About This Manual
3. Foundation	3.1. Foundation
4. Wall	4.1. Wall
5. Floor	5.1. Floor
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7. Exterior	7.1. Exterior
8. Interior	8.1. Interior
9. Appendix	9.1. Appendix

Figure 3. Exterior, Poured Foundation and Pad



Notes

1. Consult with Structural and/or Geotechnical Engineers for appropriate below-grade insulation material and placement.
2. For weather protection, use Integral Water Repellent (IWR) in the block and mortar. Some exceptions may apply such as for California shear wall testing. We also recommend the use of a clear, breathable post-applied water repellent. Partially Grouted Walls will require an air barrier.
3. Fully grouting masonry walls is an excellent and cost-effective alternative to partially grouted walls. In many areas of the country where seismic design considerations are important, highly reinforced and fully grouted masonry is the preferred solution. Fully grouted walls do not require flashing at bond beam locations, and meet Code air barrier requirements.
4. See Figure 6 for Plan View of Michigan Style Movement Joint.

Codes and Standards References

Applicable References are found in Section III.

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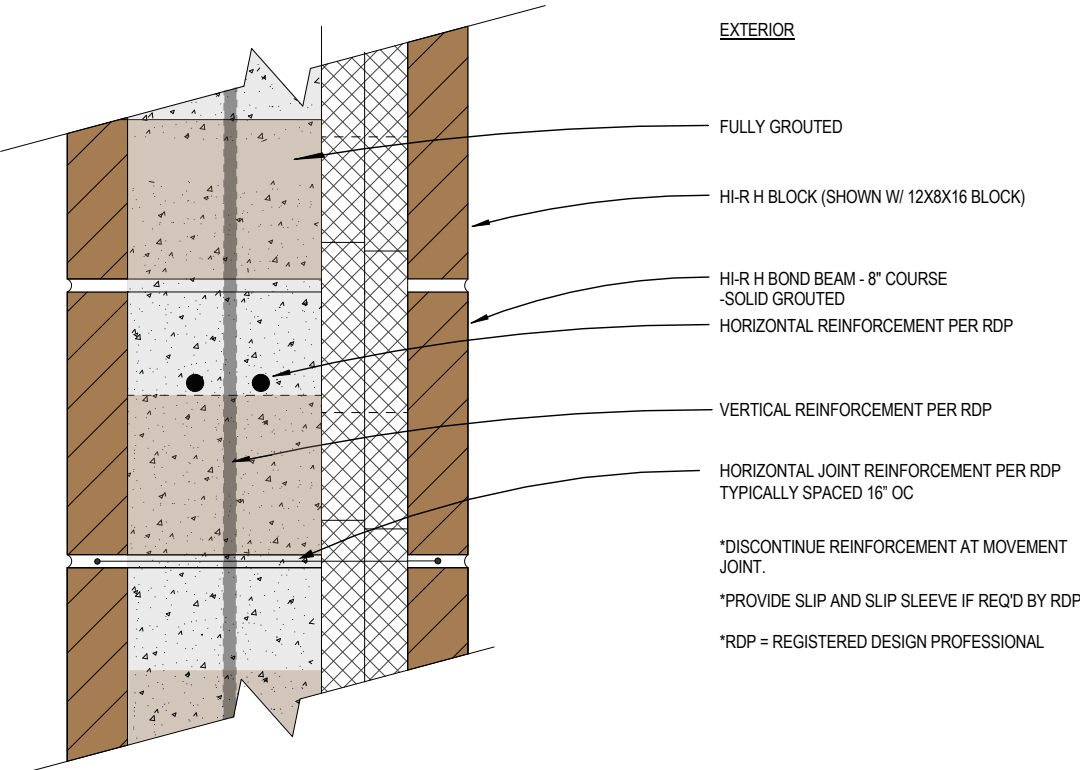
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Table of Contents

1. Introduction	1.1
2. General Information	2.1
3. Foundation Details	3.1
4. Wall Details	4.1
5. Roof Details	5.1
6. Floor Details	6.1
7. Exterior Finishes	7.1
8. Interior Finishes	8.1
9. Mechanical Details	9.1
10. Electrical Details	10.1
11. Plumbing Details	11.1
12. HVAC Details	12.1
13. Fire Protection Details	13.1
14. Security Details	14.1
15. Miscellaneous Details	15.1



Figure 4. HI-R-H – Fully Grouted Bond Beam



Notes

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2. Request evidence in writing of, or special inspection for, adequate head joint mortar bond to IWR-containing CMU for Properties-based mortars.
3. The HI-R-H units are suitable for use as bond beam units without modification or removal of the insulative inserts.
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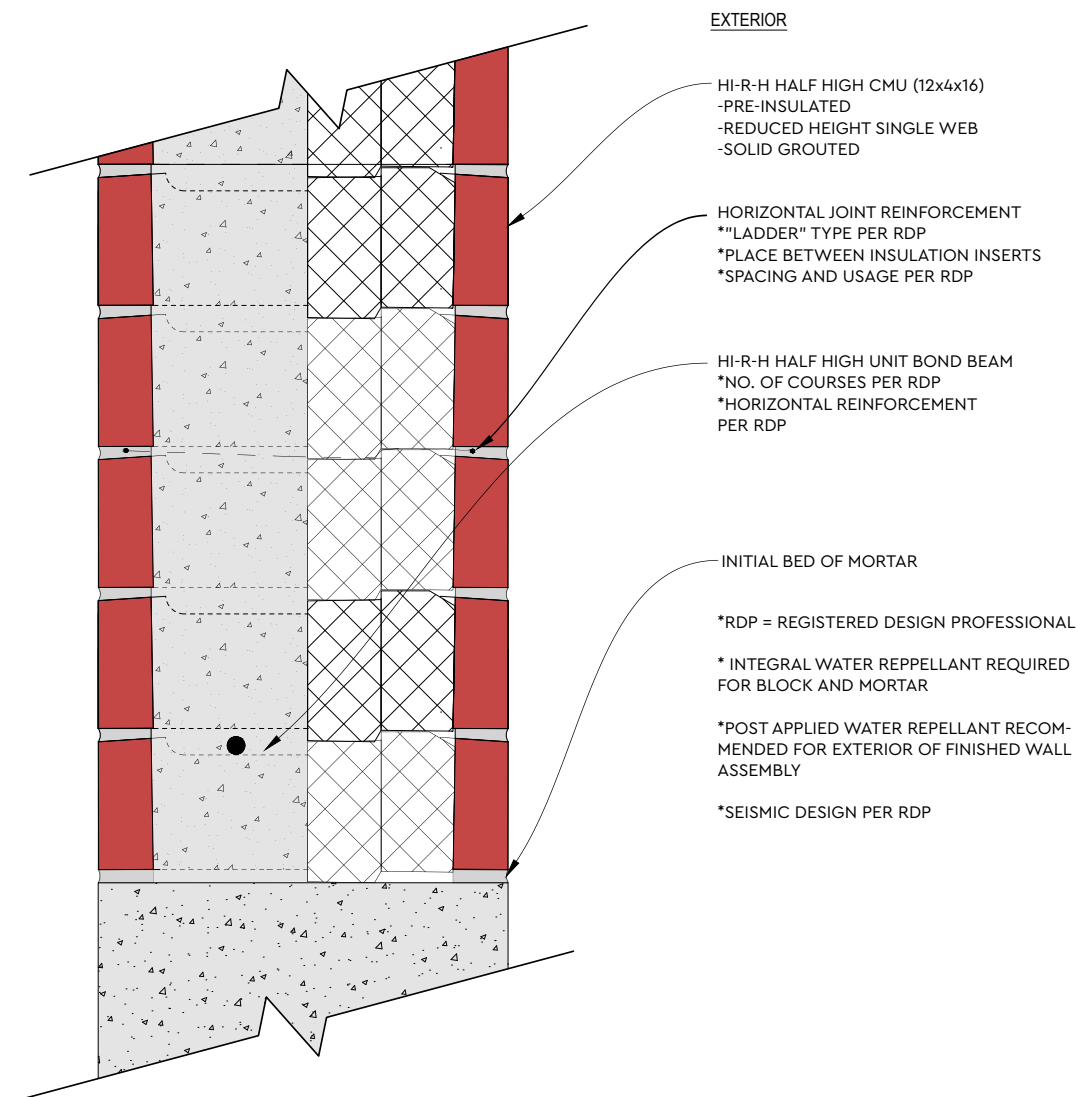
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Figure 5. HI-R-H Half High – Fully Grouted Bond Beam at Wall Base



Notes

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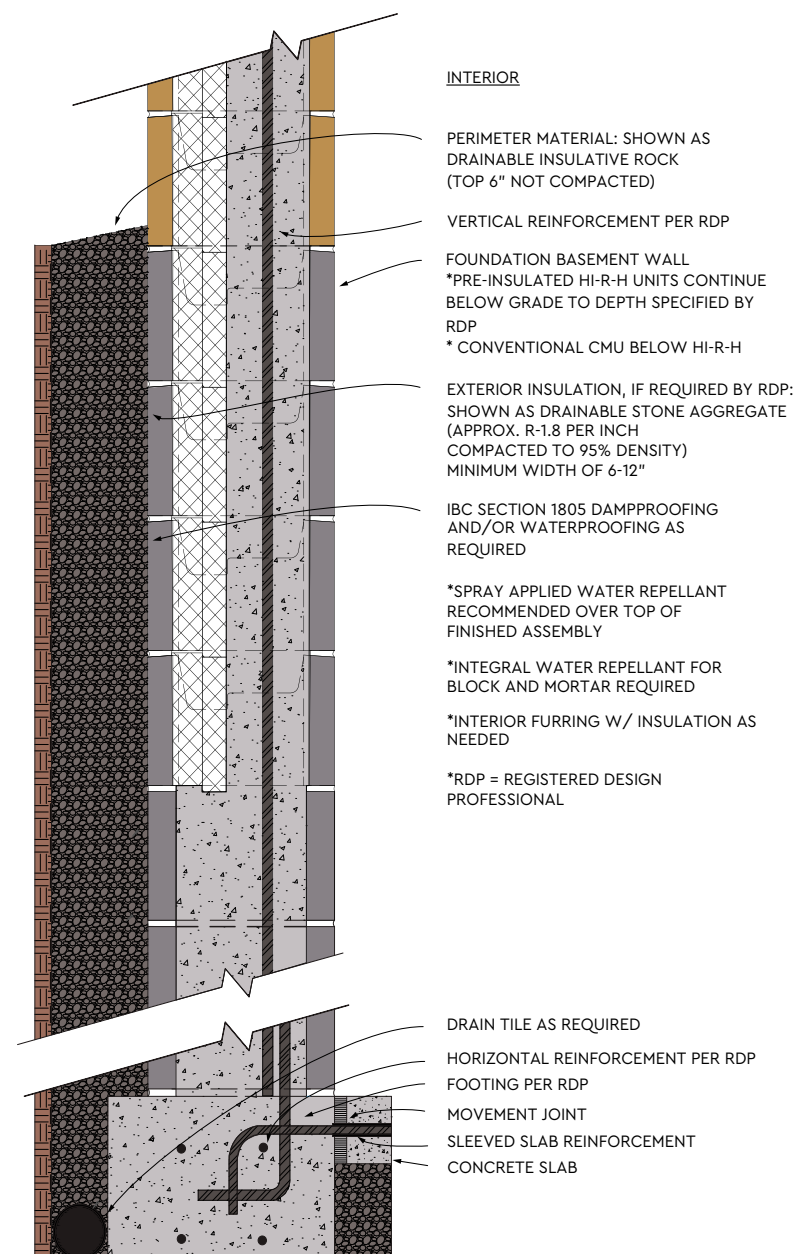
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Figure 6. HI-R-H and CMU Basement Wall



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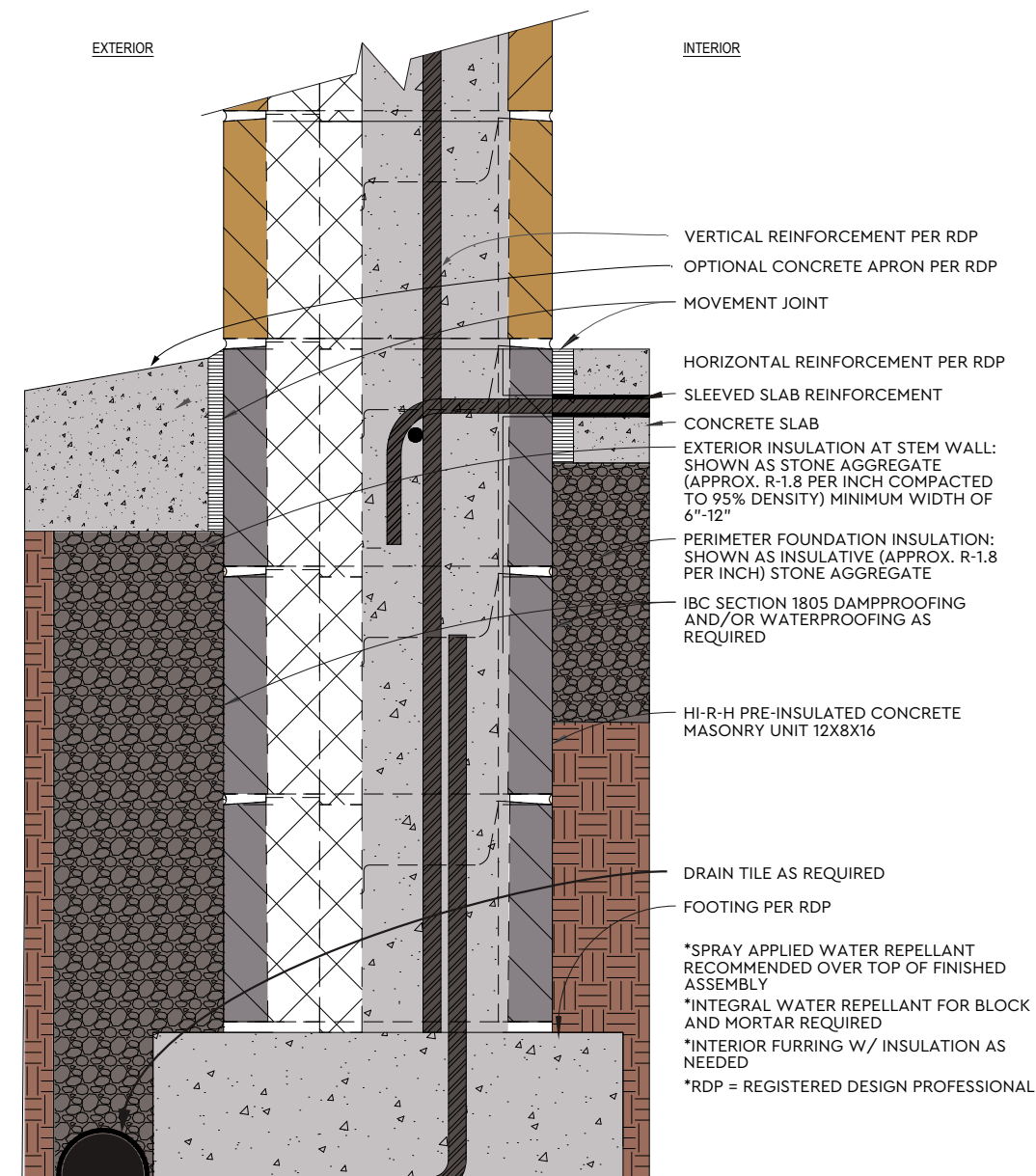
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Codes and Standards References

Applicable References are found in Section III.



Figure 7. HI-R-H Foundation Stem Wall



Notes

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Table of Contents

- Introduction
- Section I: General Information
- Section II: Foundation Details
- Section III: Codes and Standards References
- Section IV: Notes
- Section V: Appendix



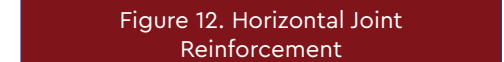
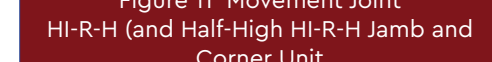


Table of Contents

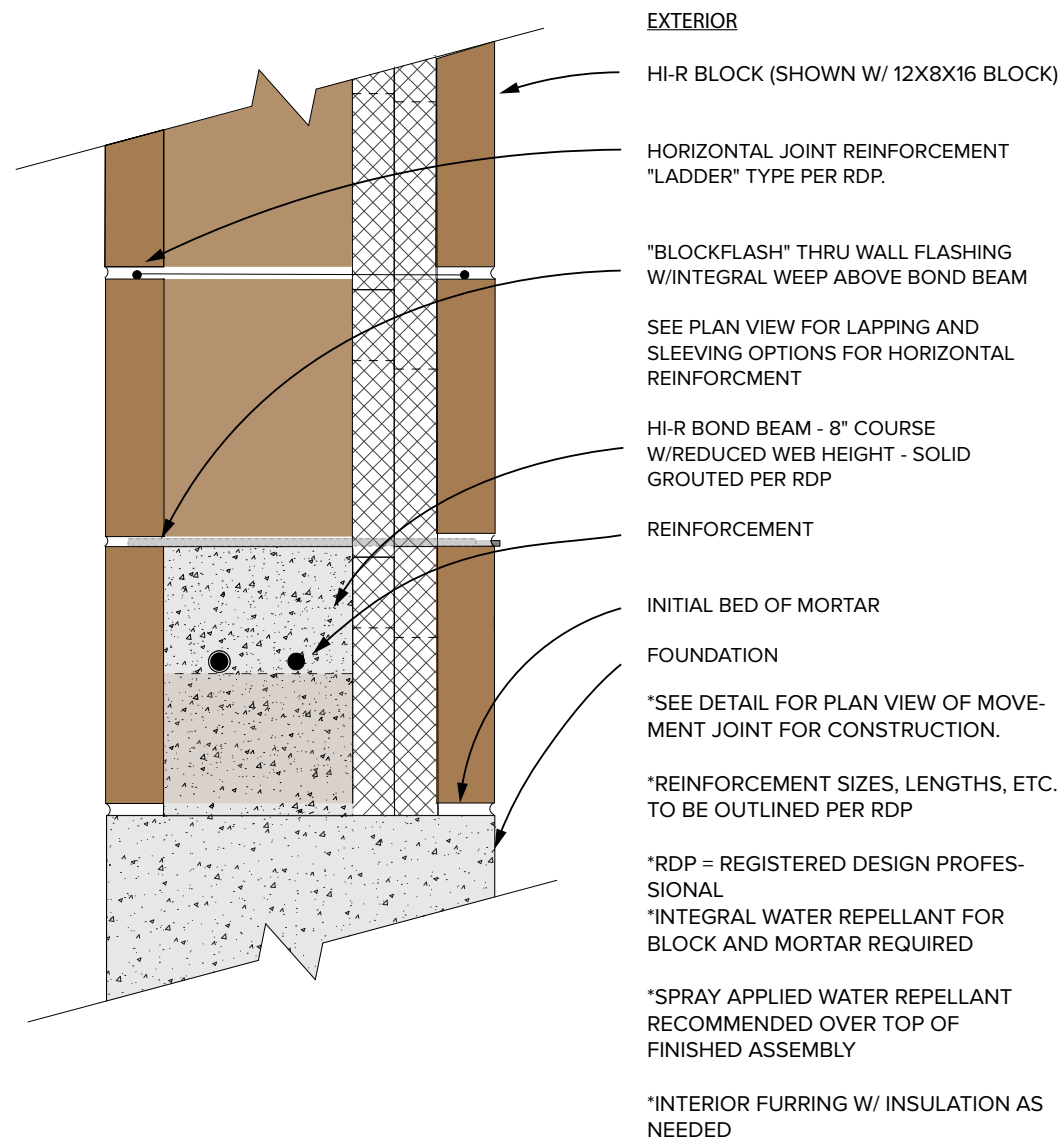
<p>INTRODUCTION</p> <p>SECTION 100 – GENERAL NOTES</p> <p>SECTION 200 – PREPARED CONCRETE</p> <p>SECTION 300 – FORMWORK</p> <p>SECTION 400 – REINFORCING</p> <p>SECTION 500 – JOINTS</p> <p>SECTION 600 – CURING</p> <p>SECTION 700 – PROTECTIVE COATINGS</p> <p>SECTION 800 – FINISHES</p> <p>SECTION 900 – ACCESSORIES</p> <p>SECTION 1000 – SPECIALTIES</p> <p>SECTION 1100 – PAINTS</p> <p>SECTION 1200 – EROSION CONTROL</p> <p>SECTION 1300 – LANDSCAPING</p> <p>SECTION 1400 – UTILITIES</p> <p>SECTION 1500 – FENCES</p> <p>SECTION 1600 – SIGNAGE</p> <p>SECTION 1700 – LIGHTING</p> <p>SECTION 1800 – SAFETY</p> <p>SECTION 1900 – MAINTENANCE</p> <p>SECTION 2000 – DEMOLITION</p> <p>SECTION 2100 – REPAIRS</p> <p>SECTION 2200 – TESTING</p> <p>SECTION 2300 – RECORDS</p> <p>SECTION 2400 – AS-BUILT</p> <p>SECTION 2500 – FINAL</p>	<p>SECTION 2600 – GENERAL NOTES</p> <p>SECTION 2700 – PREPARED CONCRETE</p> <p>SECTION 2800 – FORMWORK</p> <p>SECTION 2900 – REINFORCING</p> <p>SECTION 3000 – JOINTS</p> <p>SECTION 3100 – CURING</p> <p>SECTION 3200 – PROTECTIVE COATINGS</p> <p>SECTION 3300 – FINISHES</p> <p>SECTION 3400 – ACCESSORIES</p> <p>SECTION 3500 – SPECIALTIES</p> <p>SECTION 3600 – PAINTS</p> <p>SECTION 3700 – EROSION CONTROL</p> <p>SECTION 3800 – LANDSCAPING</p> <p>SECTION 3900 – UTILITIES</p> <p>SECTION 4000 – FENCES</p> <p>SECTION 4100 – SIGNAGE</p> <p>SECTION 4200 – LIGHTING</p> <p>SECTION 4300 – SAFETY</p> <p>SECTION 4400 – MAINTENANCE</p> <p>SECTION 4500 – DEMOLITION</p> <p>SECTION 4600 – REPAIRS</p> <p>SECTION 4700 – TESTING</p> <p>SECTION 4800 – RECORDS</p> <p>SECTION 4900 – AS-BUILT</p> <p>SECTION 5000 – FINAL</p>
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Click on drawings to enlarge

Movement Joints

Horizontal Joint Reinforcement

Figure 8. Michigan Style Movement Joint at Bond Beam



Notes

1. This detail indicates a spliced detail for the horizontal reinforcement, which should be used only if it is required by the RDP. In general, movement joints do not require spliced bars. See Figure 9 for a plan view of this detail. This detail indicates a spliced detail for the horizontal reinforcement only if it is required by the RDP. In general, movement joints do not require spliced bars.
2. Movement joints are a method to avoid cracking in masonry walls. They are advisable in areas where there are interfaces with materials that may have different expansion properties than the wall as a whole and at regular intervals in the field of the wall. Placing movement joints will accommodate any slight differential in expansion/contraction properties. The movement joint is sealed with a gasket and sealants for weather protection. The spacing and placement of movement joints should be reviewed by a structural engineer in accordance with NCMA TEK Notes.
3. For weather protection, use Integral Water Repellent (IWR) in the block and mortar. Some exceptions may apply such as for California shear wall testing. We also recommend the use of a clear, breathable post-applied water repellent. Partially Grouted Walls will require an air barrier.

Codes and Standards References

Applicable References are found in Section III.

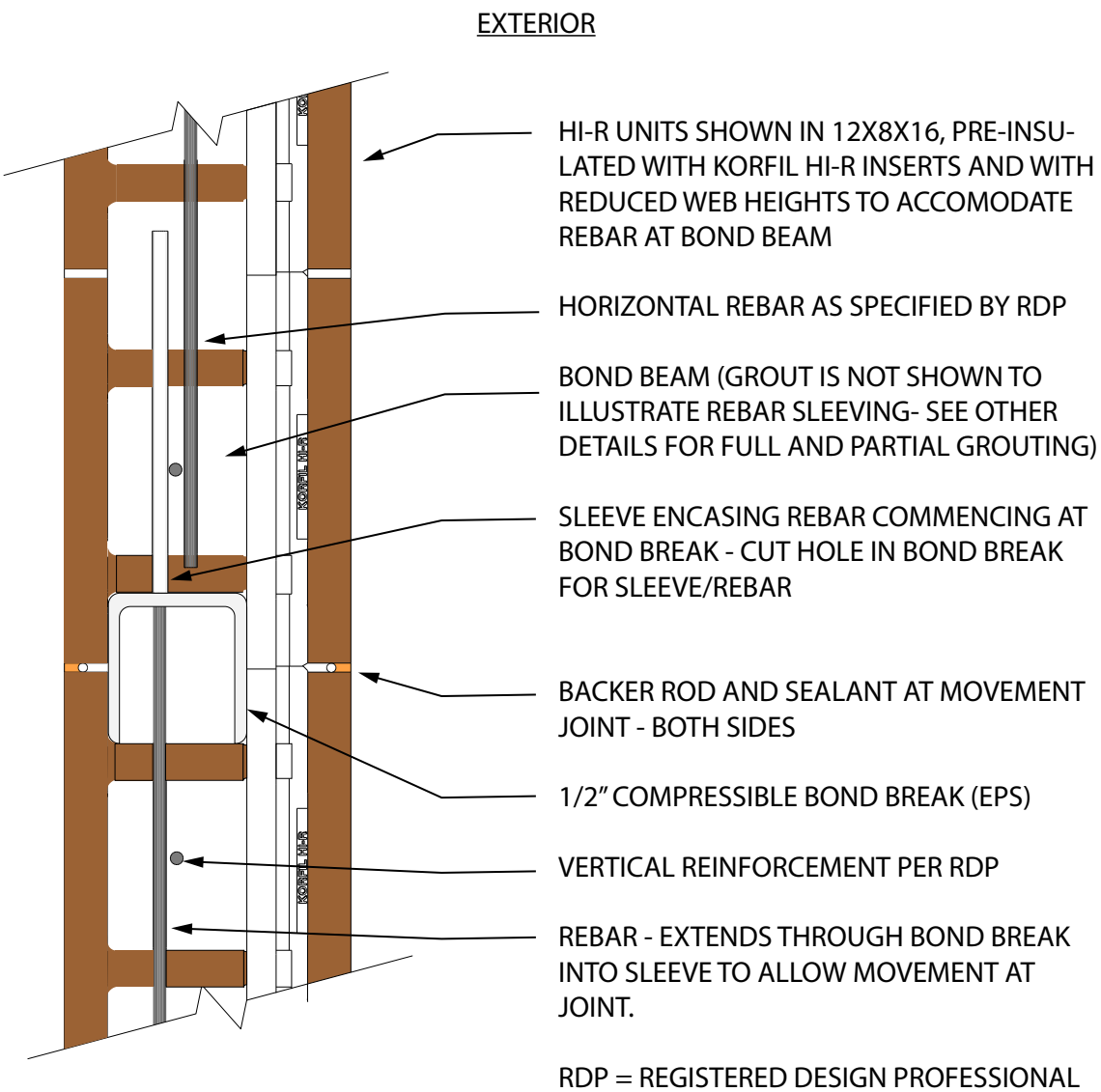
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Figure 9. Movement Joint- "Michigan" Style



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Notes

1. This detail indicates a spliced detail for the horizontal reinforcement, which should be used only if it is required by the RDP. In general, movement joints do not require spliced bars.
2. Movement joints are a method to avoid cracking in masonry walls. They are advisable in areas where there are interfaces with materials that may have different expansion properties than the wall as a whole and at regular intervals in the field of the wall. Placing movement joints will accommodate any slight differential in expansion/contraction properties. The spacing and placement of movement joints should be reviewed by a structural engineer in accordance with NCMA TEK Notes.
3. For weather protection, use Integral Water Repellent (IWR) in the block and mortar. Some exceptions may apply such as for California shear wall testing. The movement joint is sealed with a gasket and sealants for weather protection. We also recommend the use of a clear, breathable post-applied water repellent. Partially Grouted Walls will require an air barrier.
4. This style of Movement Joint offers superior thermal performance at the joint because it does not require removal of the insulation inserts at the joint. It is suitable for use with HI-R units, but the greater core size of the HI-R-H units do not lend themselves to this approach.
5. On alternate courses, half HI-R units and insulation are placed at the joint in place of the full units shown here.

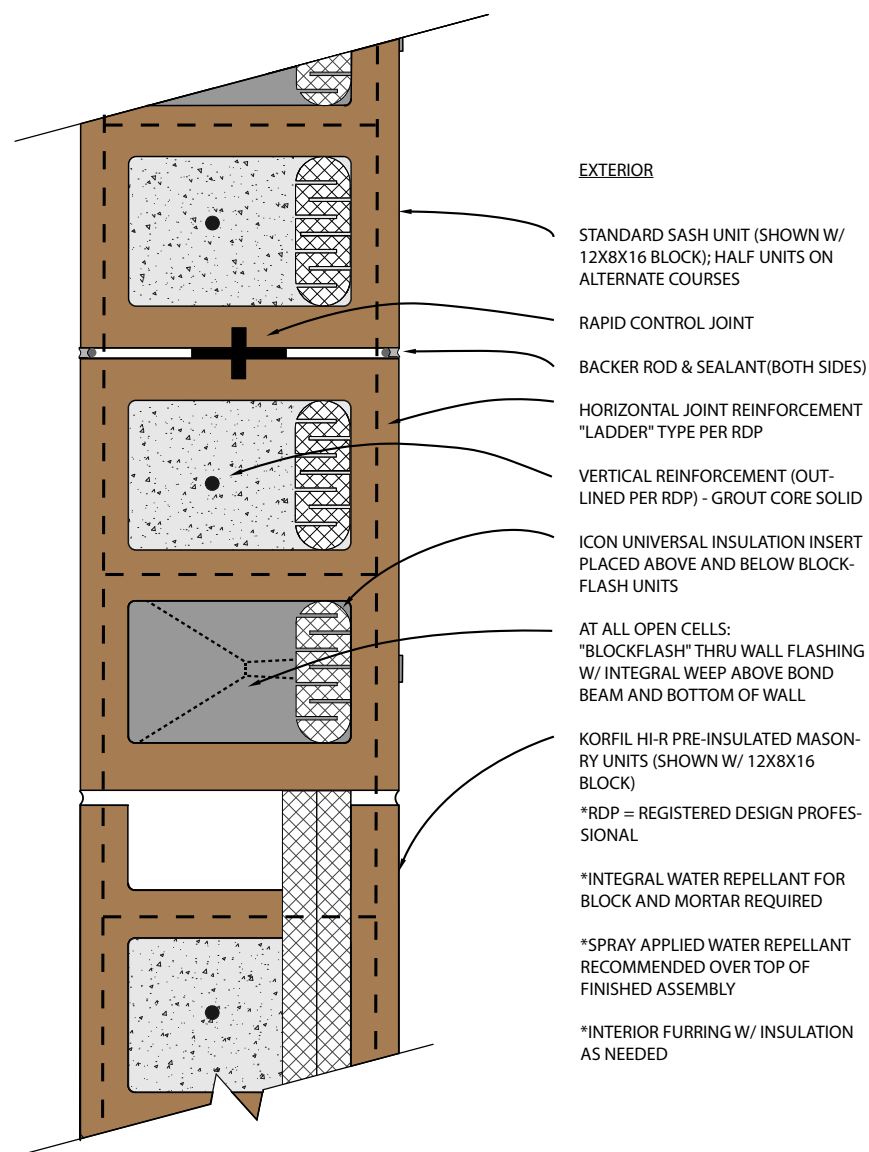
This is detail 4075A in the CPG CAD detail collection.

Codes and Standards References

Applicable References are found in Section III.



Figure 10. Movement Joint



Notes

1. Movement joints are a method to avoid cracking in masonry walls. They are advisable in areas where there are interfaces with materials that may have different expansion properties than the wall as a whole and at regular intervals in the field of the wall. Placing these joints here will accommodate any slight differential in expansion/contraction properties. The movement joint will be sealed with a gasket and sealants.
2. In general, the specific spacing and placement of movement joints for a project should be reviewed by a structural engineer, in accordance with the recommendations in the NCMA TEK Notes.

Codes and Standards References

Applicable References are found in Section III.

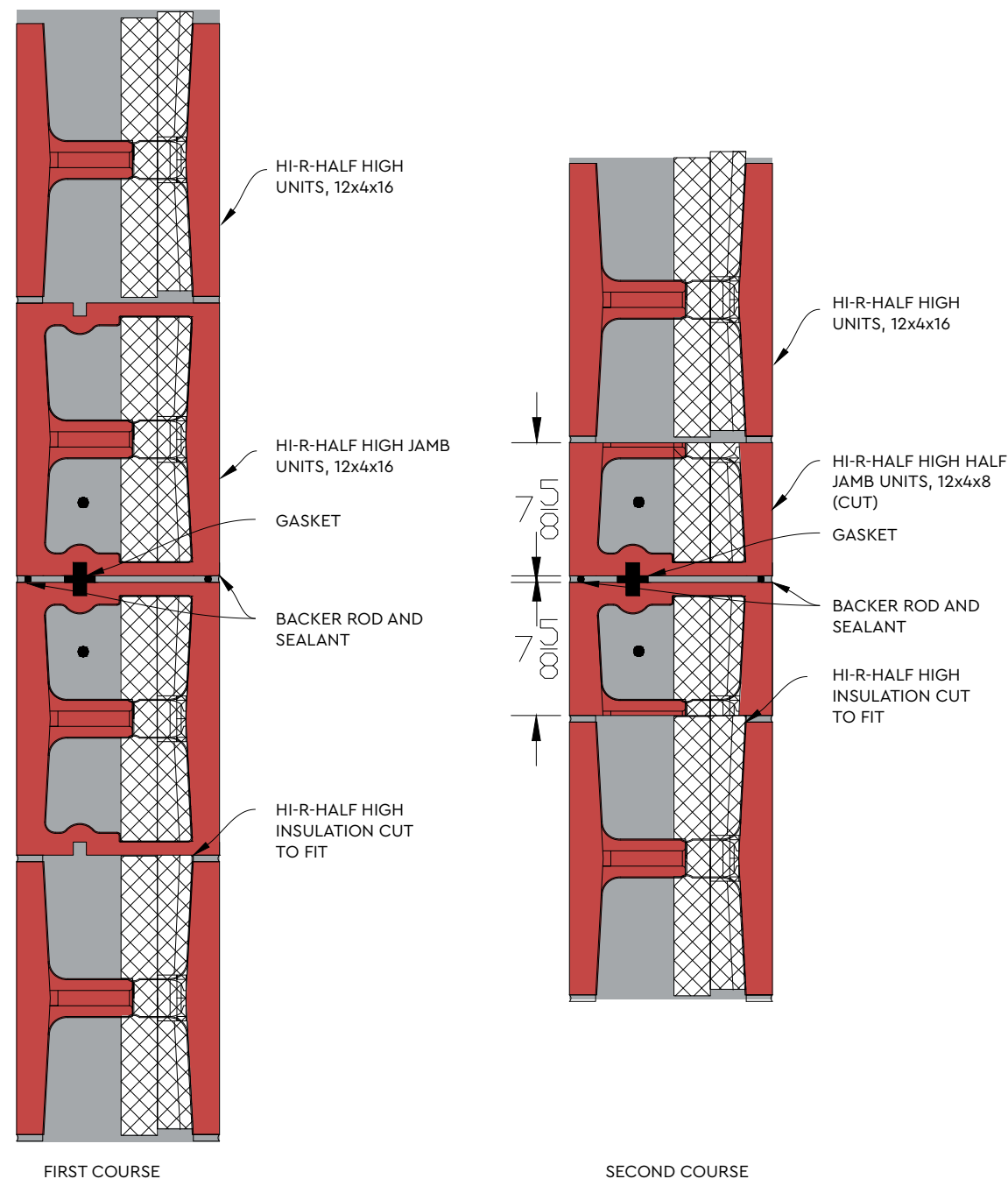
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Figure 11. Movement Joint Using HI-R-H or HI-R-H Half High Jamb and Corner Unit



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Notes

- 1. The HI-R-H Jamb Unit has been recently introduced and has regional availability. Check with your local manufacturer prior to specifying.
- 2. Movement joints are a method to avoid cracking in masonry walls. They are advisable in areas where there are interfaces with materials that may have different expansion properties than the wall as a whole and at regular intervals in the field of the wall. Placing these joints will accommodate any slight differential in expansion/contraction properties. The movement joint will be sealed with a gasket and sealants.
- 3. In general, the specific spacing and placement of movement joints for a project should be reviewed by a structural engineer, in accordance with the recommendations in the NCMA TEK Notes.

Codes and Standards References

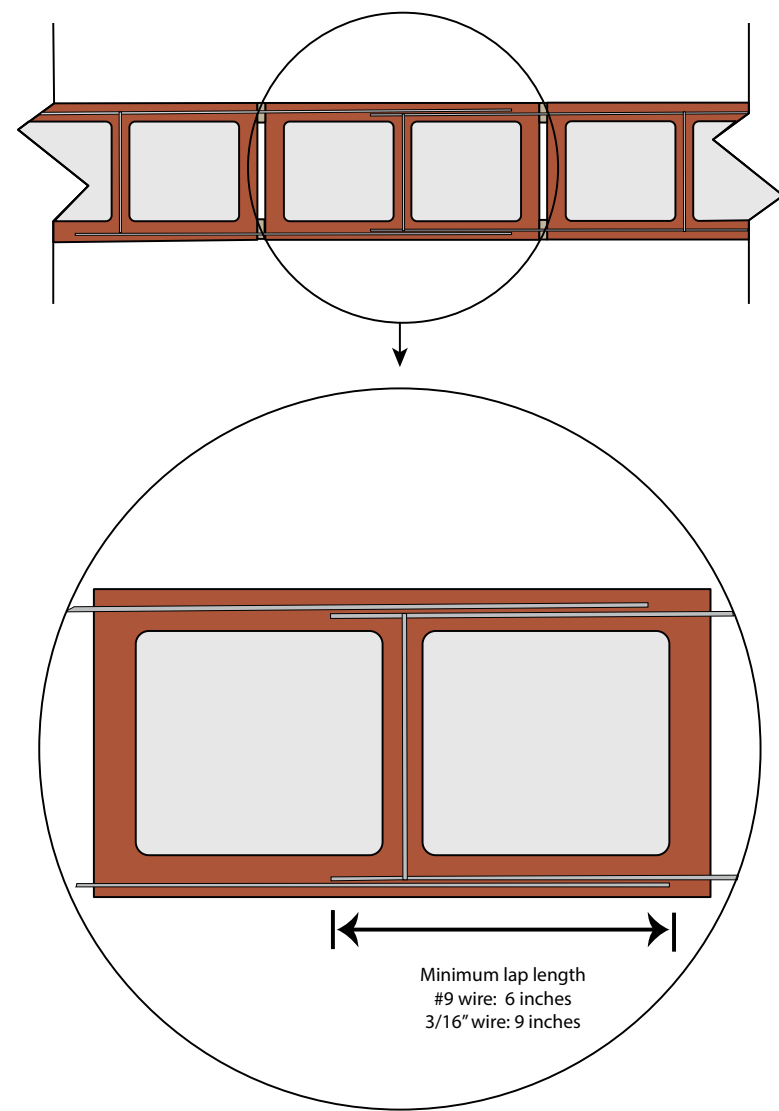
Applicable References are found in Section III.

Table of Contents

Introduction	1
Chapter 1: General Information	2
Chapter 2: Design and Construction	3
Chapter 3: Materials	4
Chapter 4: Installation	5
Chapter 5: Maintenance	6
Chapter 6: Troubleshooting	7
Chapter 7: Appendix	8
Chapter 8: Index	9



Figure 12. Joint Reinforcement



Notes

- 1. Lapping the joint reinforcement is required by Code and typically specified. However, the failure to execute this detail properly during construction is a common source of cracking issues. If cracking is found, forensic testing will often show lack of continuity of the joint reinforcement at the location of cracks that are found in the field of the wall.
- 2. Typical recommendations are for 16" vertical spacing for 8" nominal height units and 12" for 4" nominal height units. The Registered Design Professional may elect to limit or not use horizontal joint reinforcement for walls that have sufficient horizontal reinforcement from reinforcement rebar including fully grouted walls. See NCMA TEK Notes for recommendations for horizontal joint reinforcement spacing.
- 3. Horizontal joint reinforcement terminates at movement joints.

Codes and Standards References

Applicable References are found in Section III.

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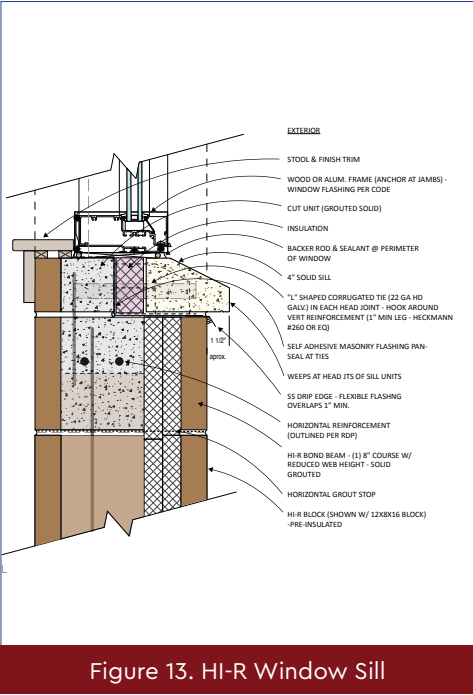


Figure 13. HI-R Window Sill

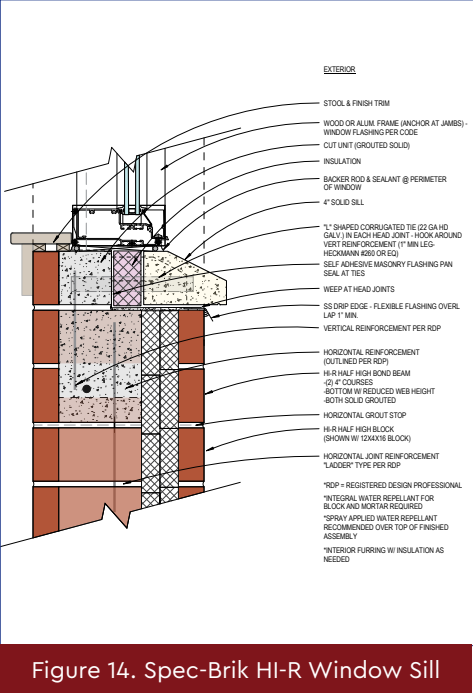


Figure 14. Spec-Brik HI-R Window Sill

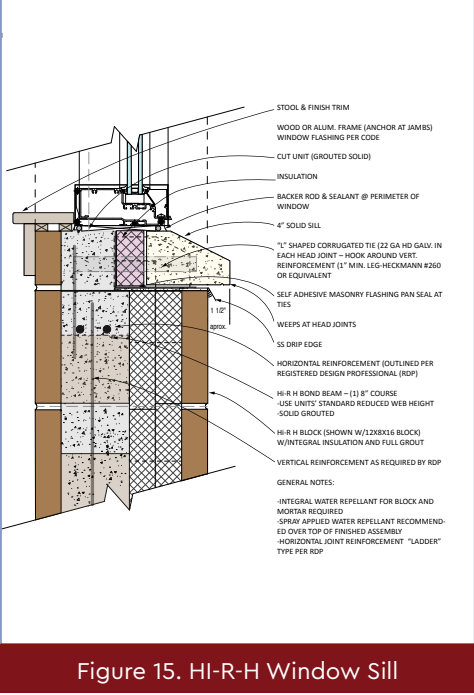


Figure 15. HI-R-H Window Sill

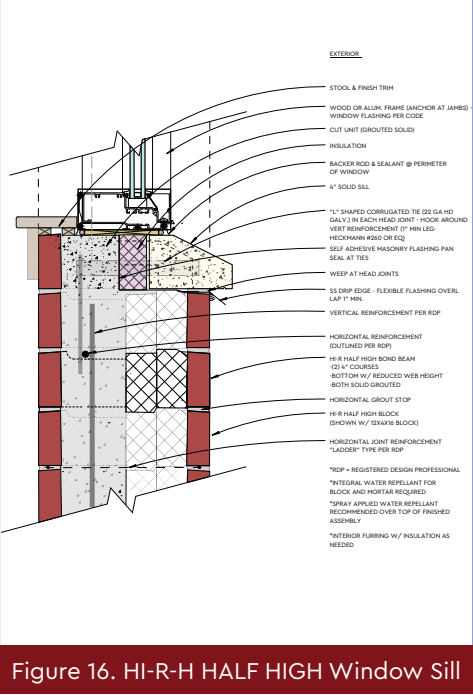


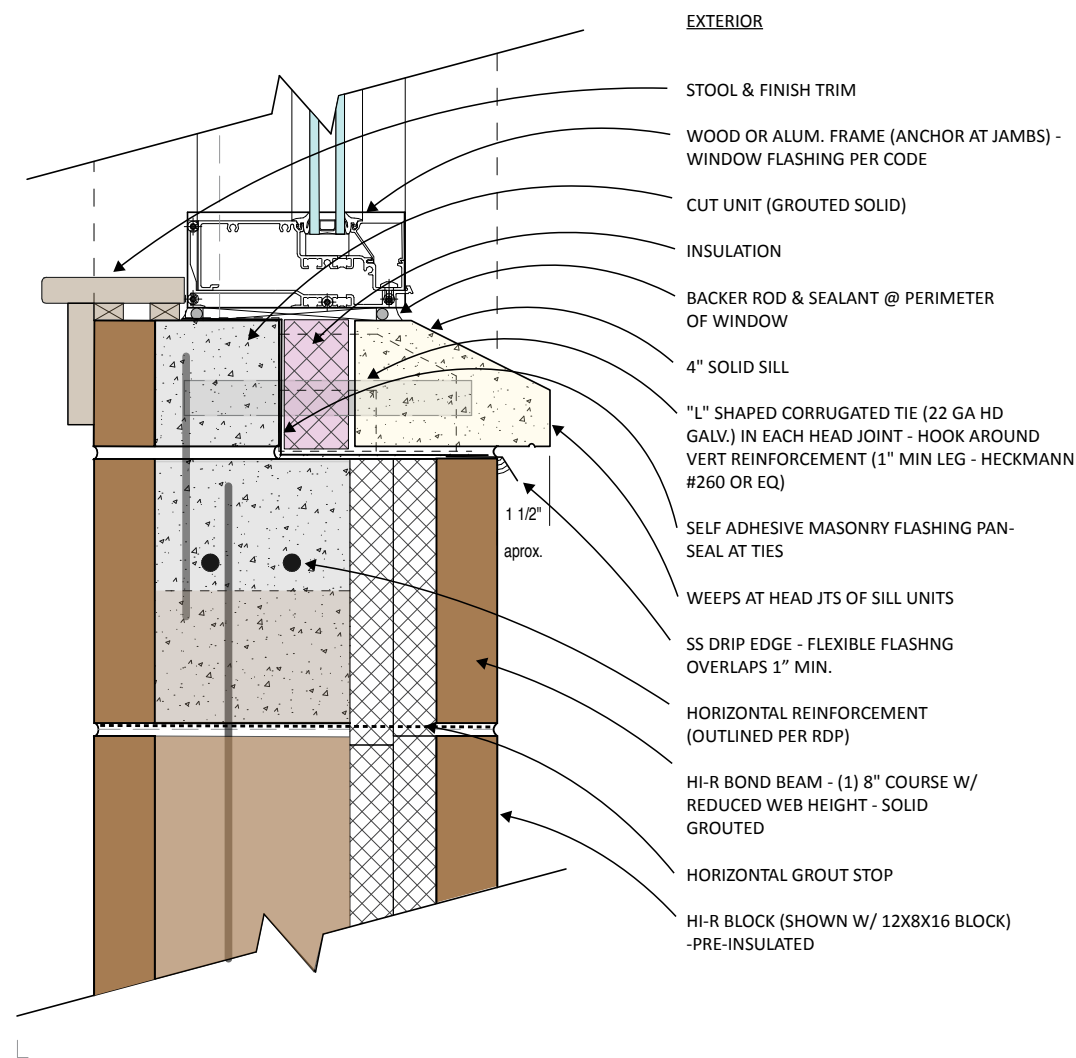
Figure 16. HI-R-H HALF HIGH Window Sill

[Click on drawings to enlarge](#)

Table of Contents	
<ul style="list-style-type: none"> Introduction Product Overview Installation Finishing Maintenance Warranty Technical Support Contact Information 	<ul style="list-style-type: none"> Product Overview Installation Finishing Maintenance Warranty Technical Support Contact Information

Window Sills

Figure 13. HI-R Window Sill (Partially Grouted Wall)



Notes:

1. This detail depicts a partially grouted wall. HI-R CMU may also be used to construct fully grouted walls and would be detailed in the same manner, other than excluding the grout stop below the sill bond beam. Fully grouting masonry walls is a cost-effective alternative to partially grouted walls. In many areas of the country where seismic design considerations are important, highly reinforced and fully grouted masonry is the preferred solution. Fully grouted walls do not require flashing at bond beam locations (though flashing at a sill location as shown is recommended), and meet Code air barrier requirements.
2. For projects located in California, or other projects where compliance to vertical wall shear testing is required, alternate moisture control techniques that omit integral water repellent may be used (e.g. use IWR within mortar; use post-applied breathable penetrating sealants or drainable film forming coatings; use High Range Water Reducer in grout).
3. Request evidence in writing of adequate head joint mortar bond to IWR-containing CMU for Properties-based mortars. Request in writing evidence of sufficient composite-action bond to IWR-containing CMU of Properties-based grout.
4. Single wythe walls rely upon a belt-and-suspenders approach to moisture control. Design typically will integrate flashing and weeps, integral water repellent, post-applied moisture control means and measures, sealants, movement joints, damp-checks, crack control, thermal bridging/condensate control, as well as soil elevation offsets and below-grade damp-proofing.

Codes and Standards References

Applicable References are found in Section III.

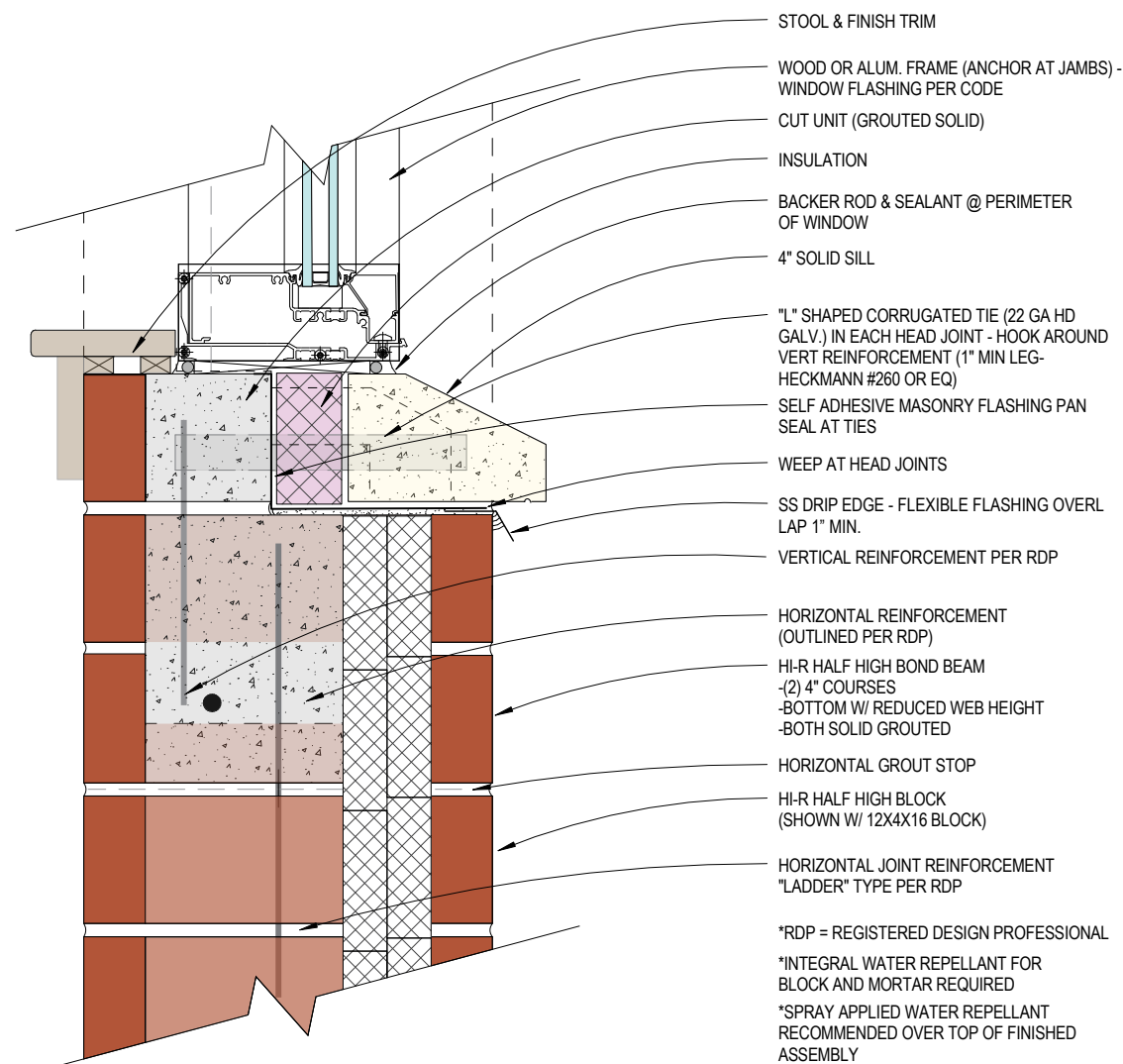
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Figure 14. Spec-Brik HI-R Window Sill



Notes:

1. This detail depicts a partially grouted wall. HI-R CMU may also be used to construct fully grouted walls and would be detailed in the same manner, other than excluding the grout stop below the sill bond beam. Fully grouting masonry walls is a cost-effective alternative to partially grouted walls. In many areas of the country where seismic design considerations are important, highly reinforced and fully grouted masonry is the preferred solution. Fully grouted walls do not require flashing at bond beam locations (though flashing at a sill location as shown is recommended), and meet Code air barrier requirements.
2. For projects located in California, or other projects where compliance to vertical wall shear testing is required, alternate moisture control techniques that omit integral water repellent may be used (e.g. use IWR within mortar; use post-applied breathable penetrating sealants or drainable film forming coatings; use High Range Water Reducer in grout).
3. Request evidence in writing of adequate head joint mortar bond to IWR-containing CMU for Properties-based mortars. Request in writing evidence of sufficient composite-action bond to IWR-containing CMU of Properties-based grout.
4. Single wythe walls rely upon a belt-and-suspenders approach to moisture control. Design typically will integrate flashing and weeps, integral water repellent, post-applied moisture control means and measures, sealants, movement joints, damp-checks, crack control, thermal bridging/condensate control, as well as soil elevation offsets and below-grade damp-proofing.

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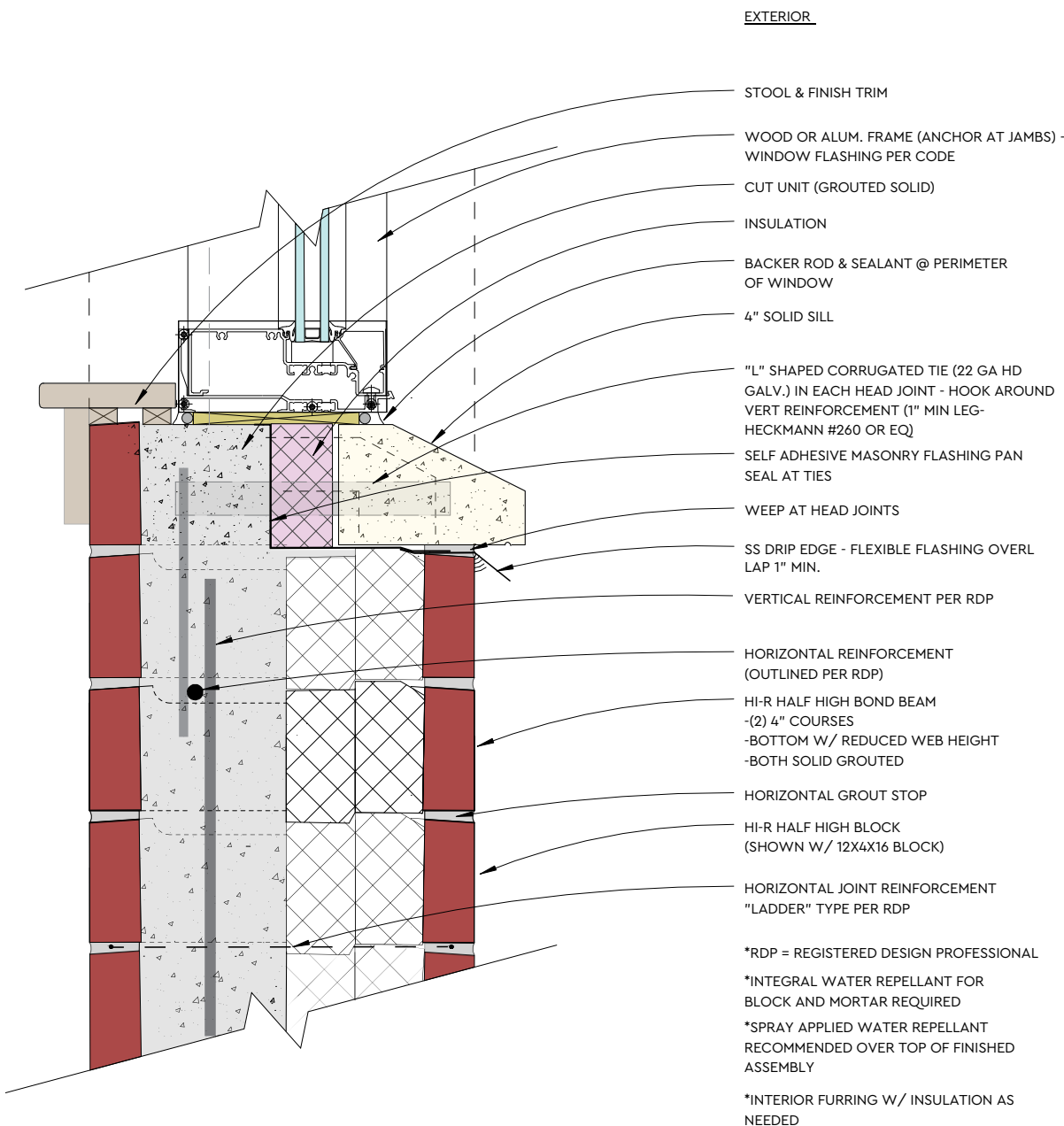
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Table of Contents

Introduction	1
Section III - Codes and Standards References	1
Section IV - Details	1
Section V - Construction	1
Section VI - Maintenance	1
Section VII - Quality Control	1
Section VIII - Safety	1
Section IX - Environmental	1
Section X - Health	1
Section XI - Security	1
Section XII - Accessibility	1
Section XIII - Sustainability	1
Section XIV - Innovation	1
Section XV - Research	1
Section XVI - Education	1
Section XVII - Outreach	1
Section XVIII - Partnerships	1
Section XIX - Funding	1
Section XX - Evaluation	1
Section XXI - Reporting	1
Section XXII - Archiving	1
Section XXIII - Dissemination	1
Section XXIV - Implementation	1
Section XXV - Monitoring	1
Section XXVI - Assessment	1
Section XXVII - Review	1
Section XXVIII - Feedback	1
Section XXIX - Improvement	1
Section XXX - Conclusion	1



Figure 15. HI-R-H Half High Window Sill



Notes:

1. This detail depicts a fully grouted wall. HI-R walls may be built either fully or partially grouted, while the HI-R-H products are fully grouted only. Fully grouting masonry walls is a cost-effective alternative to partially grouted walls. In many areas of the country where seismic design considerations are important, highly reinforced and fully grouted masonry is the preferred solution. Fully grouted walls do not require flashing at bond beam locations (though flashing at a sill location as shown is recommended), and meet Code air barrier requirements.
2. For projects located in California, or other projects where compliance to vertical wall shear testing is required, alternate moisture control techniques that omit integral water repellent may be used (e.g. use IWR within mortar; use post-applied breathable penetrating sealants or drainable film forming coatings; use High Range Water Reducer in grout).
3. Request evidence in writing of adequate head joint mortar bond to IWR-containing CMU for Properties-based mortars. Request in writing evidence of sufficient composite-action bond to IWR-containing CMU of Properties-based grout.
4. Single wythe walls rely upon a belt-and-suspenders approach to moisture control. Design typically will integrate flashing and weeps, integral water repellent, post-applied moisture control means and measures, sealants, movement joints, damp-checks, crack control, thermal bridging/condensate control, as well as soil elevation offsets and below-grade damp-proofing.

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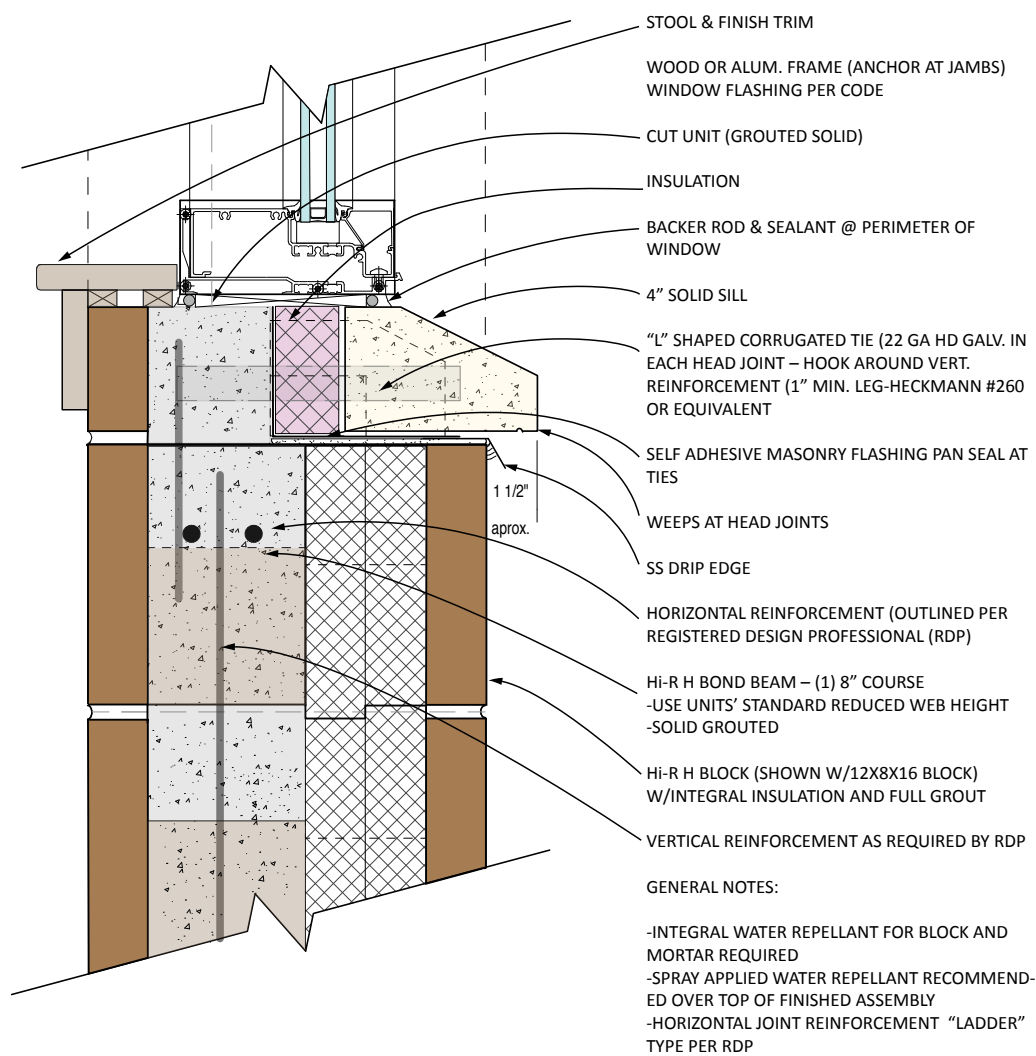
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Figure 16. HI-R-H Window Sill



Notes:

1. This detail depicts a fully grouted wall. HI-R walls may be built either fully or partially grouted, while the HI-R-H products are fully grouted only. Fully grouting masonry walls is a cost-effective alternative to partially grouted walls. In many areas of the country where seismic design considerations are important, highly reinforced and fully grouted masonry is the preferred solution. Fully grouted walls do not require flashing at bond beam locations (though flashing at a sill location as shown is recommended), and meet Code air barrier requirements.
2. For projects located in California, or other projects where compliance to vertical wall shear testing is required, alternate moisture control techniques that omit integral water repellent may be used (e.g. use IWR within mortar; use post-applied breathable penetrating sealants or drainable film forming coatings; use High Range Water Reducer in grout).
3. Request evidence in writing of adequate head joint mortar bond to IWR-containing CMU for Properties-based mortars. Request in writing evidence of sufficient composite-action bond to IWR-containing CMU of Properties-based grout.
4. Single wythe walls rely upon a belt-and-suspenders approach to moisture control. Design typically will integrate flashing and weeps, integral water repellent, post-applied moisture control means and measures, sealants, movement joints, damp-checks, crack control, thermal bridging/condensate control, as well as soil elevation offsets and below-grade damp-proofing.

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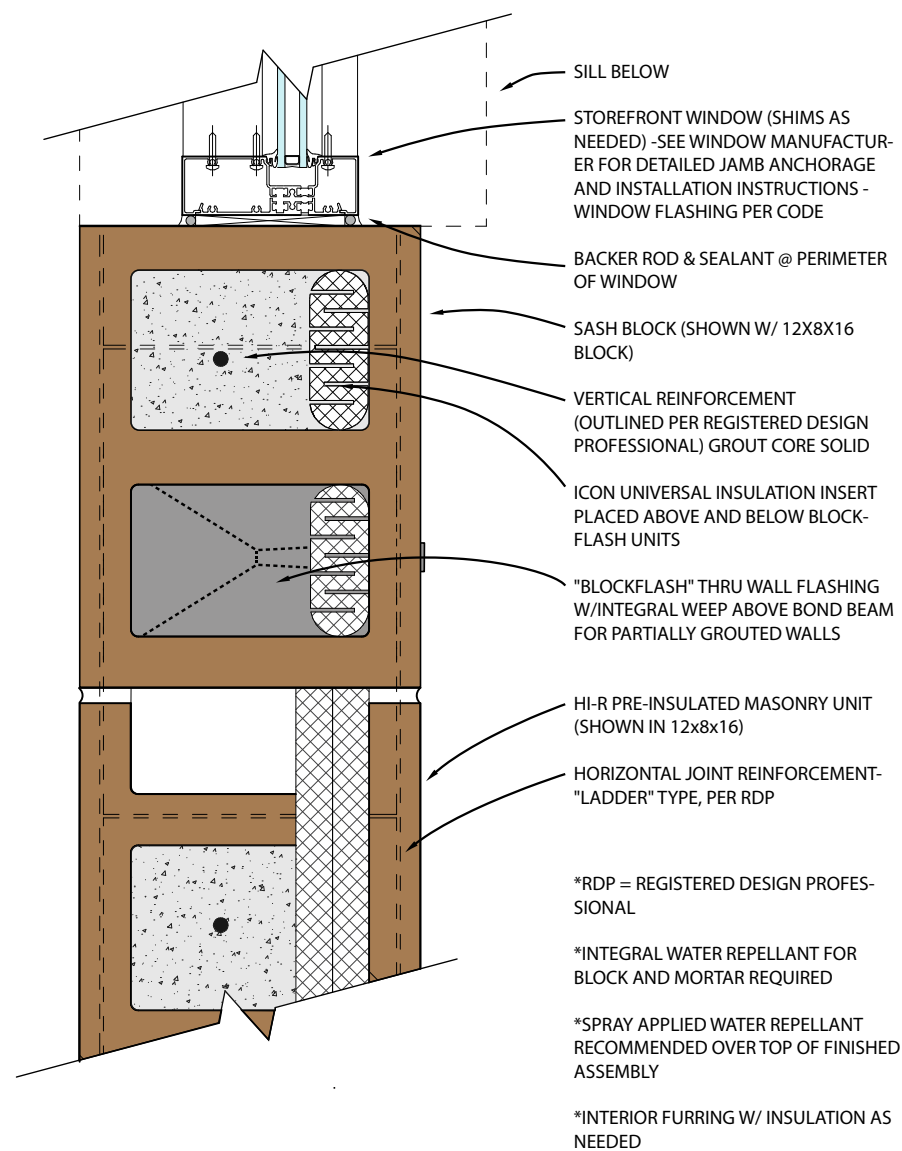
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Figure 17. HI-R Window Jamb



Notes:

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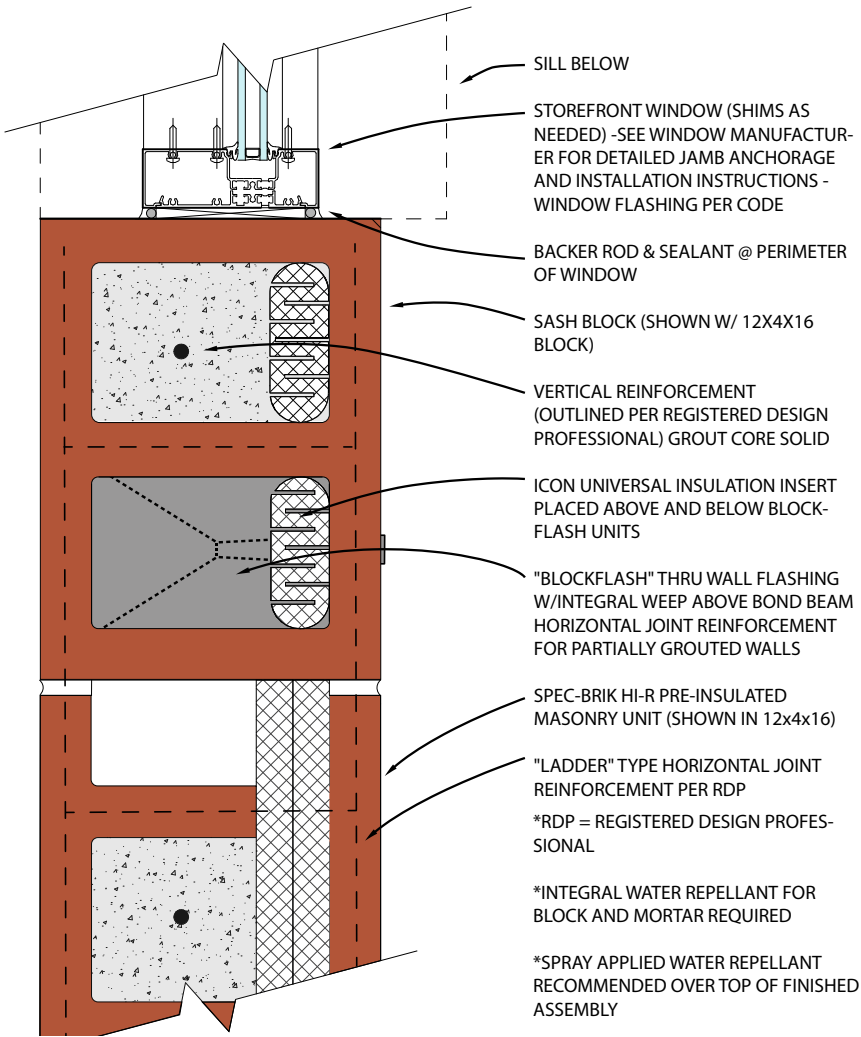
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Table of Contents

Introduction	1
Chapter 1: General Information	2
Chapter 2: Foundation	3
Chapter 3: Wall	4
Chapter 4: Window	5
Chapter 5: Door	6
Chapter 6: Roof	7
Chapter 7: Floor	8
Chapter 8: Ceiling	9
Chapter 9: Interior Finish	10
Chapter 10: Exterior Finish	11
Chapter 11: Mechanical	12
Chapter 12: Electrical	13
Chapter 13: Plumbing	14
Chapter 14: HVAC	15
Chapter 15: Fire Protection	16
Chapter 16: Security	17
Chapter 17: Sustainability	18
Chapter 18: Accessibility	19
Chapter 19: Safety	20
Chapter 20: Maintenance	21
Chapter 21: Appendix	22



Figure 18. Spec-Brik HI-R Window Jamb



Notes:

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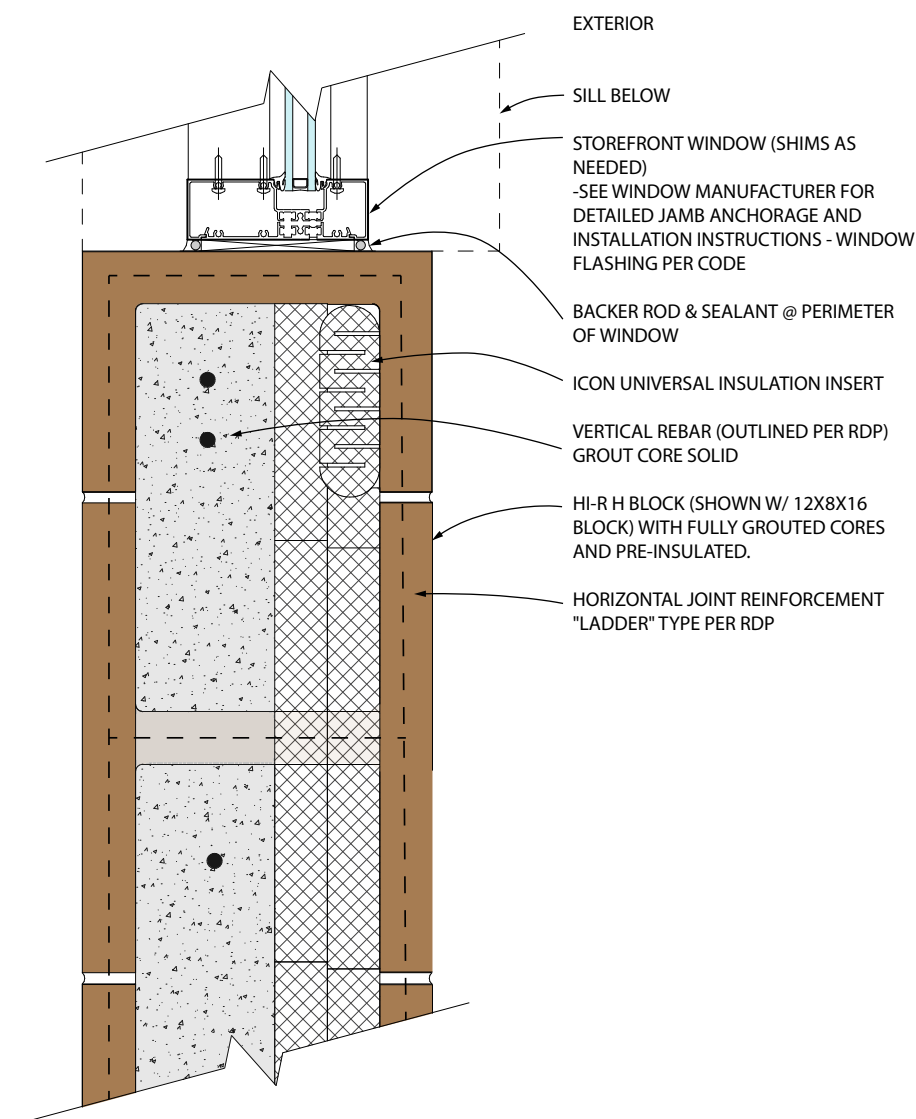
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Figure 19. HI-R-H Window Jamb



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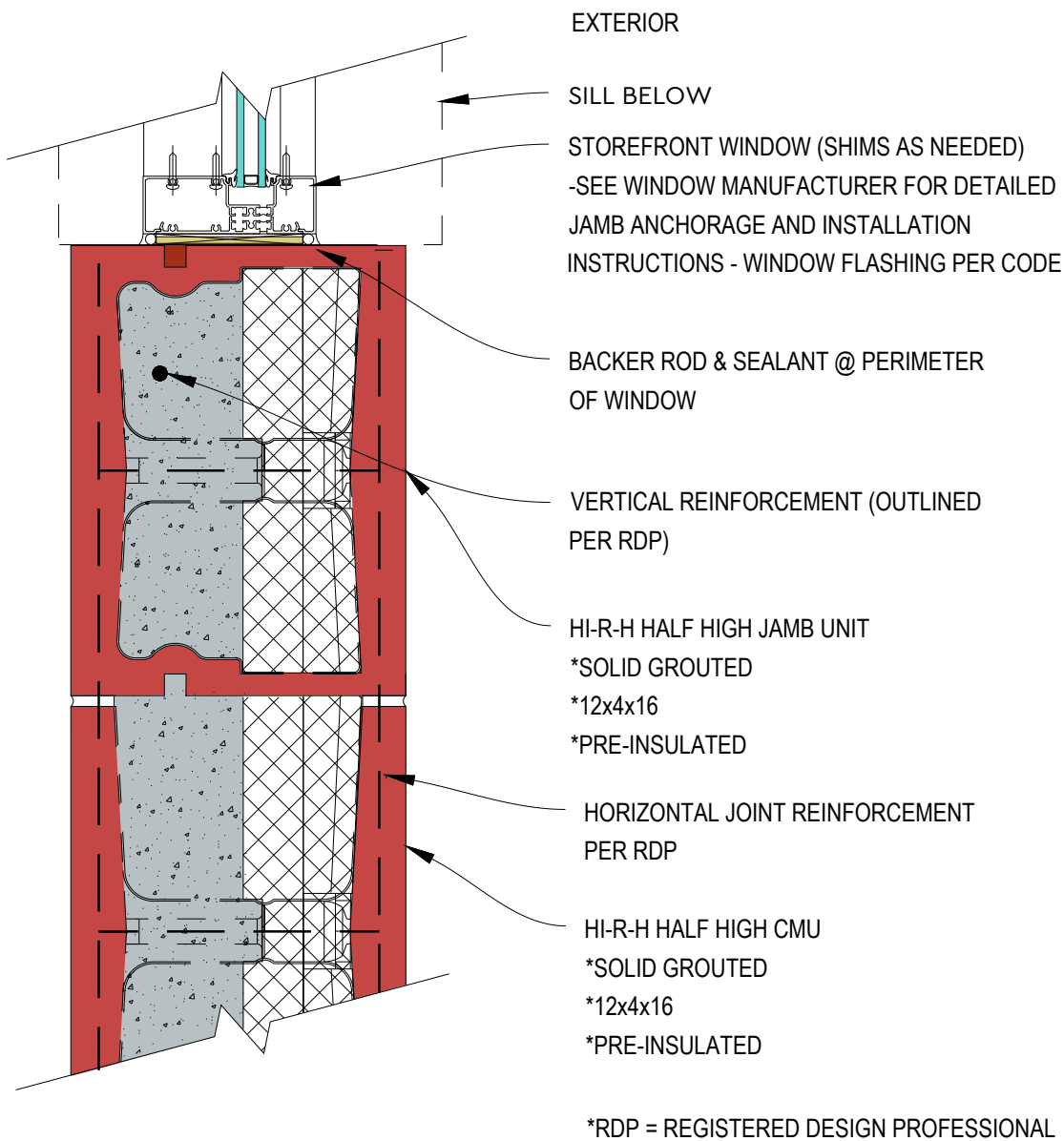
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Table of Contents

1. Introduction	1
2. General Information	2
3. Codes and Standards	3
4. Design Requirements	4
5. Construction Details	5
6. Maintenance	6
7. Appendix	7
8. Index	8



Figure 20. Jamb Using HI-R-H or HI-R-H Half High Jamb and Corner Unit



Notes:

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2. This detail depicts a fully grouted wall. HI-R walls may be built either fully or partially grouted, while the HI-R-H products are fully grouted only. Fully grouting masonry walls is a cost-effective alternative to partially grouted walls. In many areas of the country where seismic design considerations are important, highly reinforced and fully grouted masonry is the preferred solution. Fully grouted walls do not require flashing at bond beam locations, and meet Code air barrier requirements.
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Table of Contents

Introduction	1
Chapter 1: General Information	2
Chapter 2: Foundation	3
Chapter 3: Wall	4
Chapter 4: Window	5
Chapter 5: Door	6
Chapter 6: Roof	7
Chapter 7: Siding	8
Chapter 8: Gutter	9
Chapter 9: Drainage	10
Chapter 10: Insulation	11
Chapter 11: Vapor Barrier	12
Chapter 12: Air Barrier	13
Chapter 13: Moisture Control	14
Chapter 14: Thermal Bridging	15
Chapter 15: Condensate Control	16
Chapter 16: Soil Elevation	17
Chapter 17: Below-Grade Damp-Proofing	18



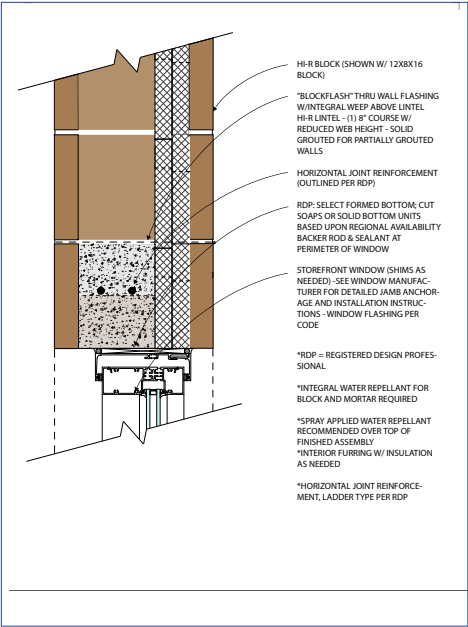


Figure 21. HI-R Lintel

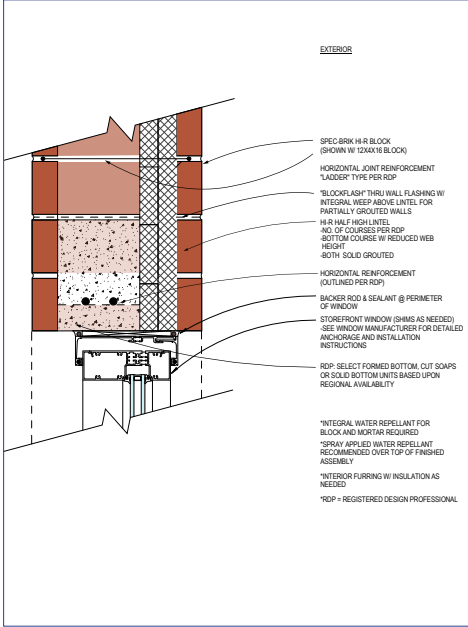


Figure 22. Spec-Brik HI-R Lintel

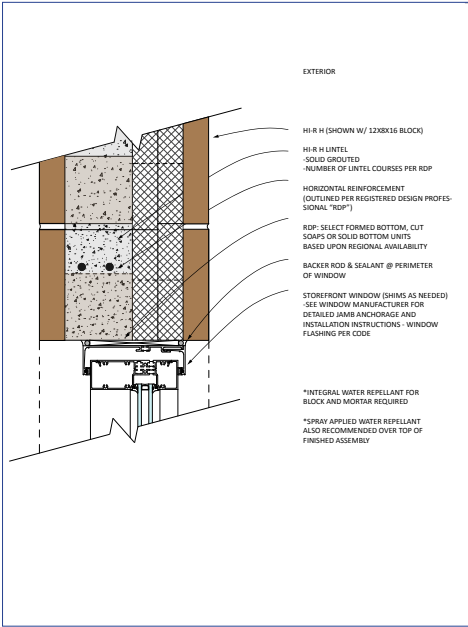


Figure 23. HI-R-H Lintel

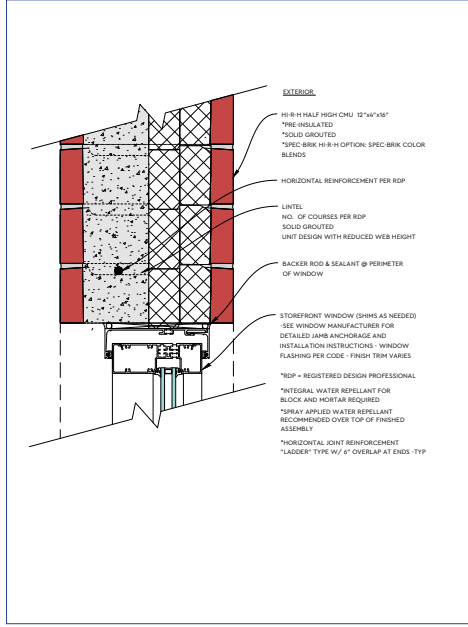


Figure 24. HI-R-H Half High Lintel

[Click on drawings to enlarge](#)

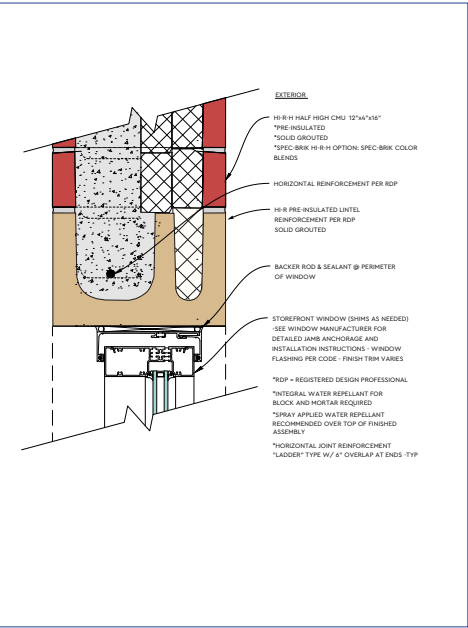
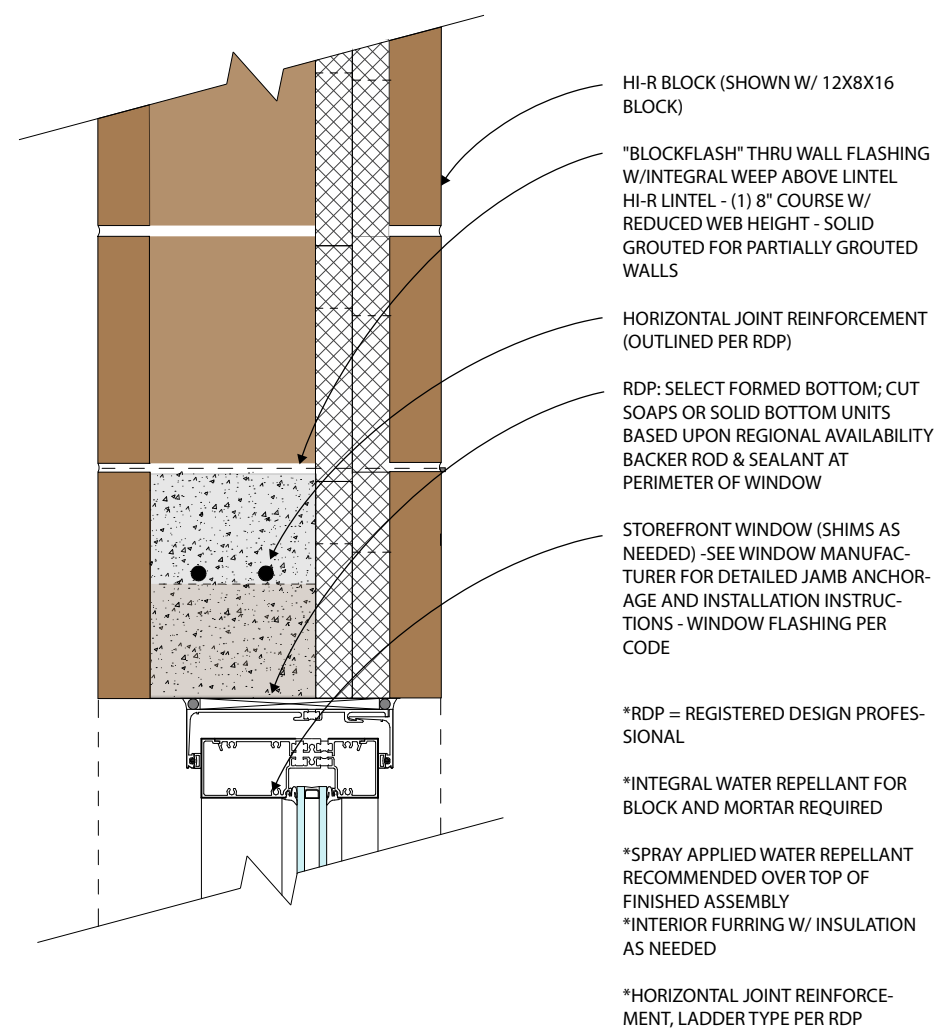


Figure 25. Insulated HI-R Lintel

Table of Contents	
1. Introduction	1
2. Product Overview	2
3. Installation Instructions	3
4. Maintenance	4
5. Warranty	5
6. Contact Information	6
7. Glossary	7
8. Index	8
9. Appendix	9
10. Notes	10
11. Revision History	11
12. Drawings	12
13. Specifications	13
14. Test Results	14
15. Environmental Data	15
16. Safety Information	16
17. Compliance	17
18. Certifications	18
19. References	19
20. Other Documents	20

Window Head/Lintel

Figure 21. HI-R Lintel



Notes:

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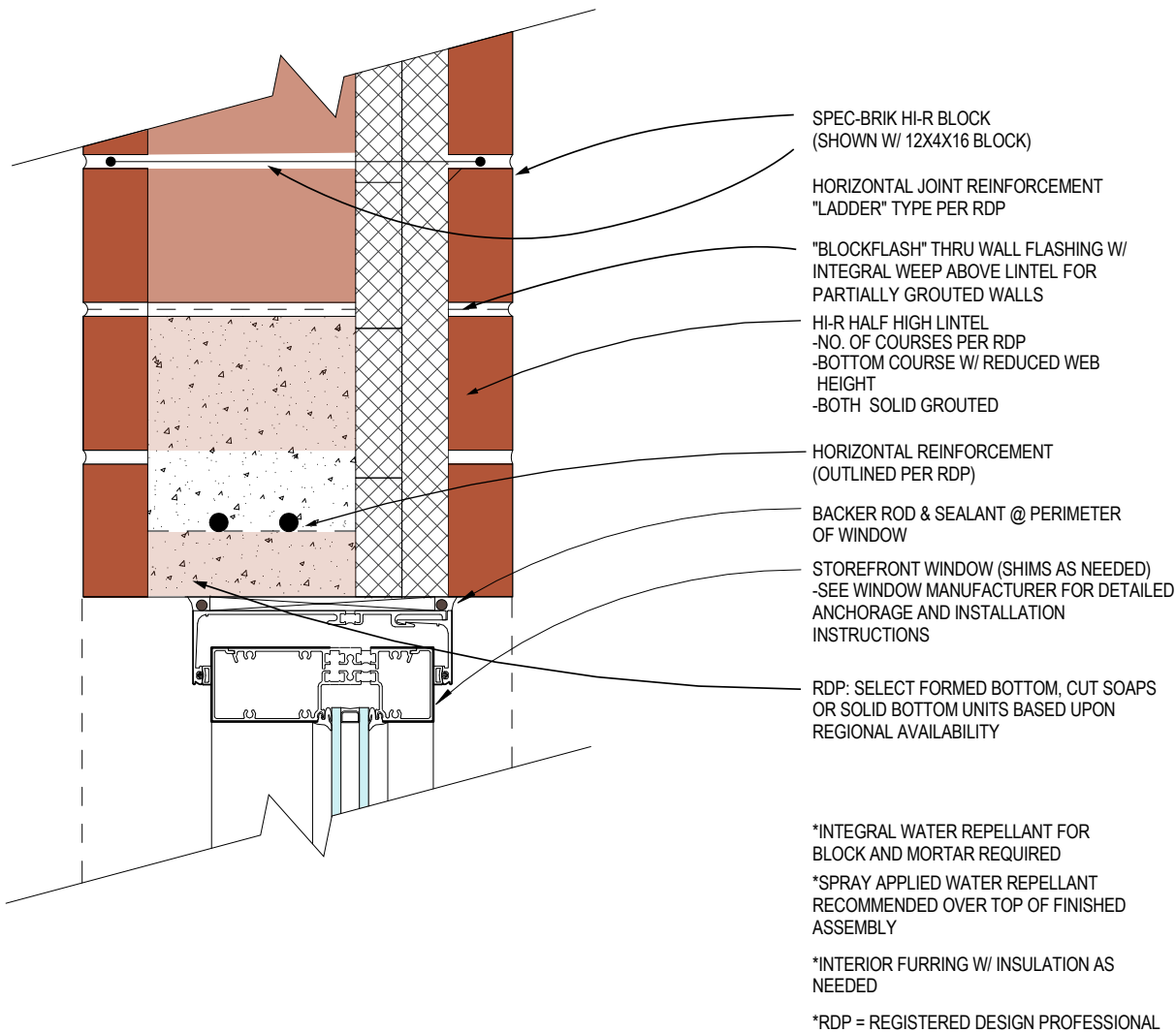
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Table of Contents

Introduction	1
Section I: General Information	2
Section II: Design Requirements	3
Section III: Codes and Standards References	4
Section IV: Construction Details	5
Section V: Maintenance and Repair	6
Section VI: Appendix	7
Section VII: Glossary	8
Section VIII: Index	9



Figure 22. Spec-Brik HI-R Lintel



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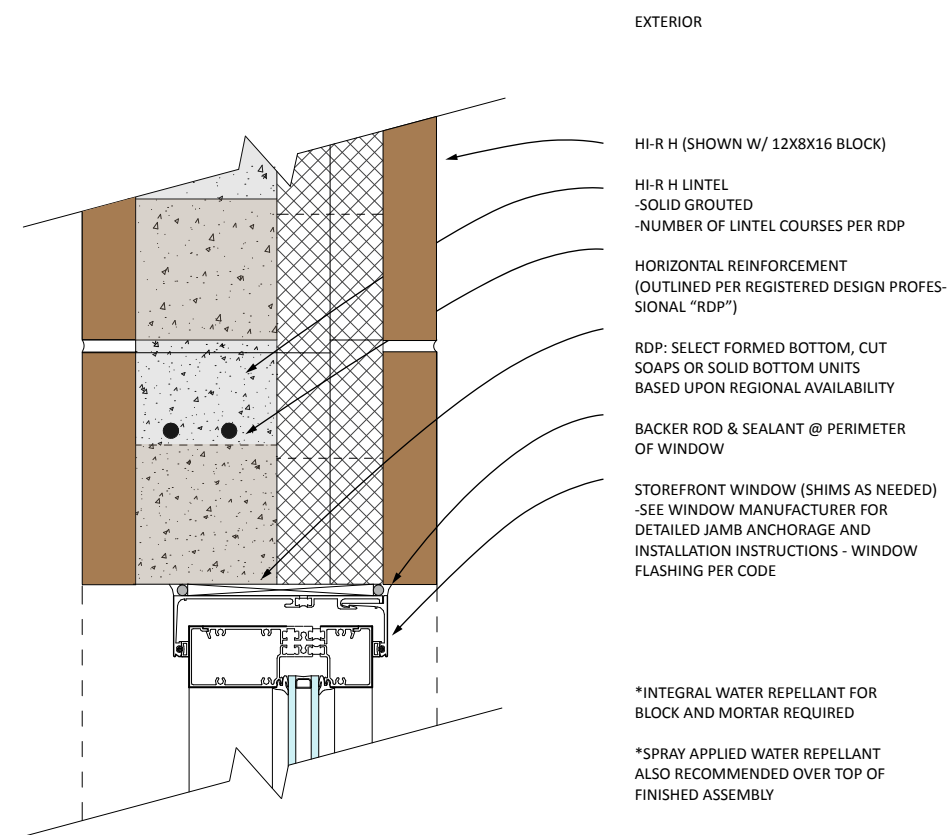
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Figure 23. HI-R-H Lintel



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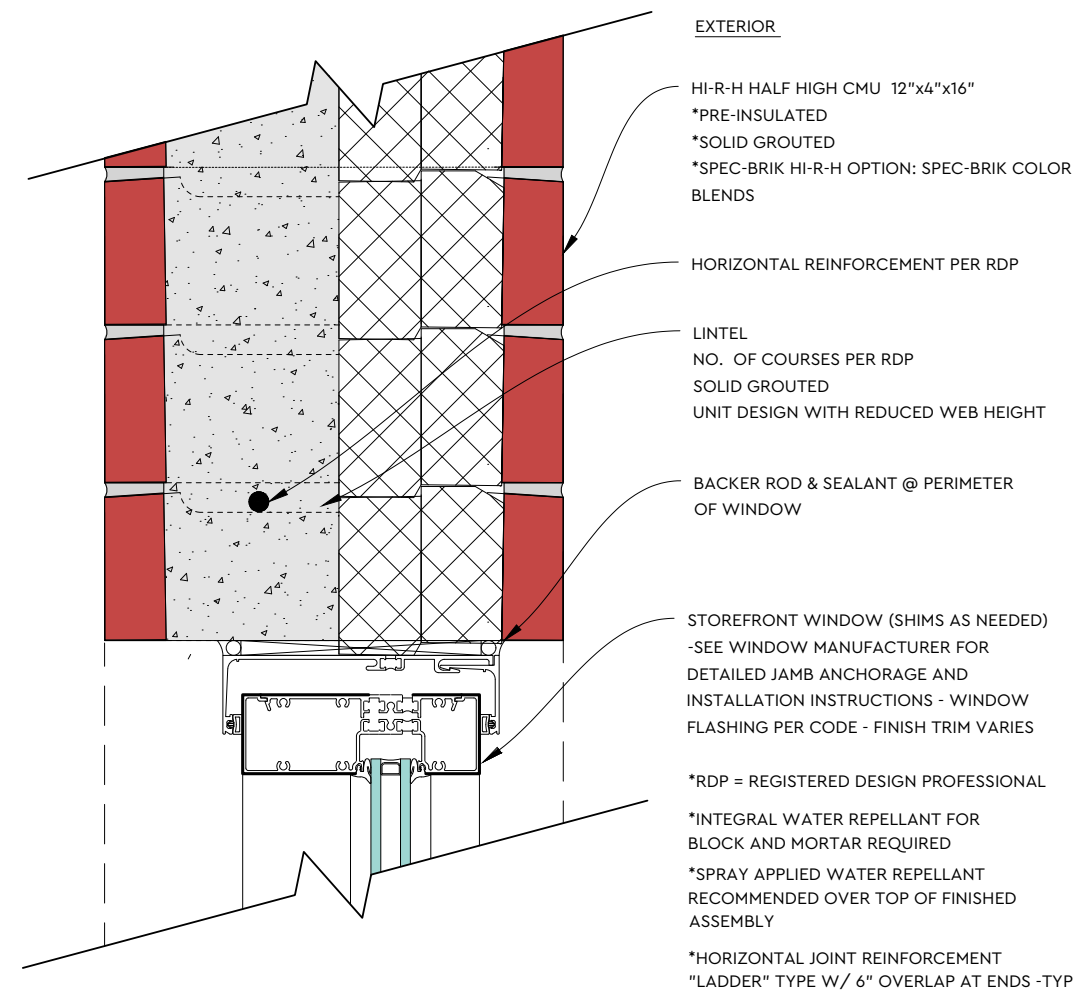
Figure 24. HI-R-H Half High Lintel

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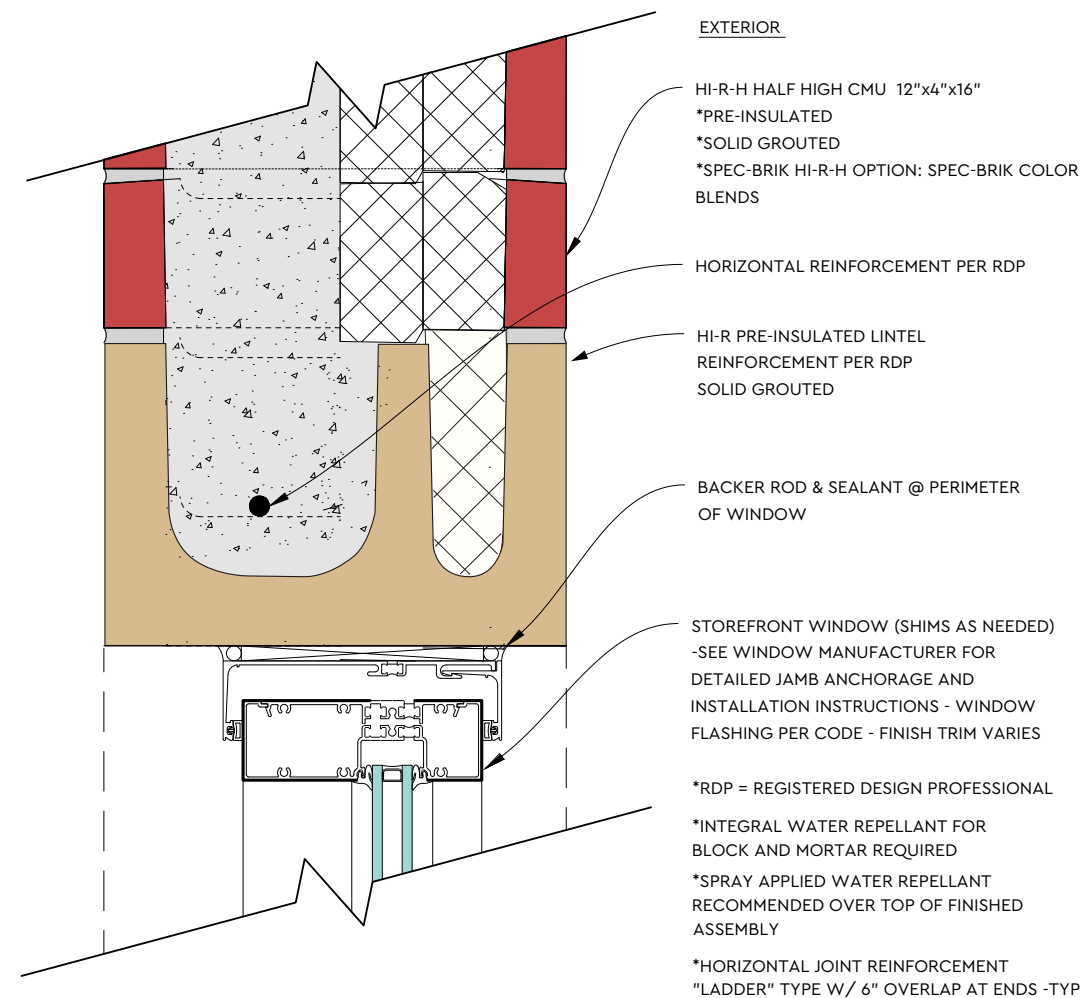
Figure 25. HI-R Pre-Insulated Lintel Unit

Notes:

1. This specialty Lintel unit is available regionally- please check with your local supplier for availability. The HI-R Lintel unit is compatible with all HI-R and HI-R-H product types.
2. For projects located in California, or other projects where compliance to vertical wall shear testing is required, alternate moisture control techniques that omit integral water repellent may be used (e.g. use IWR within mortar; use post-applied breathable penetrating sealants or drainable film forming coatings; use High Range Water Reducer in grout).
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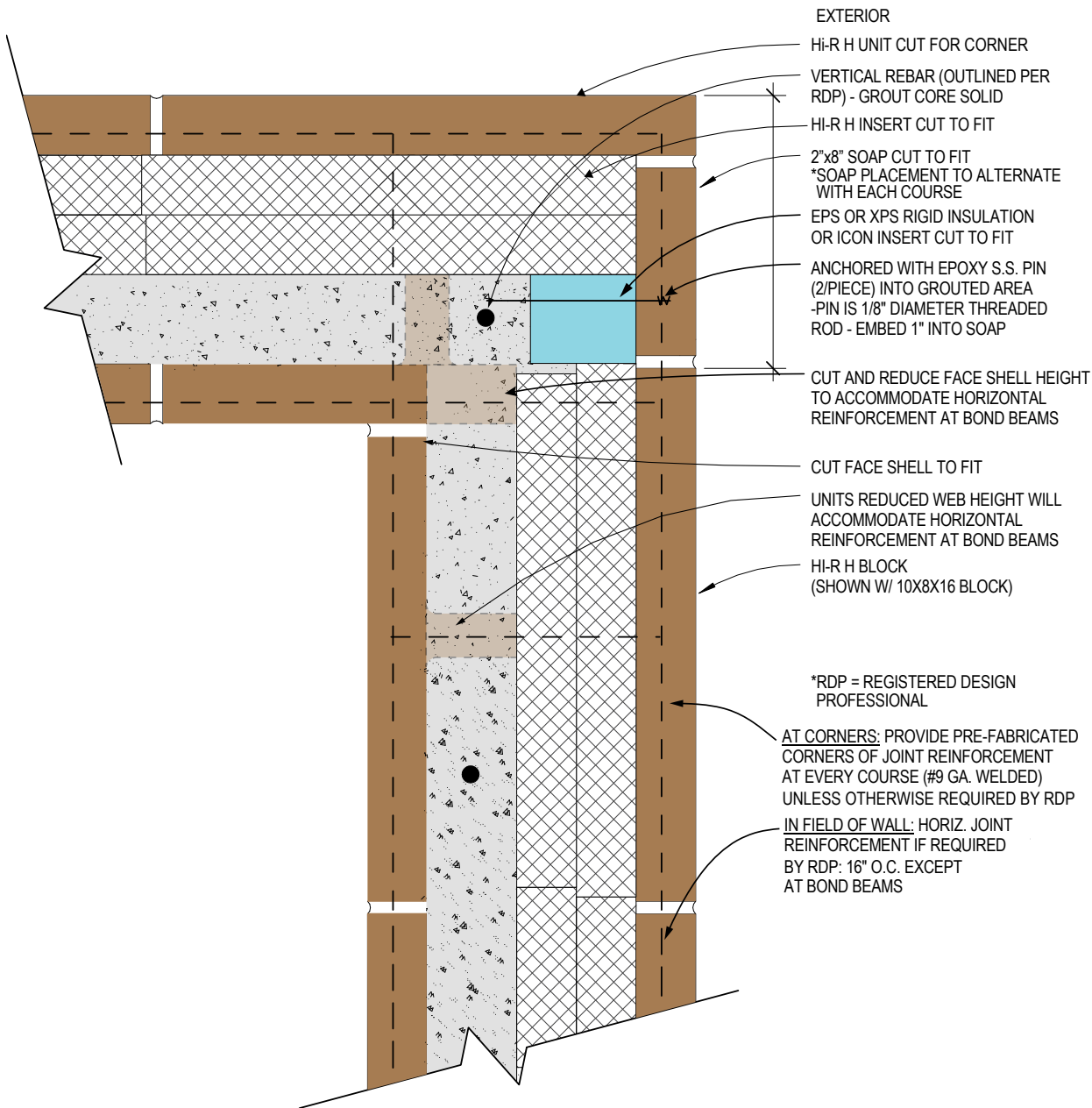
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Figure 26. 10" HI-R-H Bonded Corner – Exterior Soap



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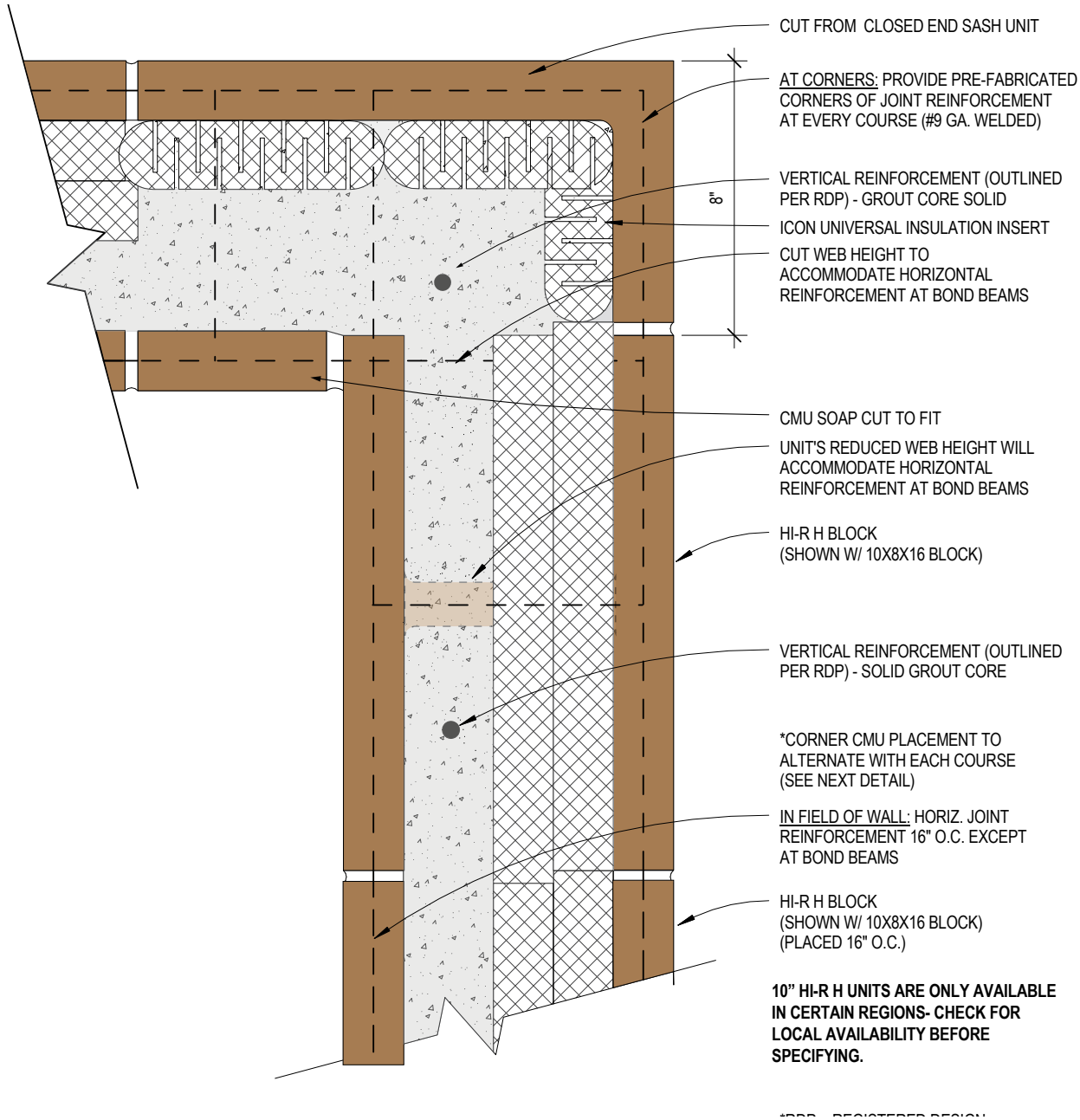
Notes:

1. The 10" version of HI-R-H is limited to regional availability. Please check with your local manufacturer prior to specification.
2. This detail illustrates how to build bonded corners with HI-R-H that meet structural requirements while maintaining insulation at the corner locations. This detail uses an exterior soap and cuts to the HI-R-H Units to form the corner. While this approach requires cutting both HI-R Units, the only separate fitting required for the corner is the soap.
3. Avoid bonded corners to save cost and time of construction. Not all designs require a bonded corner.
4. HI-R-H units can serve both as stretcher and bond beam unit without any modification. The reduced web height accommodates horizontal rebar. They are designed for construction of fully grouted and reinforced walls because they can be placed at rebar locations without the need to lift the unit over the top of the rebar as would be necessary with a more traditional CMU design, and grout will flow laterally at every course due to the reduced web heights.
5. HI-R-H units can also combine readily with conventional masonry fittings for construction of a variety of wall assembly details, including corners, joints, ends, and sills.

Codes and Standards References

Applicable References are found in Section III.

Figure 27. 10" HI-R-H Bonded Corner. L-Shape Veneer – course 1



Notes:

1. The 10" version of HI-R-H is limited to regional availability. Please check with your local manufacturer prior to specification.
2. This detail illustrates how to build bonded corners with HI-R-H that meet structural requirements while maintaining insulation at the corner locations. This detail uses an exterior soap and cuts to the HI-R-H Units to form the corner. While this approach requires cutting both HI-R Units, the only separate fitting required for the corner is the soap.
3. Avoid bonded corners to save cost and time of construction. Not all designs require a bonded corner.
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5. HI-R-H units can also combine readily with conventional masonry fittings for construction of a variety of wall assembly details, including corners, joints, ends, and sills.

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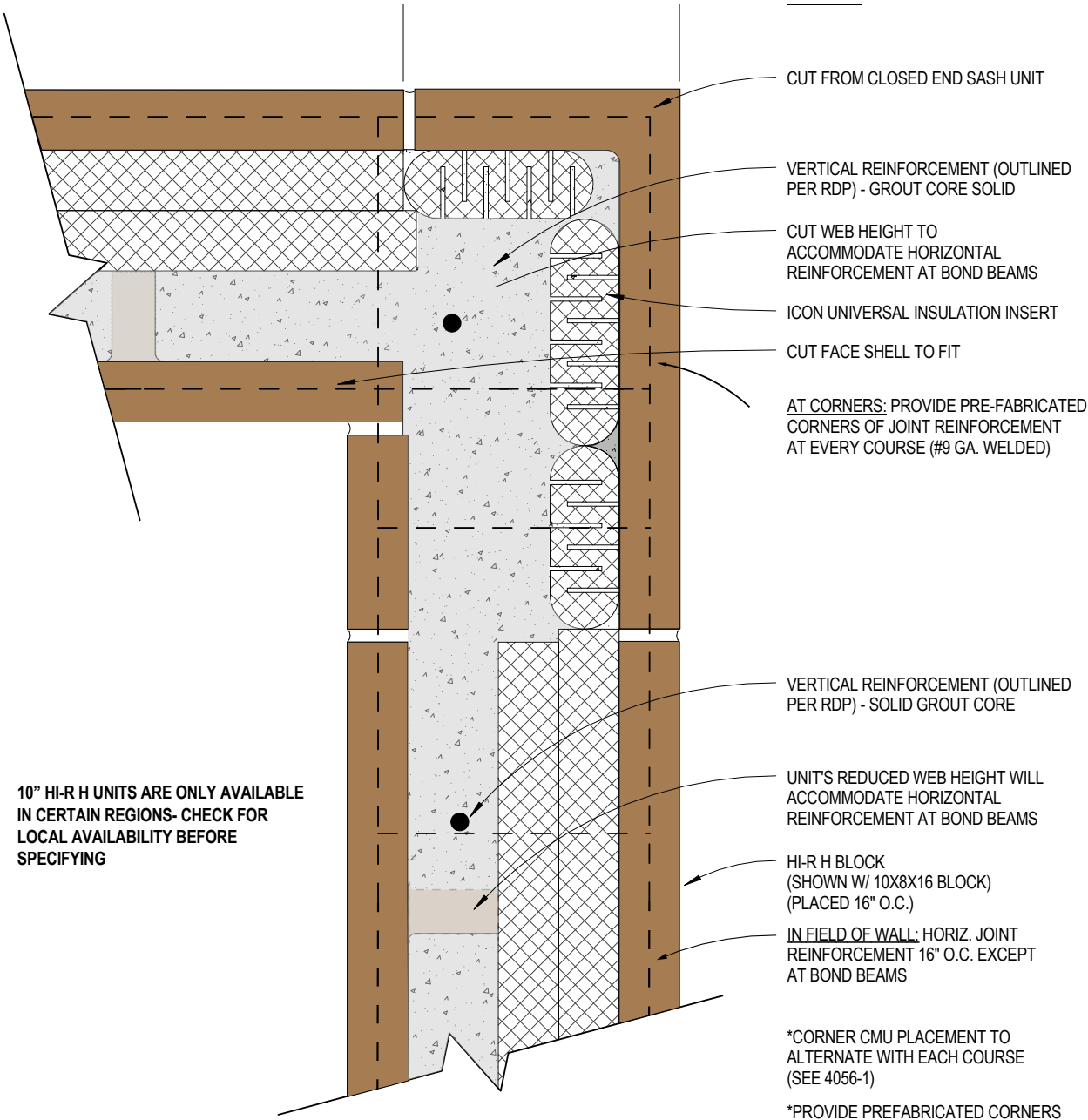
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Table of Contents

Introduction	1
Section I: General Information	2
Section II: Design and Construction	3
Section III: Codes and Standards References	4
Section IV: Details	5
Section V: Notes	6
Section VI: Codes and Standards References	7
Section VII: Details	8
Section VIII: Notes	9
Section IX: Codes and Standards References	10
Section X: Details	11
Section XI: Notes	12
Section XII: Codes and Standards References	13
Section XIII: Details	14
Section XIV: Notes	15
Section XV: Codes and Standards References	16
Section XVI: Details	17
Section XVII: Notes	18
Section XVIII: Codes and Standards References	19
Section XIX: Details	20
Section XX: Notes	21
Section XXI: Codes and Standards References	22
Section XXII: Details	23
Section XXIII: Notes	24
Section XXIV: Codes and Standards References	25
Section XXV: Details	26
Section XXVI: Notes	27
Section XXVII: Codes and Standards References	28
Section XXVIII: Details	29
Section XXIX: Notes	30
Section XXX: Codes and Standards References	31
Section XXXI: Details	32
Section XXXII: Notes	33
Section XXXIII: Codes and Standards References	34
Section XXXIV: Details	35
Section XXXV: Notes	36
Section XXXVI: Codes and Standards References	37
Section XXXVII: Details	38
Section XXXVIII: Notes	39
Section XXXIX: Codes and Standards References	40
Section XL: Details	41
Section XLI: Notes	42
Section XLII: Codes and Standards References	43
Section XLIII: Details	44
Section XLIV: Notes	45
Section XLV: Codes and Standards References	46
Section XLVI: Details	47
Section XLVII: Notes	48
Section XLVIII: Codes and Standards References	49
Section XLIX: Details	50
Section L: Notes	51



Figure 28. 10" HI-R-H Bonded Corner. L-Shape Veneer – course 2



Notes:

- 1. The 10" version of HI-R-H is limited to regional availability. Please check with your local manufacturer prior to specification.
- 2. This detail illustrates how to build bonded corners with HI-R-H that meet structural requirements while maintaining insulation at the corner locations. This detail uses an exterior soap and cuts to the HI-R-H Units to form the corner. While this approach requires cutting both HI-R Units, the only separate fitting required for the corner is the soap.
- 3. Avoid bonded corners to save cost and time of construction. Not all designs require a bonded corner.
- 4. HI-R-H units can serve both as stretcher and bond beam unit without any modification. The reduced web height accommodates horizontal rebar. They are designed for construction of fully grouted and reinforced walls because they can be placed at rebar locations without the need to lift the unit over the top of the rebar as would be necessary with a more traditional CMU design, and grout will flow laterally at every course due to the reduced web heights.
- 5. HI-R-H units can also combine readily with conventional masonry fittings for construction of a variety of wall assembly details, including corners, joints, ends, and sills.

Codes and Standards References

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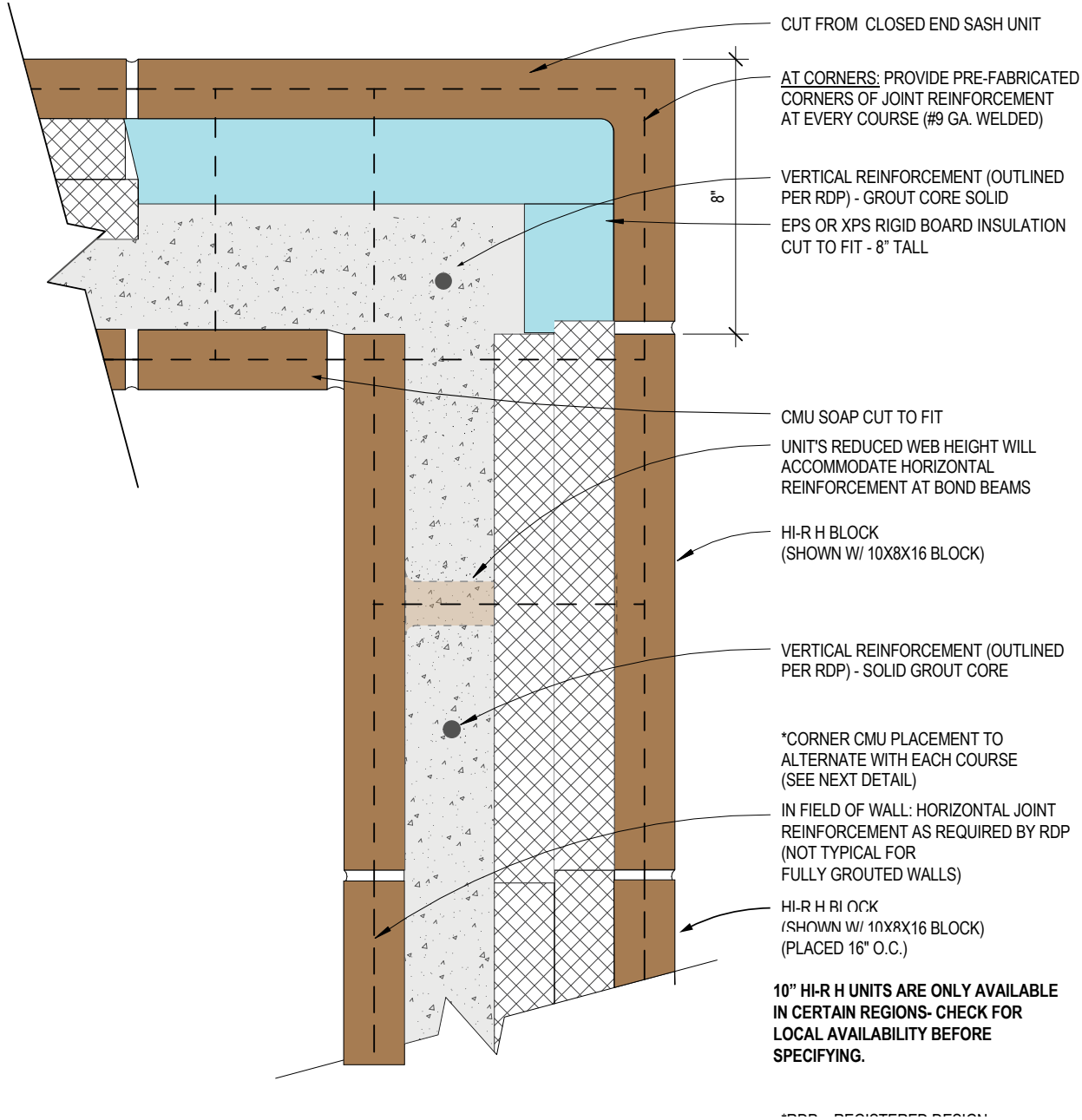
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Table of Contents

Introduction	1
Section I: General Information	2
Section II: Wall Assembly Details	3
Section III: Codes and Standards References	4
Section IV: Construction Details	5
Section V: Maintenance and Repair	6
Section VI: Safety and Health	7
Section VII: Environmental Protection	8
Section VIII: Quality Control	9
Section IX: Project Management	10
Section X: Appendix	11



Figure 29. 10" HI-R-H Bonded Corner L-Shape Veneer – course 1



Notes:

- 1. The 10" version of HI-R-H is limited to regional availability. Please check with your local manufacturer prior to specification.
- 2. This detail illustrates how to build bonded corners with HI-R-H that meet structural requirements while maintaining insulation at the corner locations. This detail uses an exterior soap and cuts to the HI-R-H Units to form the corner. While this approach requires cutting both HI-R Units, the only separate fitting required for the corner is the soap.
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- 5. HI-R-H units can also combine readily with conventional masonry fittings for construction of a variety of wall assembly details, including corners, joints, ends, and sills.

Codes and Standards References

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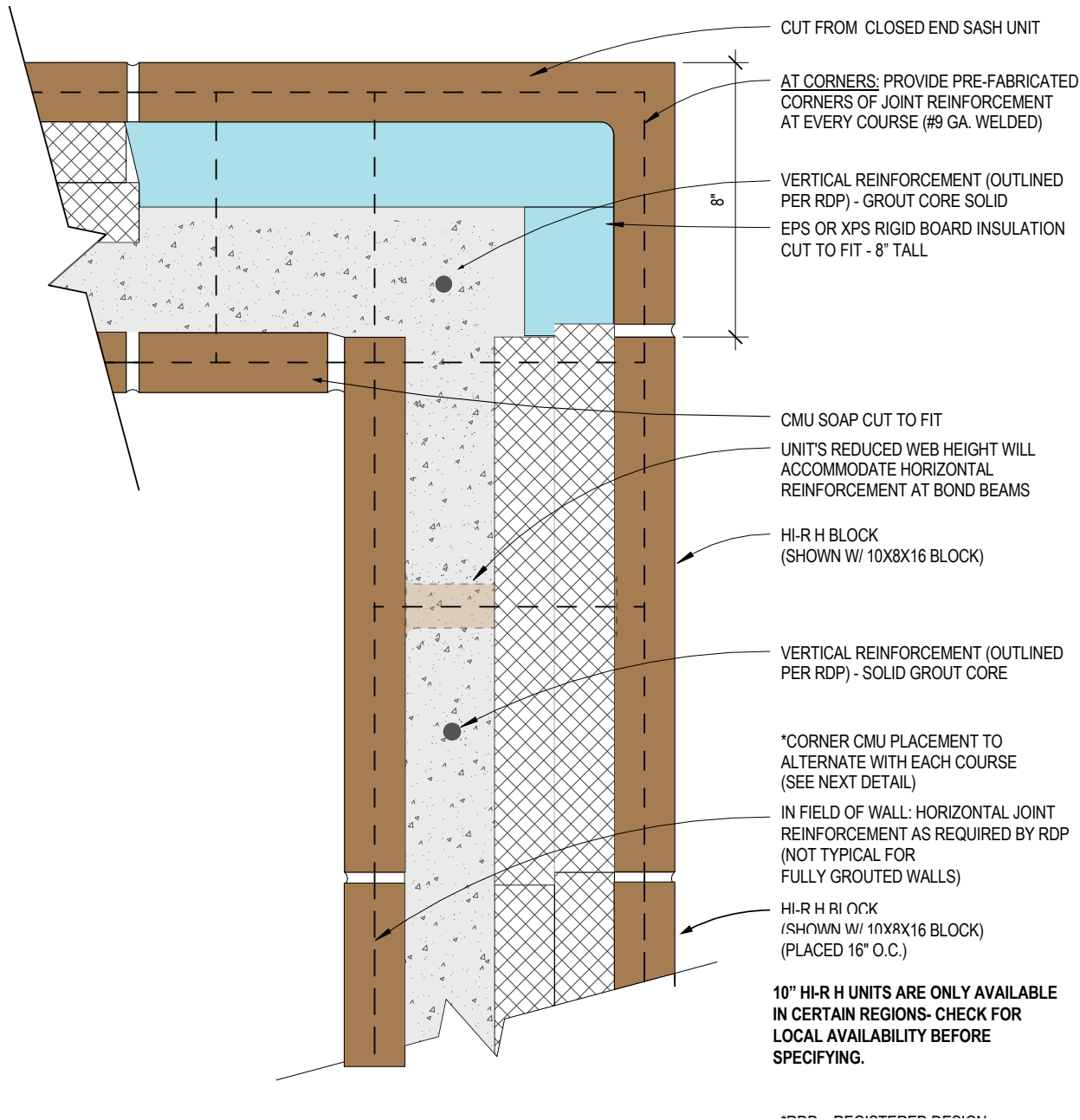
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Figure 30. 10" HI-R-H Bonded Corner L-Shape Veneer – course 2



Notes:

1. The 10" version of HI-R-H is limited to regional availability. Please check with your local manufacturer prior to specification.
2. This detail illustrates how to build bonded corners with HI-R-H that meet structural requirements while maintaining insulation at the corner locations. This detail uses an exterior soap and cuts to the HI-R-H Units to form the corner. While this approach requires cutting both HI-R Units, the only separate fitting required for the corner is the soap.
3. Avoid bonded corners to save cost and time of construction. Not all designs require a bonded corner.
4. HI-R-H units can serve both as stretcher and bond beam unit without any modification. The reduced web height accommodates horizontal rebar. They are designed for construction of fully grouted and reinforced walls because they can be placed at rebar locations without the need to lift the unit over the top of the rebar as would be necessary with a more traditional CMU design, and grout will flow laterally at every course due to the reduced web heights.
5. HI-R-H units can also combine readily with conventional masonry fittings for construction of a variety of wall assembly details, including corners, joints, ends, and sills.

Codes and Standards References

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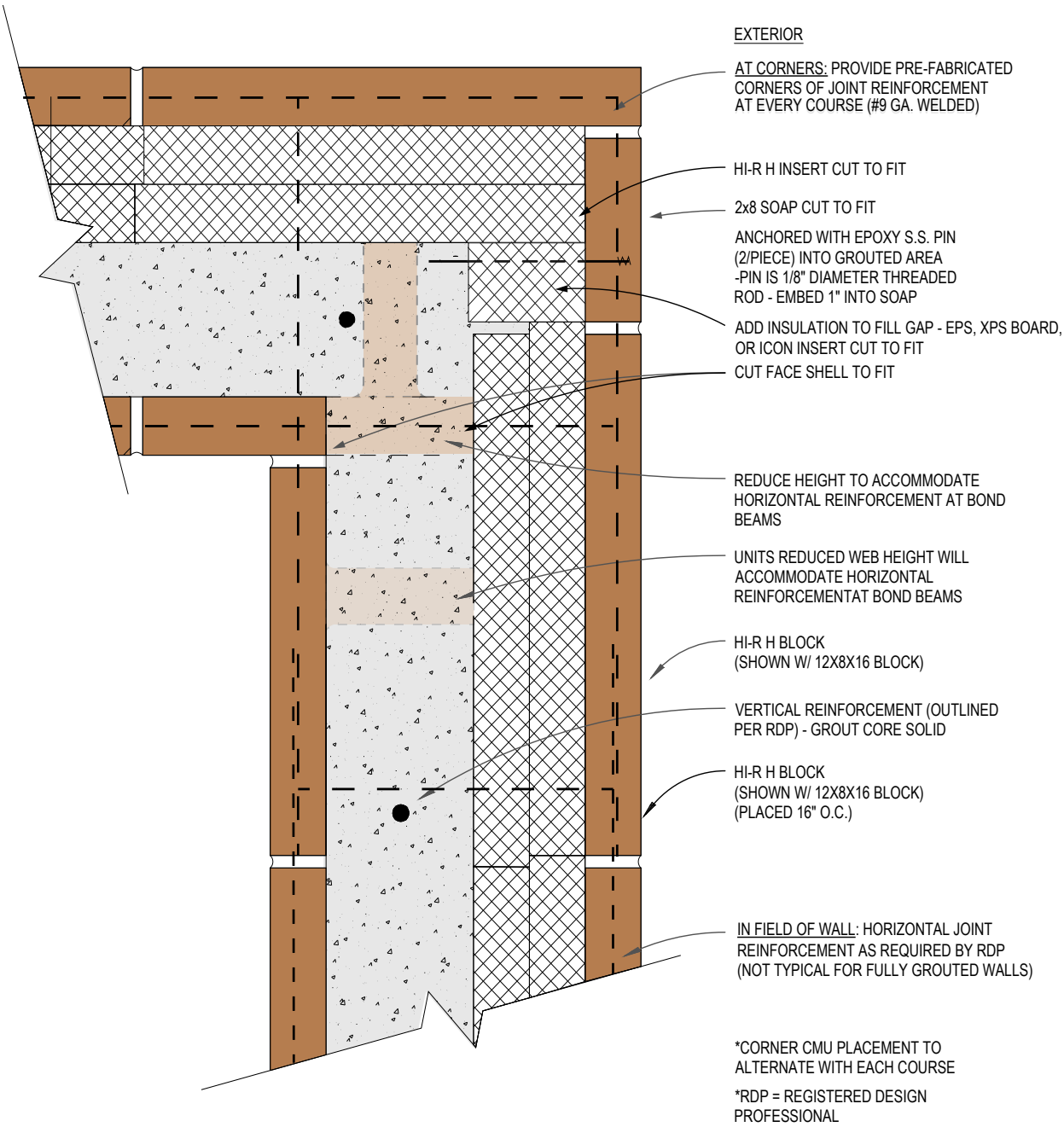
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Table of Contents	
1. Introduction	1
2. General Notes	2
3. Codes and Standards References	3
4. Wall Assembly Details	4
5. Window and Door Details	5
6. Foundation Details	6
7. Roof Details	7
8. Other Details	8
9. Index	9



Figure 31. 12" Bonded HI-R-H Corner – Exterior Soap



Notes:

1. This detail illustrates how to build bonded corners with HI-R-H that meet structural requirements while maintaining insulation at the corner locations. This detail uses an exterior soap and cuts to the HI-R-H Units to form the corner. While this approach requires cutting both HI-R Units, the only separate fitting required for the corner is the soap.
2. The same style corner can be constructed with the HI-R-H Half High product.
3. Avoid bonded corners to save cost and time of construction. Not all designs require a bonded corner.
4. HI-R-H units can serve both as stretcher and bond beam unit without any modification. The reduced web height accommodates horizontal rebar. They are designed for construction of fully grouted and reinforced walls because they can be placed at rebar locations without the need to lift the unit over the top of the rebar as would be necessary with a more traditional CMU design, and grout will flow laterally at every course due to the reduced web heights.
5. HI-R-H units can also combine readily with conventional masonry fittings for construction of a variety of wall assembly details, including corners, joints, ends, and sills.

Codes and Standards References

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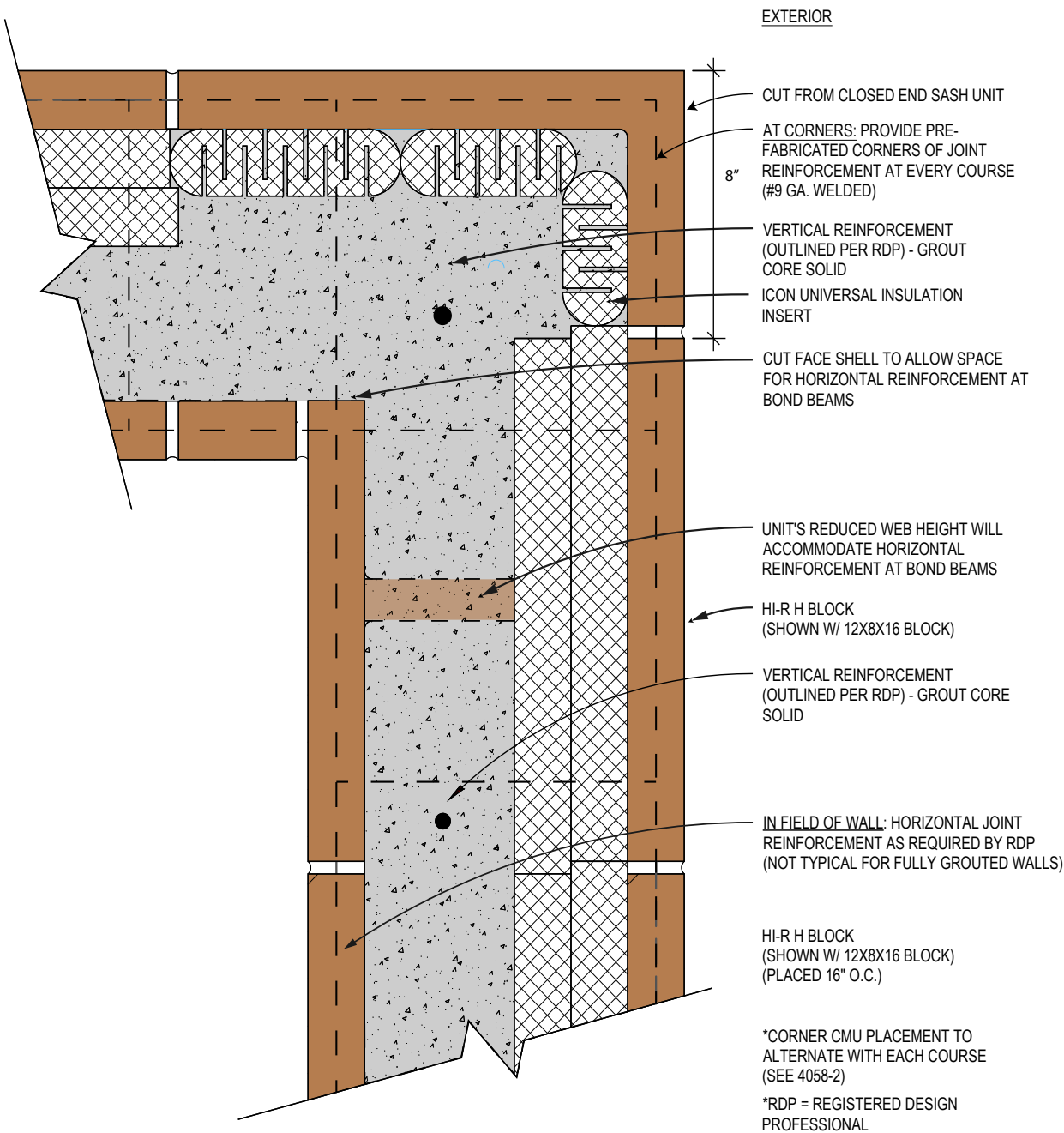
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Table of Contents	
1. Introduction	1
2. General Information	2
3. Codes and Standards	3
4. Design Requirements	4
5. Construction Details	5
6. Material Requirements	6
7. Quality Control	7
8. Safety	8
9. Environmental	9
10. Maintenance	10
11. Appendix	11
12. Index	12



Figure 32 12" HI-R-H Bonded Corner – L-Shape Veneer (ICON inserts) – Course 1



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Notes:

1. This detail illustrates how to build bonded corners with HI-R-H that meet structural requirements while maintaining insulation at the corner locations. This detail uses an exterior soap and cuts to the HI-R-H Units to form the corner. While this approach requires cutting both HI-R Units, the only separate fitting required for the corner is the soap.
2. The same style corner can be constructed with the HI-R-H Half High product.
3. Avoid bonded corners to save cost and time of construction. Not all designs require a bonded corner.
4. HI-R-H units can serve both as stretcher and bond beam unit without any modification. The reduced web height accommodates horizontal rebar. They are designed for construction of fully grouted and reinforced walls because they can be placed at rebar locations without the need to lift the unit over the top of the rebar as would be necessary with a more traditional CMU design, and grout will flow laterally at every course due to the reduced web heights.
5. HI-R-H units can also combine readily with conventional masonry fittings for construction of a variety of wall assembly details, including corners, joints, ends, and sills.

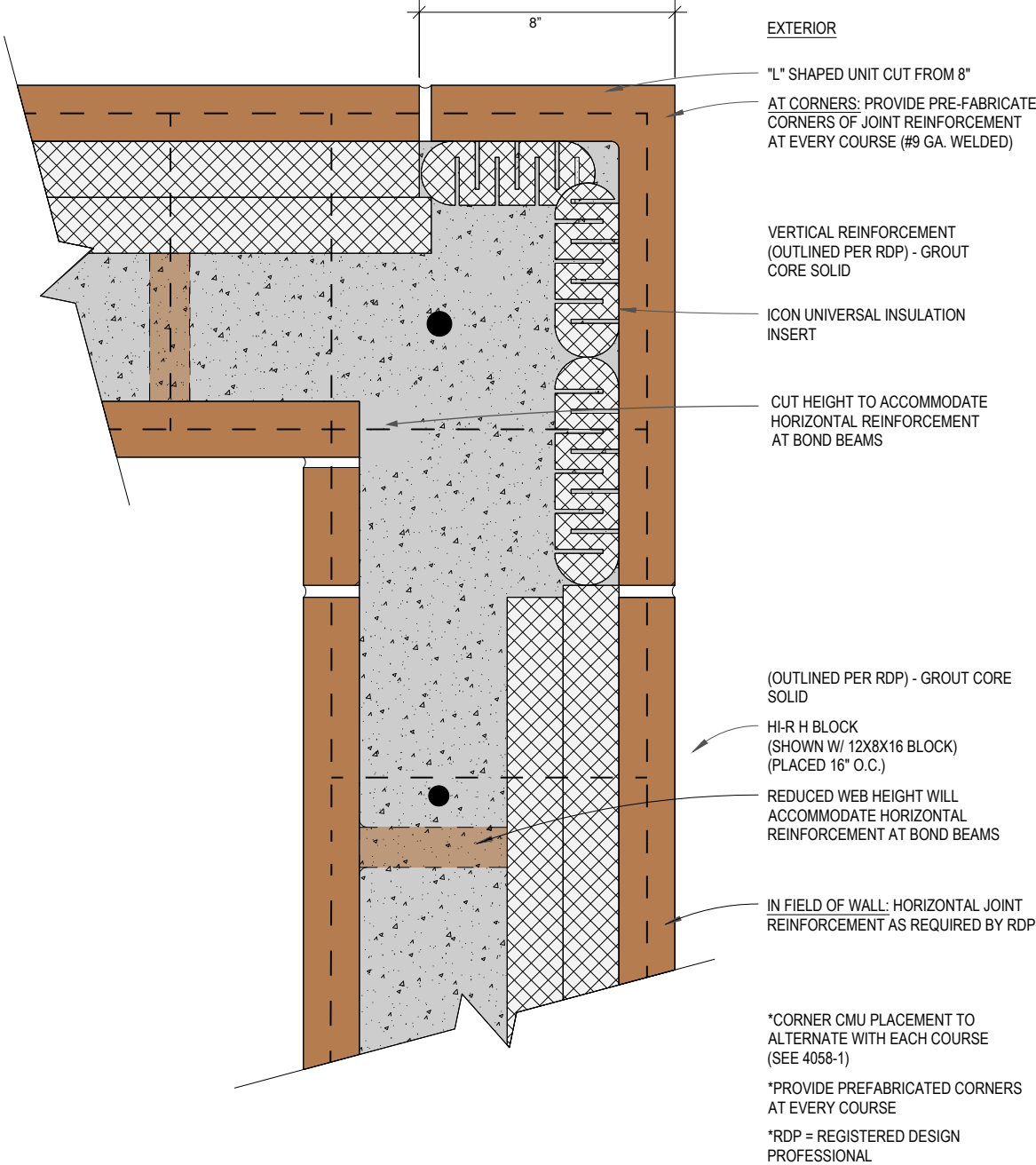
Codes and Standards References

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Table of Contents	
1. Introduction	1
2. General Notes	2
3. Codes and Standards References	3
4. Wall Details	4
5. Window Details	5
6. Door Details	6
7. Foundation Details	7
8. Roof Details	8
9. Other Details	9
10. Index	10



Figure 33. 12" HI-R-H Bonded Corner – L Shaped Veneer (ICON inserts) – Course 2



Notes:

1. This detail illustrates how to build bonded corners with HI-R-H that meet structural requirements while maintaining insulation at the corner locations. This detail uses an exterior soap and cuts to the HI-R-H Units to form the corner. While this approach requires cutting both HI-R Units, the only separate fitting required for the corner is the soap.
2. The same style corner can be constructed with the HI-R-H Half High product.
3. Avoid bonded corners to save cost and time of construction. Not all designs require a bonded corner.
4. HI-R-H units can serve both as stretcher and bond beam unit without any modification. The reduced web height accommodates horizontal rebar. They are designed for construction of fully grouted and reinforced walls because they can be placed at rebar locations without the need to lift the unit over the top of the rebar as would be necessary with a more traditional CMU design, and grout will flow laterally at every course due to the reduced web heights.
5. HI-R-H units can also combine readily with conventional masonry fittings for construction of a variety of wall assembly details, including corners, joints, ends, and sills.

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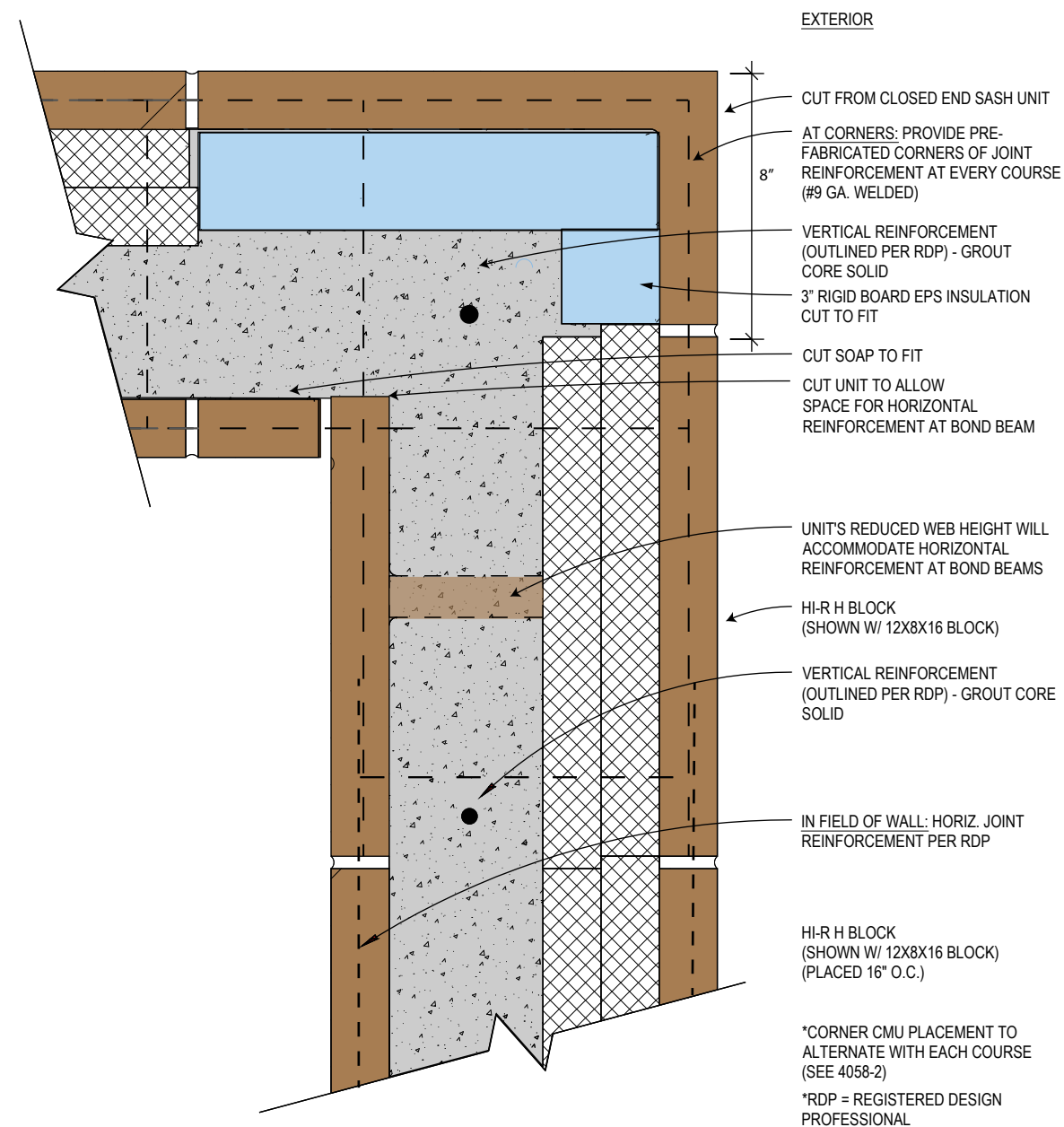
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Table of Contents	
1	Introduction
2	General Notes
3	Foundation Details
4	Wall Details
5	Roof Details
6	Window Details
7	Door Details
8	Staircase Details
9	Other Details
10	Index



Figure 34. 12" HI-R-H Corner Bonded L-Shape Veneer (Rigid Board EPS)- Course 1



Notes:

1. This detail illustrates how to build bonded corners with HI-R-H that meet structural requirements while maintaining insulation at the corner locations. This detail uses an exterior soap and cuts to the HI-R-H Units to form the corner. While this approach requires cutting both HI-R Units, the only separate fitting required for the corner is the soap.
2. The same style corner can be constructed with the HI-R-H Half High product.
3. Avoid bonded corners to save cost and time of construction. Not all designs require a bonded corner.
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5. HI-R-H units can also combine readily with conventional masonry fittings for construction of a variety of wall assembly details, including corners, joints, ends, and sills.

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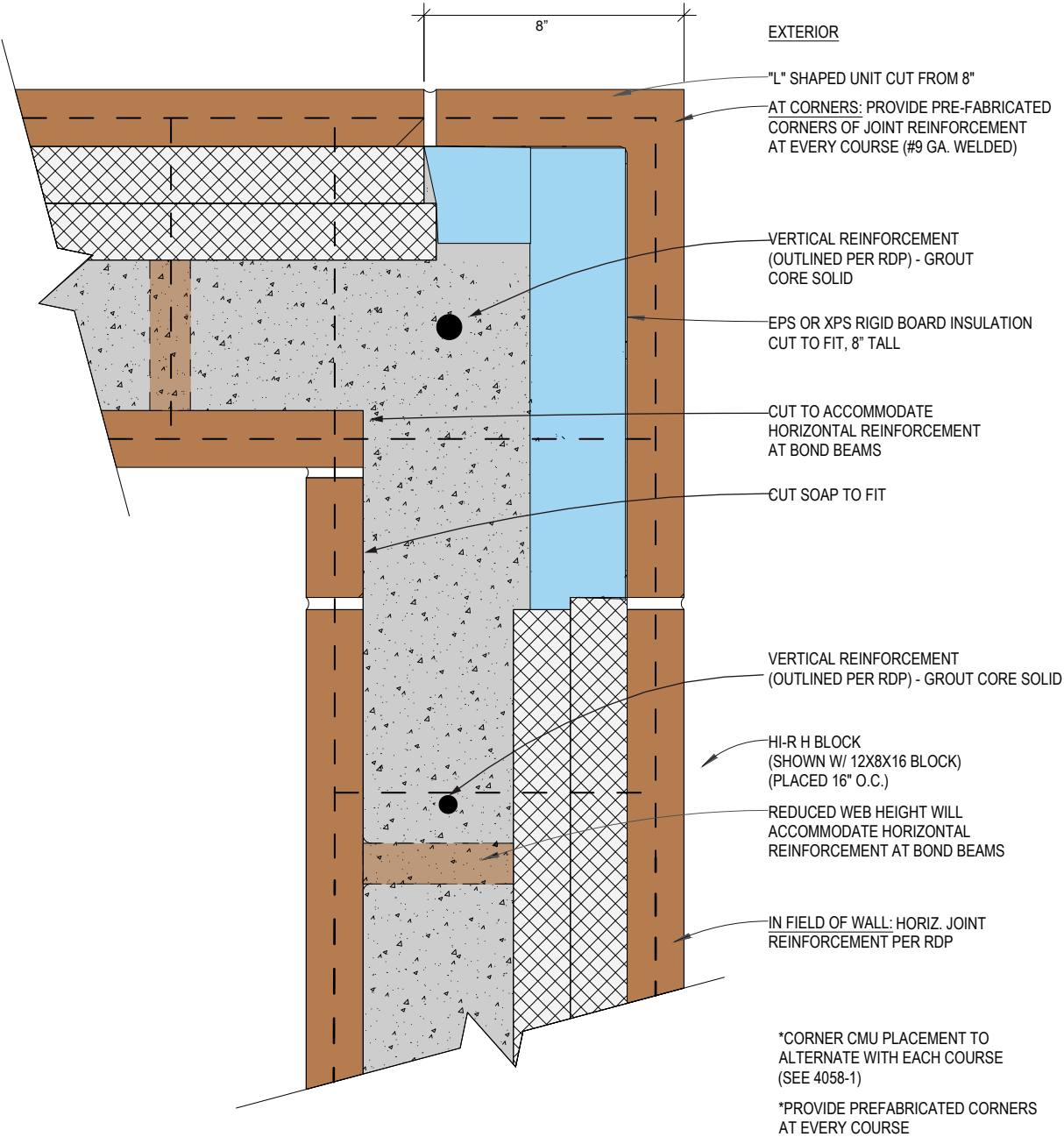
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Figure 35. 12" HI-R-H Bonded Corner – L Shaped Veneer – course 2



Notes:

1. This detail illustrates how to build bonded corners with HI-R-H that meet structural requirements while maintaining insulation at the corner locations. This detail uses an exterior soap and cuts to the HI-R-H Units to form the corner. While this approach requires cutting both HI-R Units, the only separate fitting required for the corner is the soap.
2. The same style corner can be constructed with the HI-R-H Half High product.
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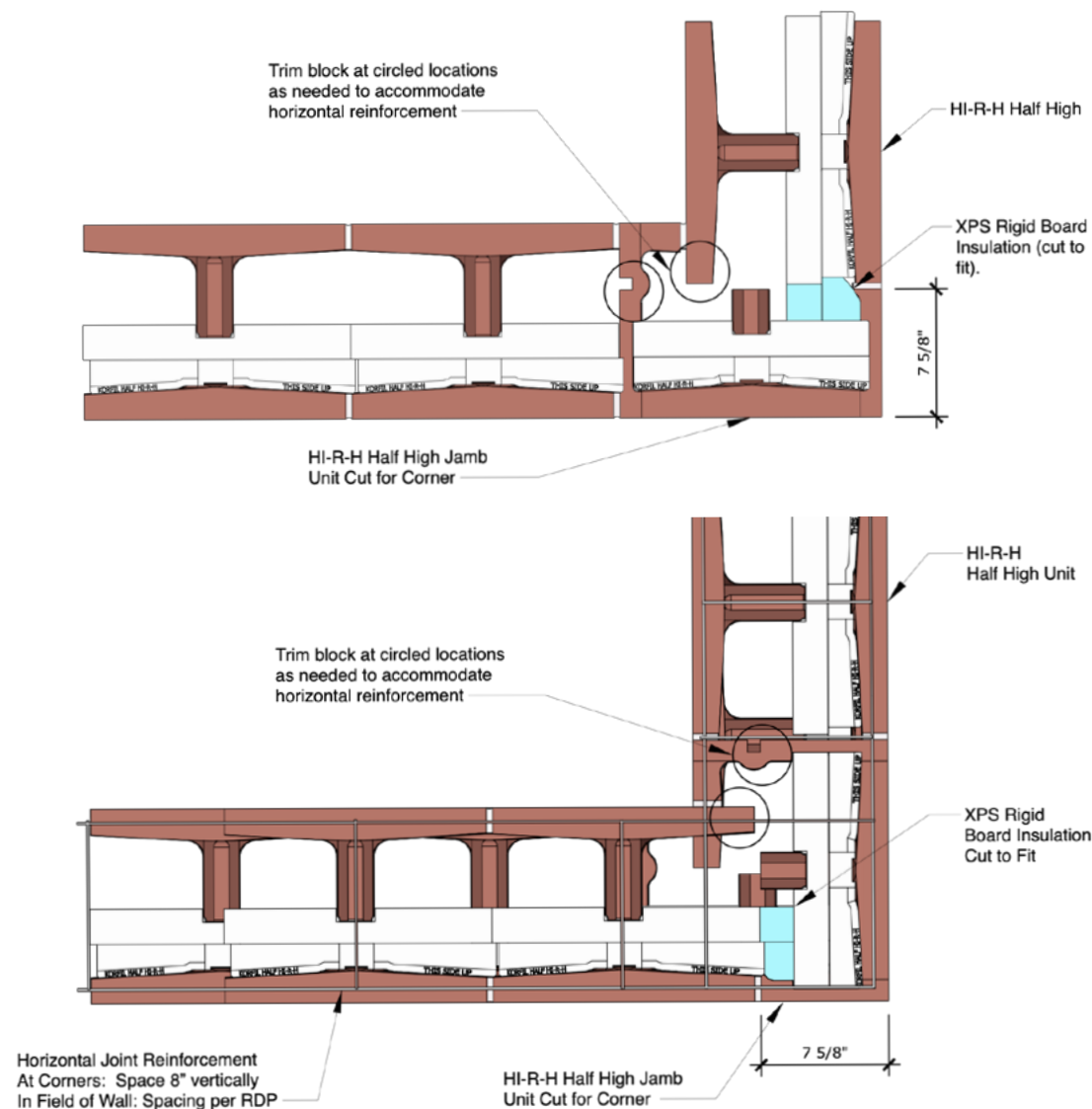
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Figure 36. Corner using HI-R-H or HI-R-H Half High Jamb and Corner Unit



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Notes:

1. The HI-R-H/HI-R-H Half High Corner and Jamb Unit is limited to regional availability, please check with your local manufacturer.
2. This detail illustrates how to build bonded corners with HI-R-H that meet structural requirements while maintaining insulation at the corner locations. This detail uses an exterior soap and cuts to the HI-R-H Units to form the corner. While this approach requires cutting both HI-R Units, the only separate fitting required for the corner is the soap.
3. The same style corner can be constructed with the HI-R-H and HI-R-H Half High product.
4. Avoid bonded corners to save cost and time of construction. Not all designs require a bonded corner.
5. HI-R-H units can serve both as stretcher and bond beam unit without any modification. The reduced web height accommodates horizontal rebar. They are designed for construction of fully grouted and reinforced walls because they can be placed at rebar locations without the need to lift the unit over the top of the rebar as would be necessary with a more traditional CMU design, and grout will flow laterally at every course due to the reduced web heights.
6. HI-R-H units can also combine readily with conventional masonry fittings for construction of a variety of wall assembly details, including corners, joints, ends, and sills.

Codes and Standards References

Applicable References are found in Section III.

Table of Contents	
Introduction	1
Chapter 1: General Information	2
Chapter 2: Wall Details	3
Chapter 3: Window Details	4
Chapter 4: Door Details	5
Chapter 5: Corner Details	6
Chapter 6: Joint Details	7
Chapter 7: Reinforcement Details	8
Chapter 8: Insulation Details	9
Chapter 9: Finishes	10
Chapter 10: Accessories	11
Chapter 11: Index	12



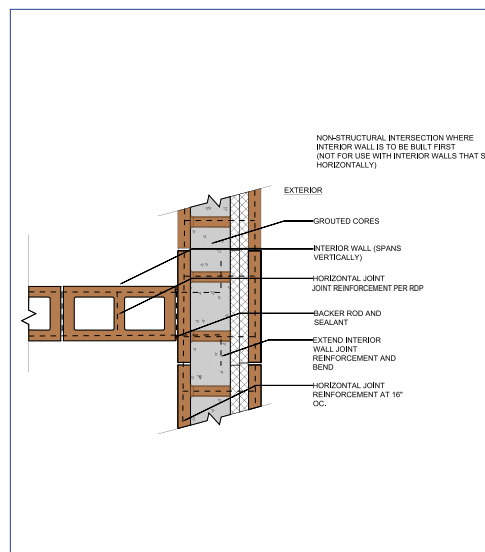


Figure 37. 12" HI-R "T" Intersection non-structural option 1

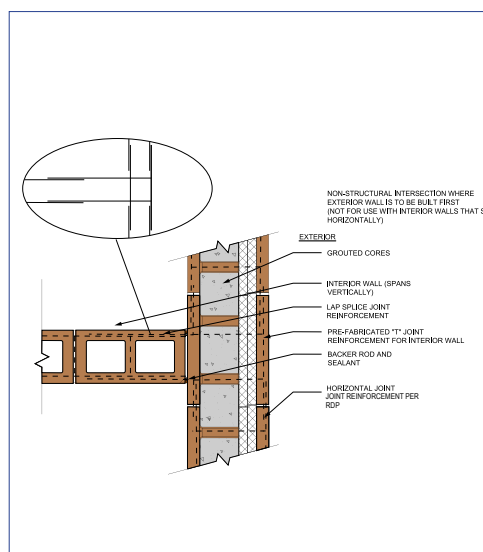


Figure 38. 12" HI-R "T" Intersection (non-structural) option 2

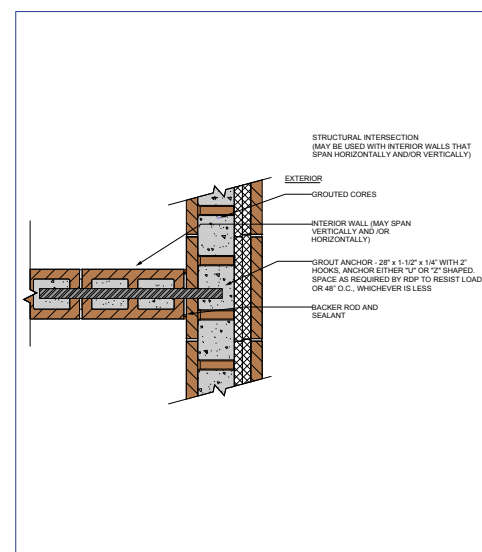


Figure 39. 12" HI-R "T" Intersection Structural - Option 1

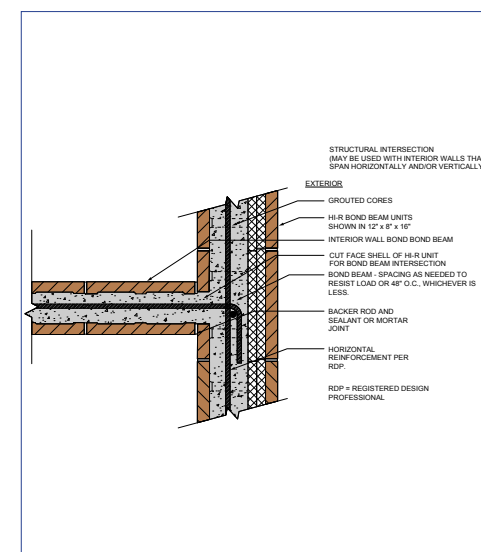


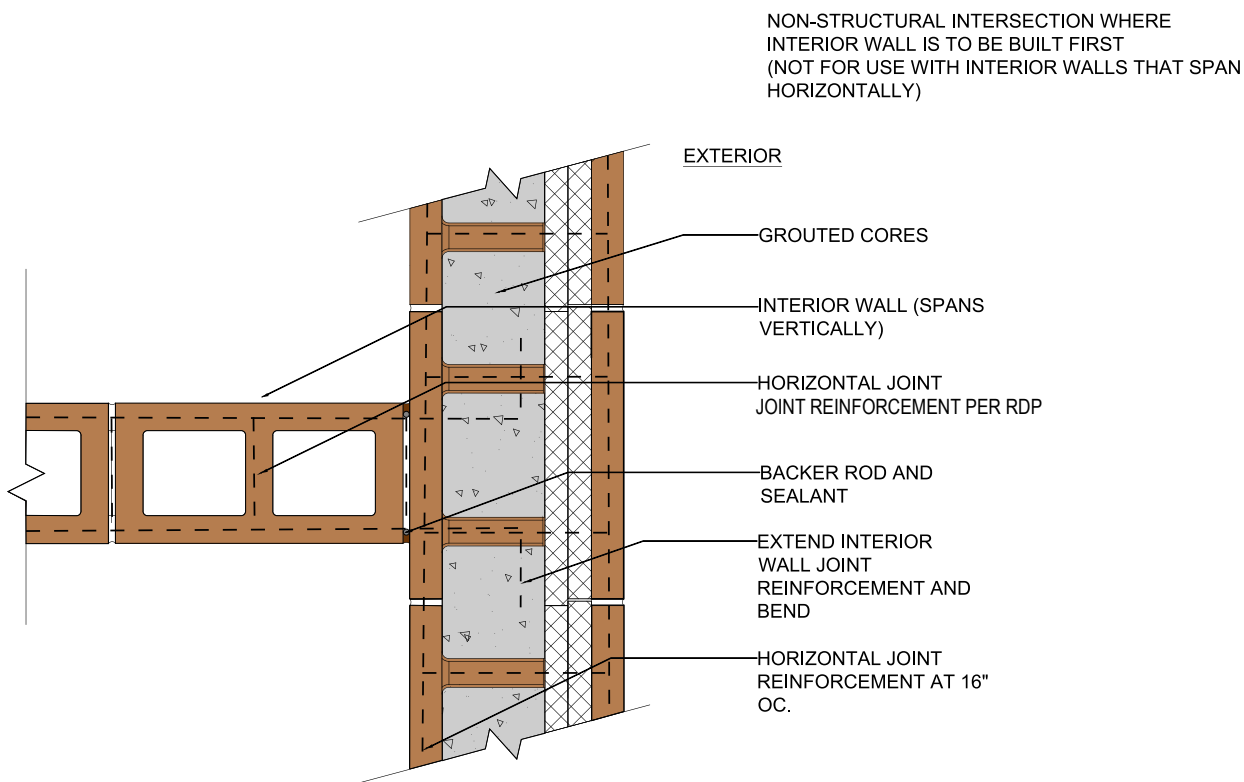
Figure 40. HI-R "T" Intersection Structural Option 2

[Click on drawings to enlarge](#)

Table of Contents	
1. Introduction	1.1 Purpose of this Document
2. References	2.1 American Institute of Steel Construction, Inc. (AISC) 360-10
3. Design Requirements	3.1 General Requirements
4. Material Requirements	4.1 Concrete
5. Construction Requirements	5.1 Formwork
6. Quality Control	6.1 Inspection
7. Safety	7.1 Fall Protection
8. Environmental Protection	8.1 Air Quality
9. Noise Control	9.1 Noise Levels
10. Traffic Control	10.1 Traffic Management
11. Construction Schedule	11.1 Construction Sequence
12. Construction Costs	12.1 Cost Estimation
13. Construction Risks	13.1 Risk Assessment
14. Construction Management	14.1 Project Management
15. Construction Safety	15.1 Safety Management
16. Construction Environmental Protection	16.1 Environmental Management
17. Construction Noise Control	17.1 Noise Management
18. Construction Traffic Control	18.1 Traffic Management
19. Construction Schedule	19.1 Construction Sequence
20. Construction Costs	20.1 Cost Estimation
21. Construction Risks	21.1 Risk Assessment
22. Construction Management	22.1 Project Management
23. Construction Safety	23.1 Safety Management
24. Construction Environmental Protection	24.1 Environmental Management
25. Construction Noise Control	25.1 Noise Management
26. Construction Traffic Control	26.1 Traffic Management

Intersections with Interior Walls

Figure 37. HI-R Bonded "T" intersection (Non-Structural) Option 1.



Notes:

1. This detail shows how to build a bonded "T" intersection between an interior partition wall and an exterior HI-R/Hi-R-H wall where the intersection is non-structural, and the interior wall is to be built first. This is suitable for walls that span vertically but not horizontally.
2. Not all T intersections require bonded construction. RDP to determine whether bonded detail is required.
3. When the interior wall is built, joint reinforcement is placed as required by the RDP. Where the partition is to meet the exterior wall, the joint reinforcement is extended past the end of the partition wall and will be bent when connected to the exterior wall.
4. HI-R and HI-R-H units can also combine readily with conventional masonry fittings for construction of a variety of wall assembly details, including corners, joints, ends, and sills.

Codes and Standards References

Applicable References are found in Section III.

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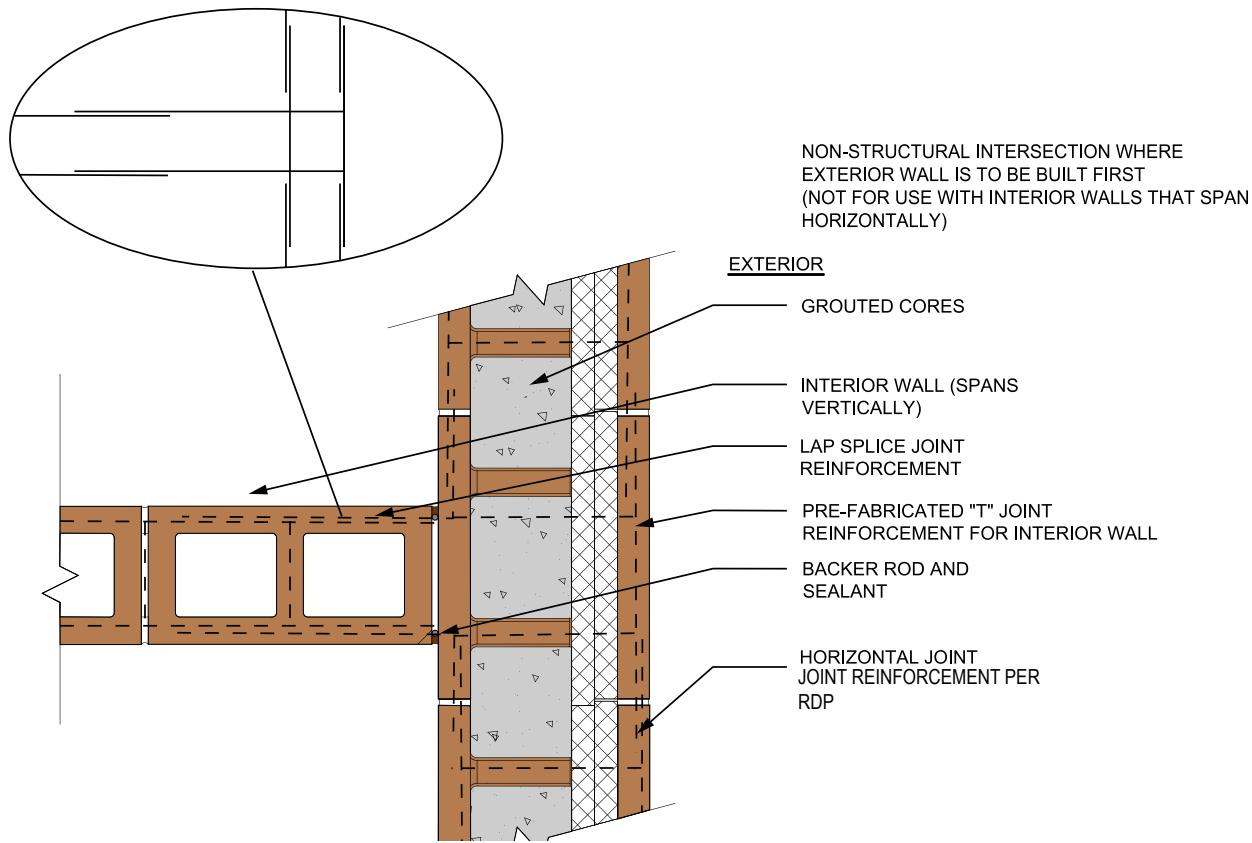
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Table of Contents	
Introduction	1
Chapter 1: General Information	2
Chapter 2: Wall Assembly Details	3
Chapter 3: Window and Door Details	4
Chapter 4: Roof Details	5
Chapter 5: Foundation Details	6
Chapter 6: Other Details	7
Index	8



Figure 38. HI-R Bonded T Intersection (Non-Structural) Option 2



Notes:

1. This detail shows how to build a bonded "T" intersection between an interior partition wall and an exterior HI-R/HI-R-H wall where the intersection is non-structural, and the interior wall is to be built first. This is suitable for walls that span vertically but not horizontally.
2. Not all T intersections require bonded construction. RDP to determine whether bonded detail is required.
3. When the interior wall is built, joint reinforcement is placed as required by the RDP. Where the partition is to meet the exterior wall, the joint reinforcement is extended past the end of the partition wall and will be bent when connected to the exterior wall.
4. HI-R and HI-R-H units can also combine readily with conventional masonry fittings for construction of a variety of wall assembly details, including corners, joints, ends, and sills.

5. Codes and Standards References

Applicable References are found in Section III.
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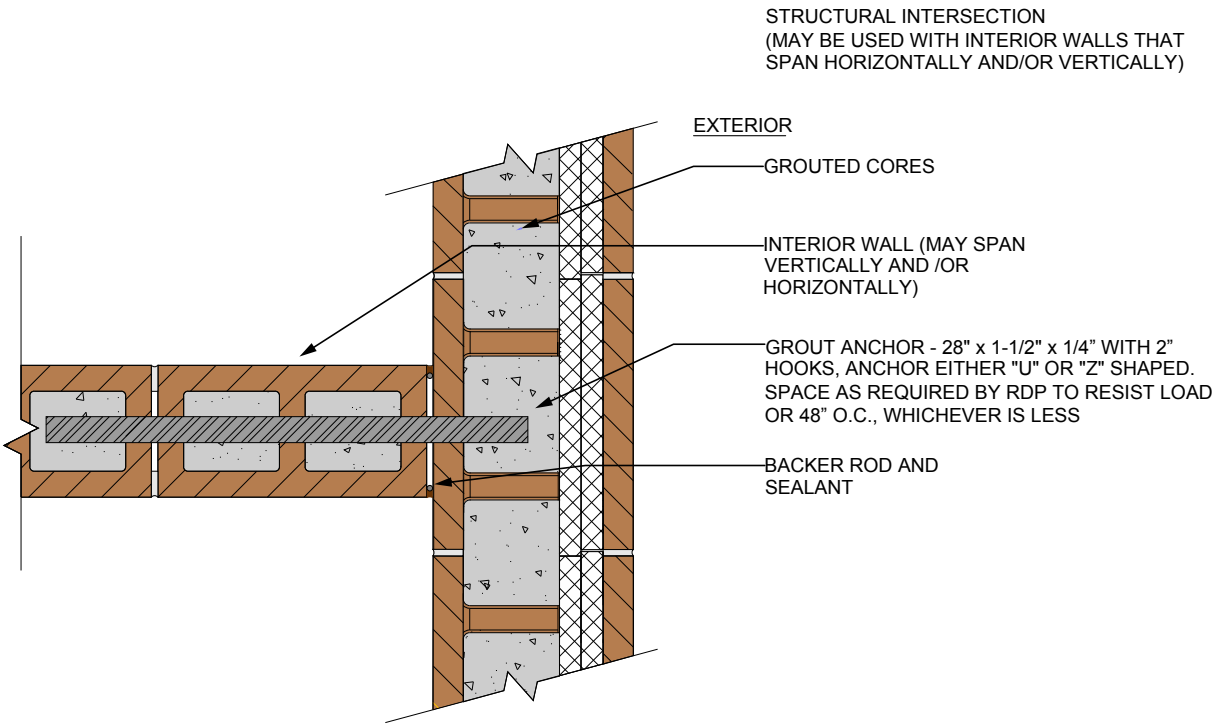
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Figure 39. HI-R Bonded "T" intersection (Structural) Option 1



Notes:

1. This detail shows how to build a "T" intersection between an interior partition wall and an exterior HI-R/HI-R-H wall where the intersection is non-structural, and the **exterior** wall is to be built first. This is suitable for walls that span vertically but not horizontally.
2. Not all T intersections require bonded construction. RDP to determine whether bonded detail is required.
3. When the exterior wall is built, joint reinforcement is placed every 16" OC. Where the partition is to meet the interior wall, a pre-fabricated T section of joint reinforcement is placed so that the joint reinforcement will extend into the partition wall at the intersection.
4. HI-R and HI-R-H units can also combine readily with conventional masonry fittings for construction of a variety of wall assembly details, including corners, joints, ends, and sills.

Codes and Standards References

Applicable References are found in Section III.

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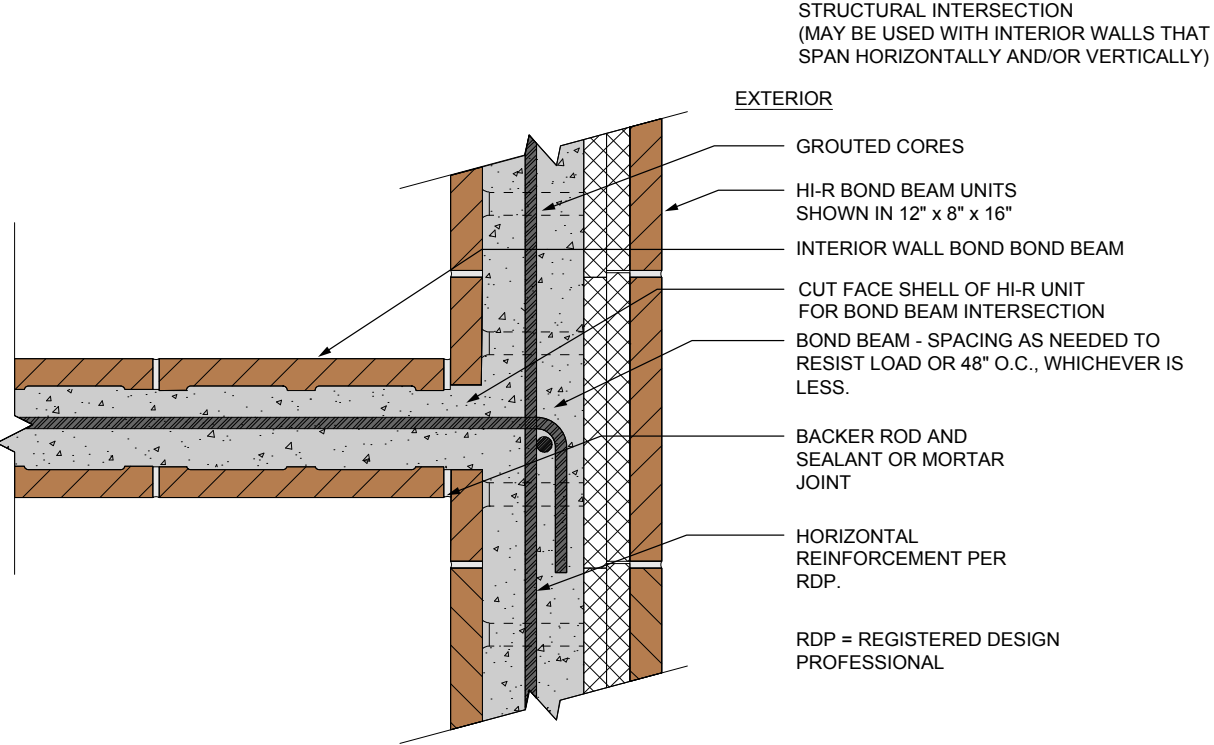
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Table of Contents	
1. Introduction	1
2. General Information	2
3. Design Requirements	3
4. Construction Details	4
5. Materials	5
6. Installation	6
7. Maintenance	7
8. Troubleshooting	8
9. Appendix	9
10. Index	10



Figure 40. HI-R Bonded "T" intersection (Structural) Option 2



Notes:

- 1. This detail shows how to build a "T" intersection between an interior partition wall and an exterior HI-R/Hi-R-H wall where the intersection is Structural. This is suitable for walls that span vertically and/or horizontally.
- 2. This detail uses a bond beam for the connection at the intersection of the walls. HI-R units may be manufactured with reduced web height for bond beam units, or may be factory or field cut as knock out bond beam units. The standard CMU used for the interior partition wall may also be either manufactured as bond beam units or cut. Check with your local manufacturer for availability.
- 3. The spacing between bond beam units, and the selection of the type of steel reinforcement shall be specified by the Registered Design Professional based on project requirements.
- 4. HI-R and HI-R-H units can also combine readily with conventional masonry fittings for construction of a variety of wall assembly details, including corners, joints, ends, and sills.

Codes and Standards References

Applicable References are found in Section III.

This is Detail 4071 in the CPG CAD details.

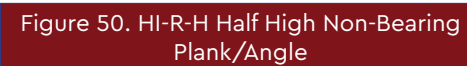
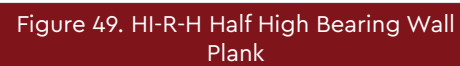
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Table of Contents	
1. Introduction	1
2. General Information	2
3. Design Requirements	3
4. Construction Details	4
5. Materials	5
6. Installation	6
7. Maintenance	7
8. Safety	8
9. Environmental	9
10. Quality Control	10
11. Project Management	11
12. Appendix	12

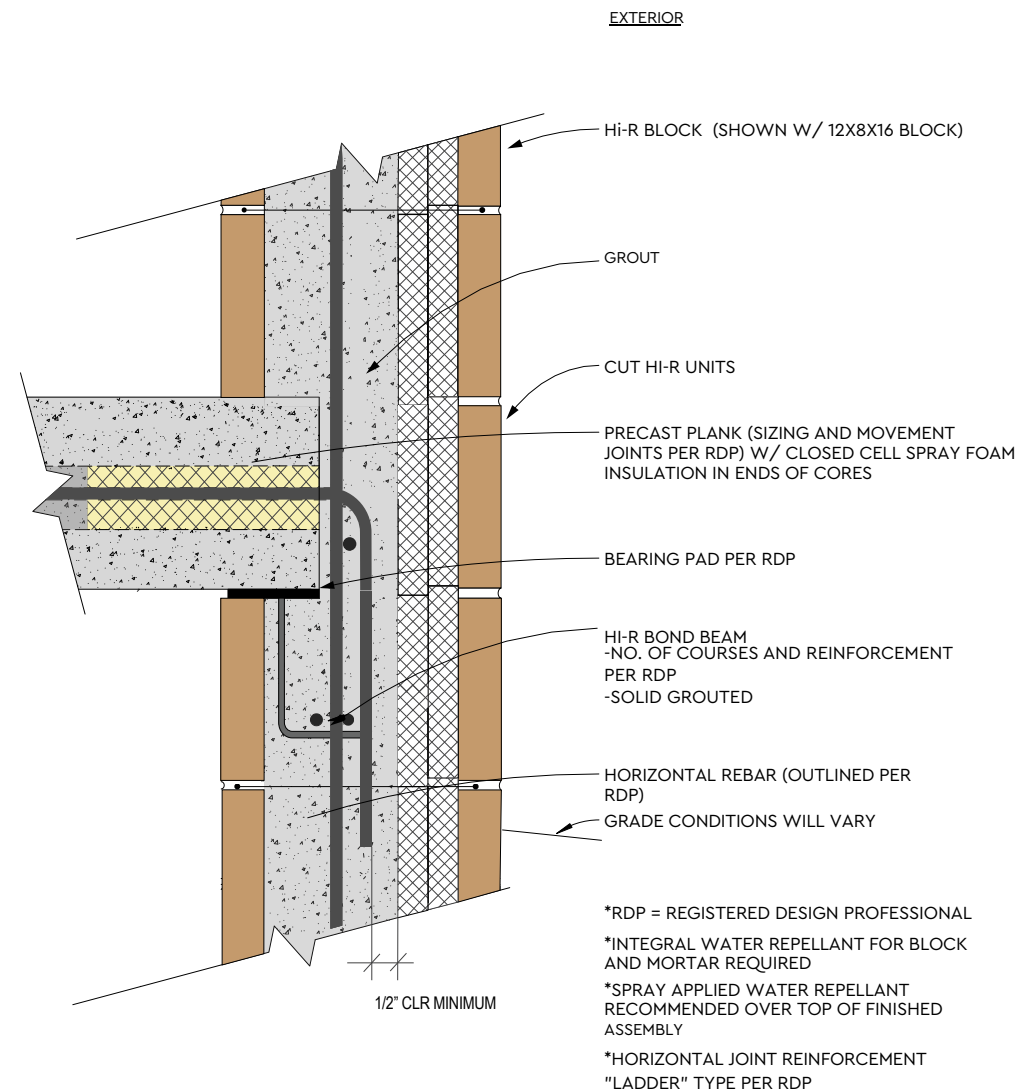




Click on drawings to enlarge

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Figure 41. HI-R Plank-Bearing Wall Fully Grouted



Notes:

1. This detail depicts a fully grouted wall. HI-R walls may be built either fully or partially grouted, while the HI-R-H products are fully grouted only. Fully grouting masonry walls is a cost-effective alternative to partially grouted walls. In many areas of the country where seismic design considerations are important, highly reinforced and fully grouted masonry is the preferred solution. Fully grouted walls do not require flashing at bond beam locations, and meet Code air barrier requirements.
2. For projects located in California, or other projects where compliance to vertical wall shear testing is required, alternate moisture control techniques that omit integral water repellent may be used (e.g. use IWR within mortar; use post-applied breathable penetrating sealants or drainable film forming coatings; use High Range Water Reducer in grout).
3. Request evidence in writing of adequate head joint mortar bond to IWR-containing CMU for Properties-based mortars. Request in writing evidence of sufficient composite-action bond to IWR-containing CMU of Properties-based grout.
4. Single wythe walls rely upon a belt-and-suspenders approach to moisture control. Design typically will integrate flashing and weeps, integral water repellent, post-applied moisture control means and measures, sealants, movement joints, damp-checks, crack control, thermal bridging/condensate control, as well as soil elevation offsets and below-grade damp-proofing.

Codes and Standards References

Applicable References are found in Section III.

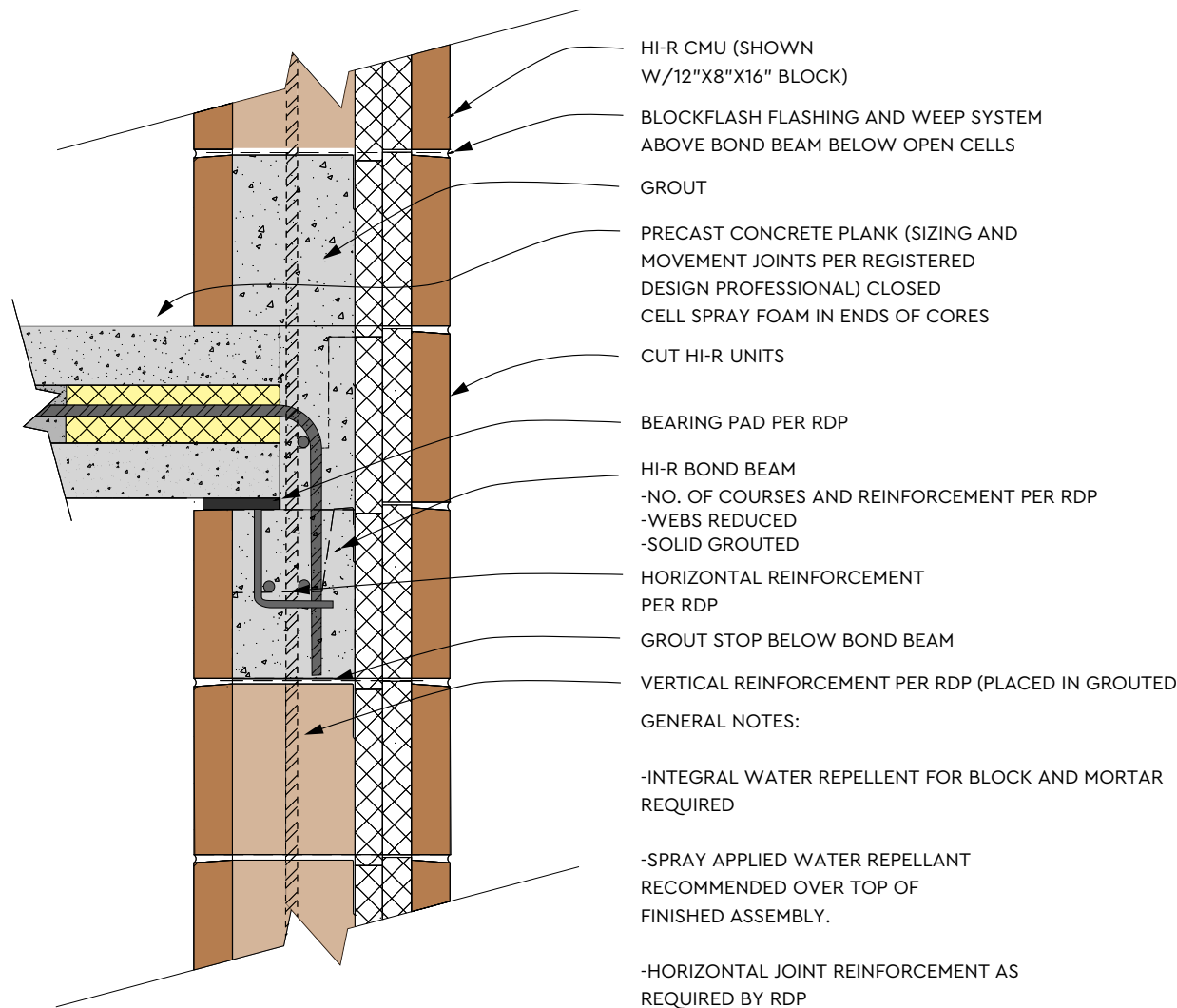
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Figure 42. HI-R Plank-Bearing Wall Partially Grouted



Notes:

1. This detail depicts a partially grouted wall. HI-R walls may be built either fully or partially grouted, while the HI-R-H products are fully grouted only. Fully grouting masonry walls is a cost-effective alternative to partially grouted walls. In many areas of the country where seismic design considerations are important, highly reinforced and fully grouted masonry is the preferred solution. Fully grouted walls do not require flashing at bond beam locations, and meet Code air barrier requirements.
2. For projects located in California, or other projects where compliance to vertical wall shear testing is required, alternate moisture control techniques that omit integral water repellent may be used (e.g. use IWR within mortar; use post-applied breathable penetrating sealants or drainable film forming coatings; use High Range Water Reducer in grout).
3. Request evidence in writing of adequate head joint mortar bond to IWR-containing CMU for Properties-based mortars. Request in writing evidence of sufficient composite-action bond to IWR-containing CMU of Properties-based grout.
4. Single wythe walls rely upon a belt-and-suspenders approach to moisture control. Design typically will integrate flashing and weeps, integral water repellent, post-applied moisture control means and measures, sealants, movement joints, damp-checks, crack control, thermal bridging/condensate control, as well as soil elevation offsets and below-grade damp-proofing.

Codes and Standards References

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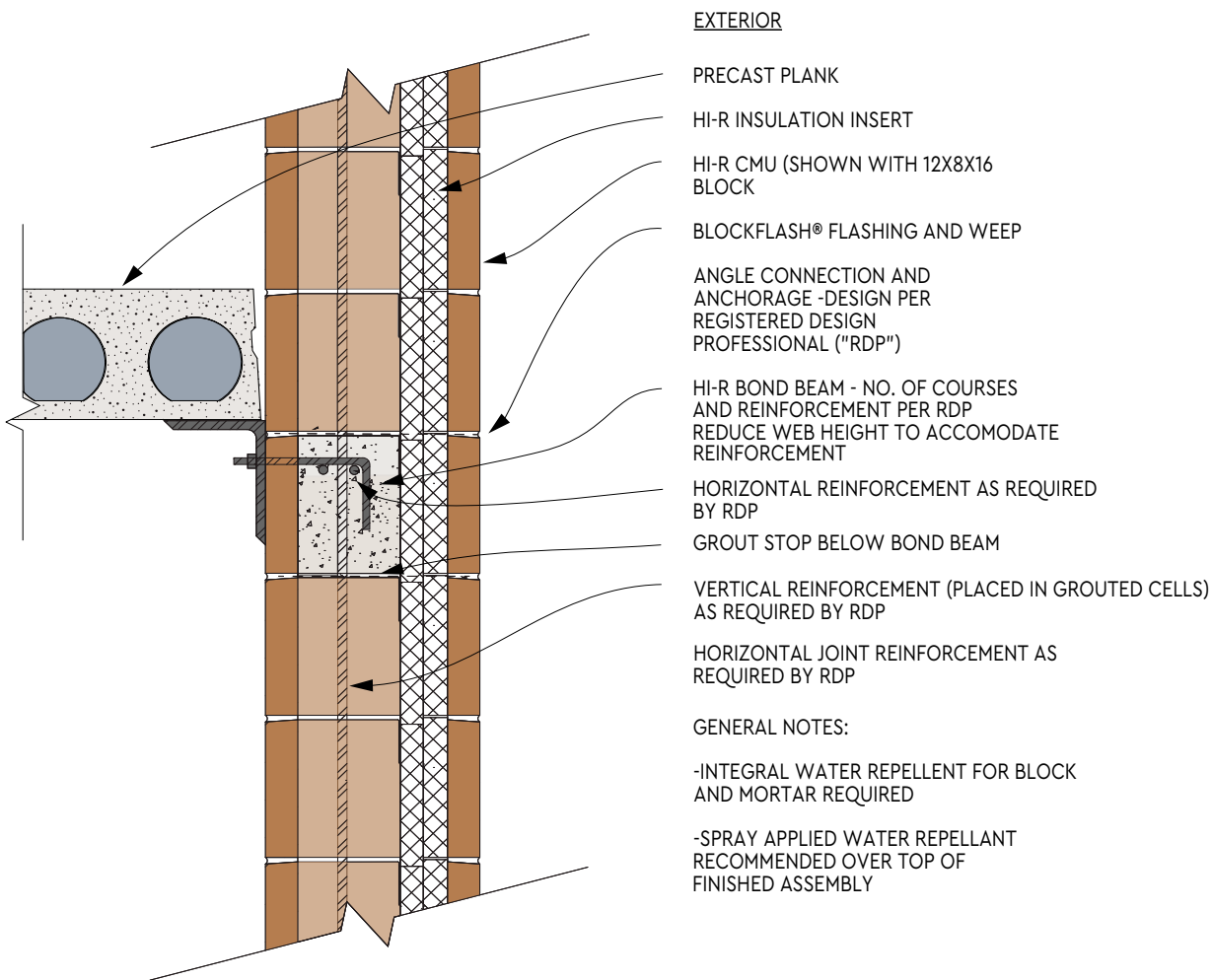
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Figure 43. HI-R Plank at Non-Bearing Wall Partially Grouted



Notes:

1. This detail depicts a partially grouted wall. HI-R walls may be built either fully or partially grouted, while the HI-R-H products are fully grouted only. Fully grouting masonry walls is a cost-effective alternative to partially grouted walls. In many areas of the country where seismic design considerations are important, highly reinforced and fully grouted masonry is the preferred solution. Fully grouted walls do not require flashing at bond beam locations, and meet Code air barrier requirements.
2. For projects located in California, or other projects where compliance to vertical wall shear testing is required, alternate moisture control techniques that omit integral water repellent may be used (e.g. use IWR within mortar; use post-applied breathable penetrating sealants or drainable film forming coatings; use High Range Water Reducer in grout).
3. Request evidence in writing of adequate head joint mortar bond to IWR-containing CMU for Properties-based mortars. Request in writing evidence of sufficient composite-action bond to IWR-containing CMU of Properties-based grout.
4. Single wythe walls rely upon a belt-and-suspenders approach to moisture control. Design typically will integrate flashing and weeps, integral water repellent, post-applied moisture control means and measures, sealants, movement joints, damp-checks, crack control, thermal bridging/condensate control, as well as soil elevation offsets and below-grade damp-proofing.

Codes and Standards References

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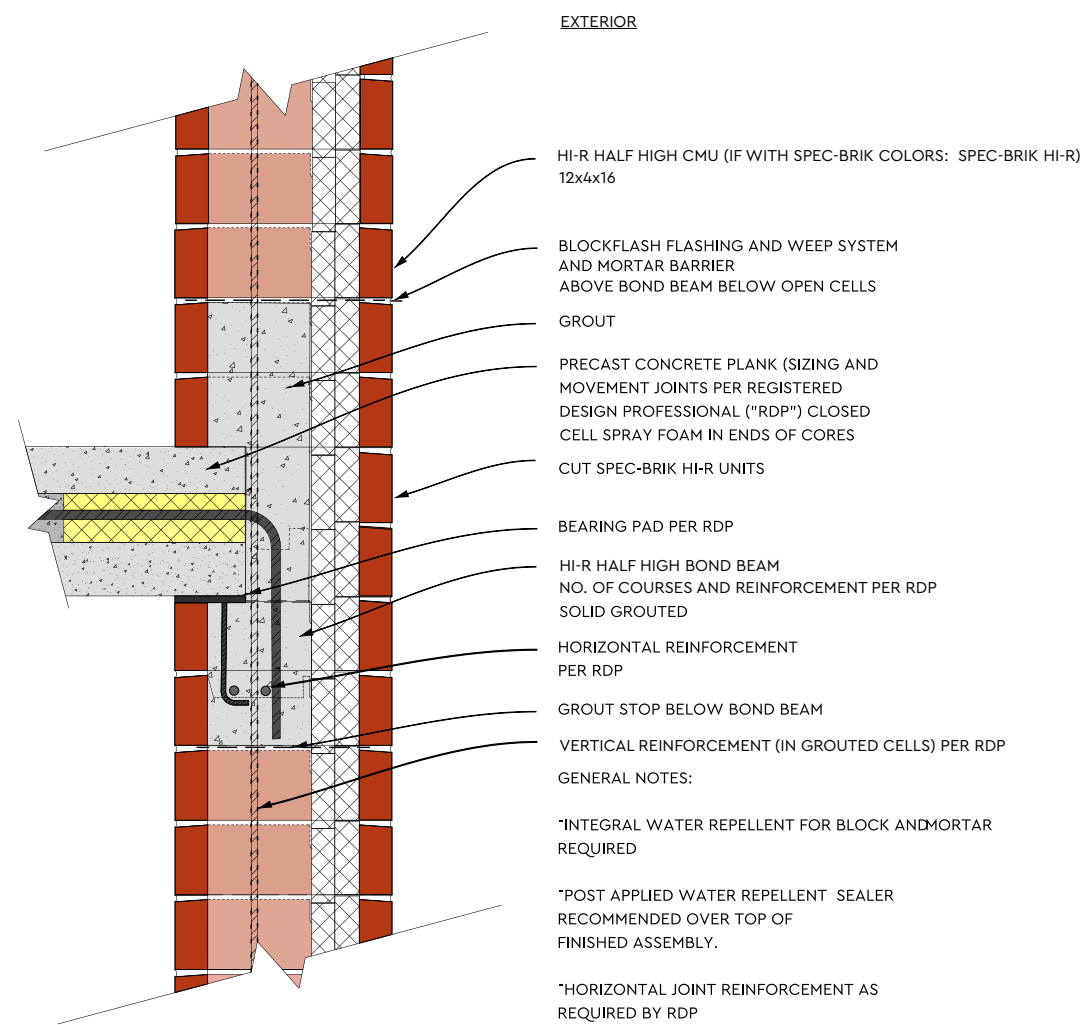
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Figure 44. HI-R HALF HIGH Plank at Bearing Wall Partially Grouted



Notes:

1. This detail depicts a partially grouted wall. HI-R walls may be built either fully or partially grouted, while the HI-R-H products are fully grouted only. Fully grouting masonry walls is a cost-effective alternative to partially grouted walls. In many areas of the country where seismic design considerations are important, highly reinforced and fully grouted masonry is the preferred solution. Fully grouted walls do not require flashing at bond beam locations, and meet Code air barrier requirements.
2. For projects located in California, or other projects where compliance to vertical wall shear testing is required, alternate moisture control techniques that omit integral water repellent may be used (e.g. use IWR within mortar; use post-applied breathable penetrating sealants or drainable film forming coatings; use High Range Water Reducer in grout).
3. Request evidence in writing of adequate head joint mortar bond to IWR-containing CMU for Properties-based mortars. Request in writing evidence of sufficient composite-action bond to IWR-containing CMU of Properties-based grout.
4. Single wythe walls rely upon a belt-and-suspenders approach to moisture control. Design typically will integrate flashing and weeps, integral water repellent, post-applied moisture control means and measures, sealants, movement joints, damp-checks, crack control, thermal bridging/condensate control, as well as soil elevation offsets and below-grade damp-proofing.

Codes and Standards References

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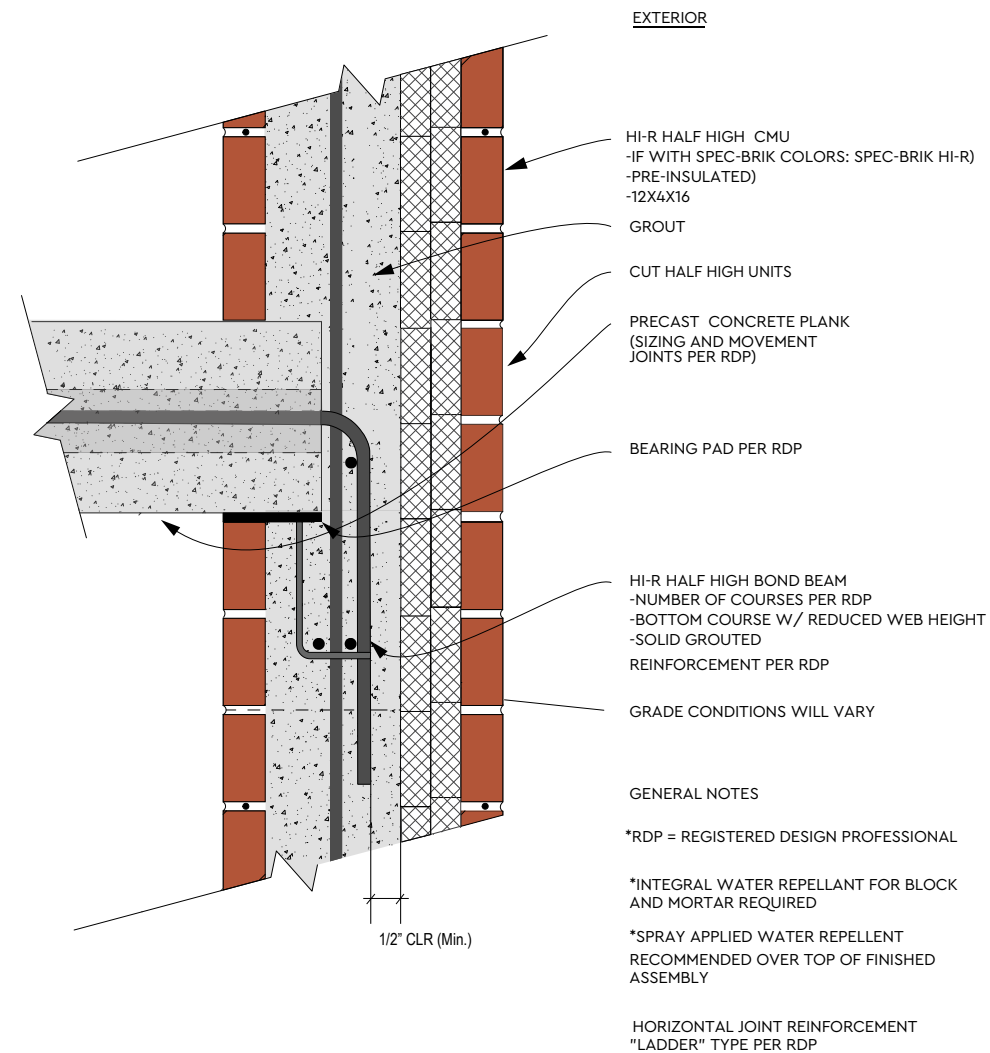
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Figure 45. HI-R Half High Bearing Wall



Notes:

1. This detail depicts a fully grouted wall. HI-R walls may be built either fully or partially grouted, while the HI-R-H products are fully grouted only. Fully grouting masonry walls is a cost-effective alternative to partially grouted walls. In many areas of the country where seismic design considerations are important, highly reinforced and fully grouted masonry is the preferred solution. Fully grouted walls do not require flashing at bond beam locations, and meet Code air barrier requirements.
2. For projects located in California, or other projects where compliance to vertical wall shear testing is required, alternate moisture control techniques that omit integral water repellent may be used (e.g. use IWR within mortar; use post-applied breathable penetrating sealants or drainable film forming coatings; use High Range Water Reducer in grout).
3. Request evidence in writing of adequate head joint mortar bond to IWR-containing CMU for Properties-based mortars. Request in writing evidence of sufficient composite-action bond to IWR-containing CMU of Properties-based grout.
4. Single wythe walls rely upon a belt-and-suspenders approach to moisture control. Design typically will integrate flashing and weeps, integral water repellent, post-applied moisture control means and measures, sealants, movement joints, damp-checks, crack control, thermal bridging/condensate control, as well as soil elevation offsets and below-grade damp-proofing.

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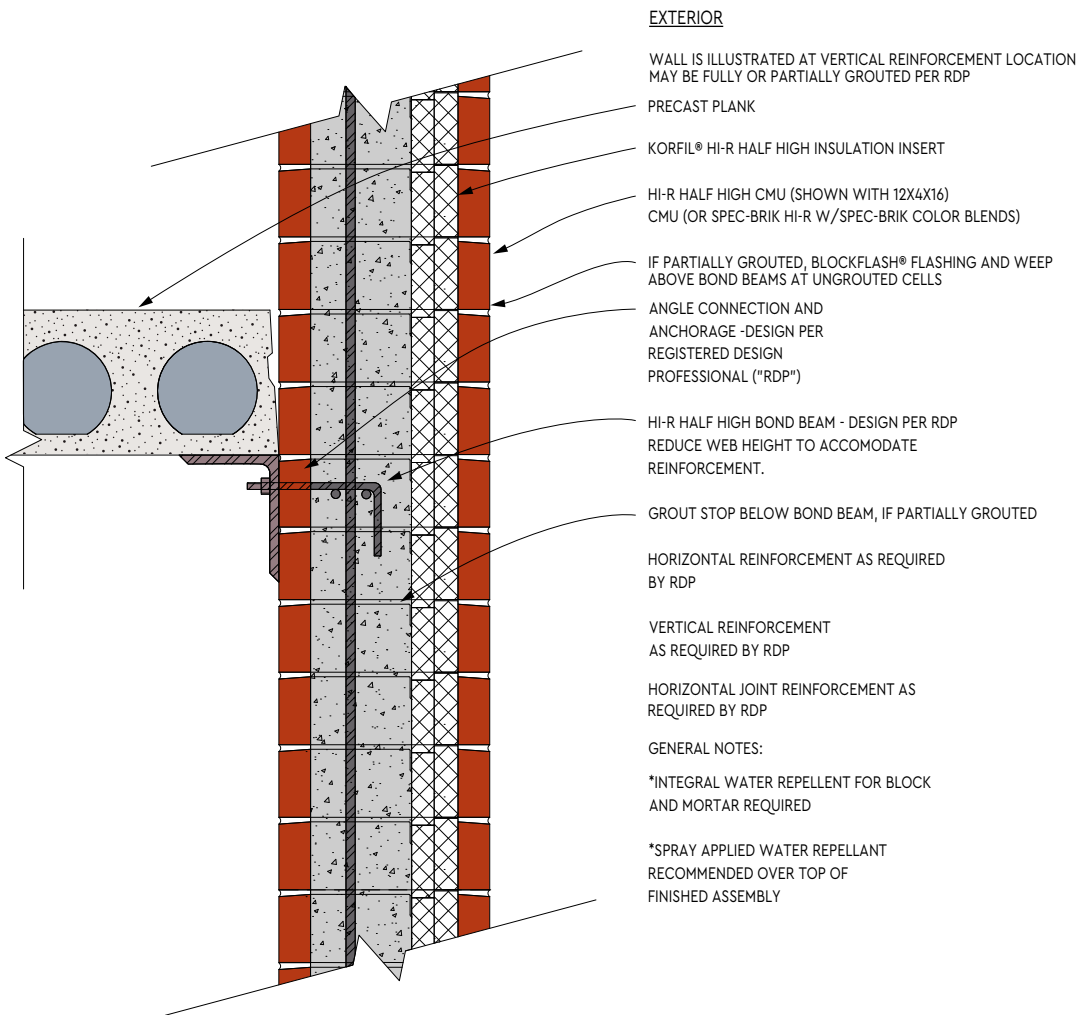
Figure 46. HI-R Half High Plank at Non-Bearing Wall Fully Grouted

Notes:

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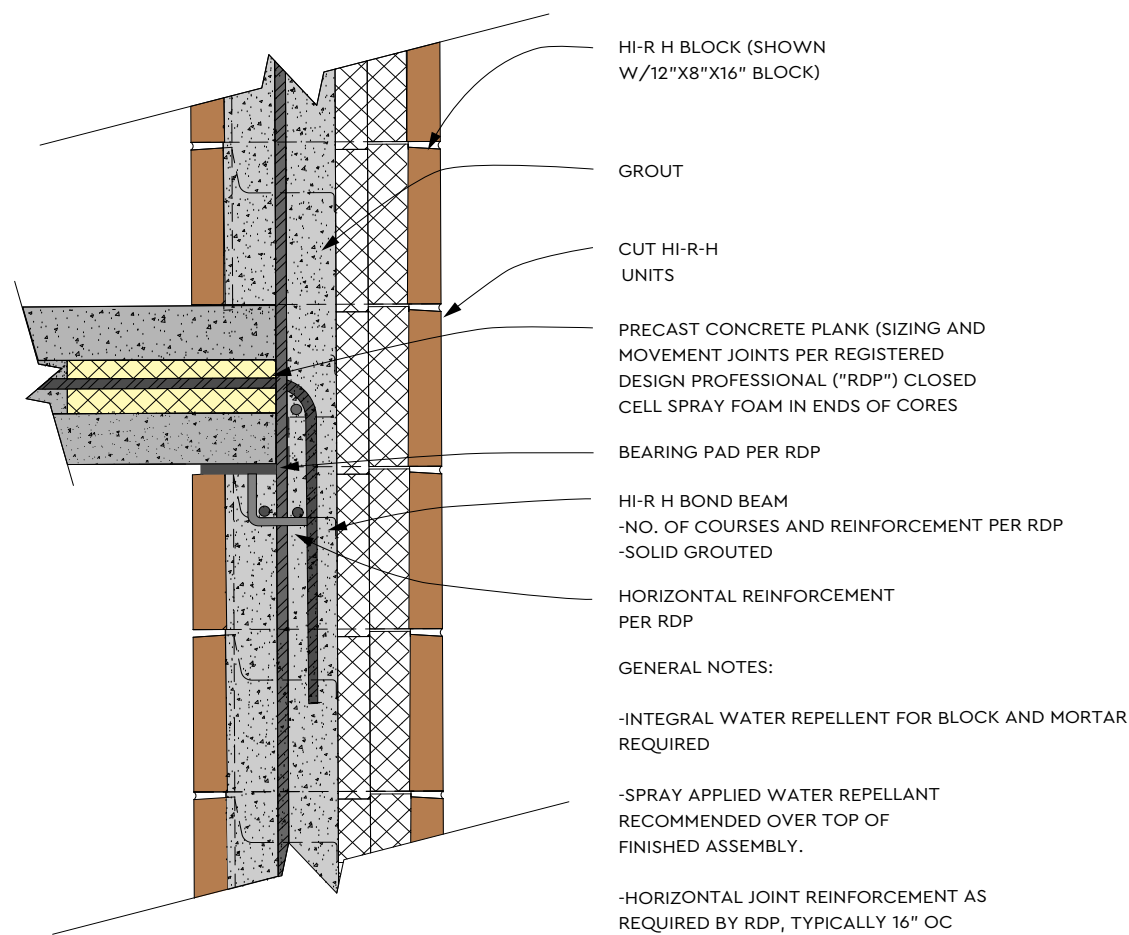
Table of Contents

1. Introduction	1
2. General Information	2
3. Design Requirements	3
4. Construction Details	4
5. Materials	5
6. Installation	6
7. Maintenance	7
8. References	8
9. Index	9

CONCRETE PRODUCTS GROUP



Figure 47. HI-R-H Plank at Bearing Wall Fully Grouted



Notes:

1. This detail depicts a fully grouted wall. HI-R walls may be built either fully or partially grouted, while the HI-R-H products are fully grouted only. Fully grouting masonry walls is a cost-effective alternative to partially grouted walls. In many areas of the country where seismic design considerations are important, highly reinforced and fully grouted masonry is the preferred solution. Fully grouted walls do not require flashing at bond beam locations, and meet Code air barrier requirements.
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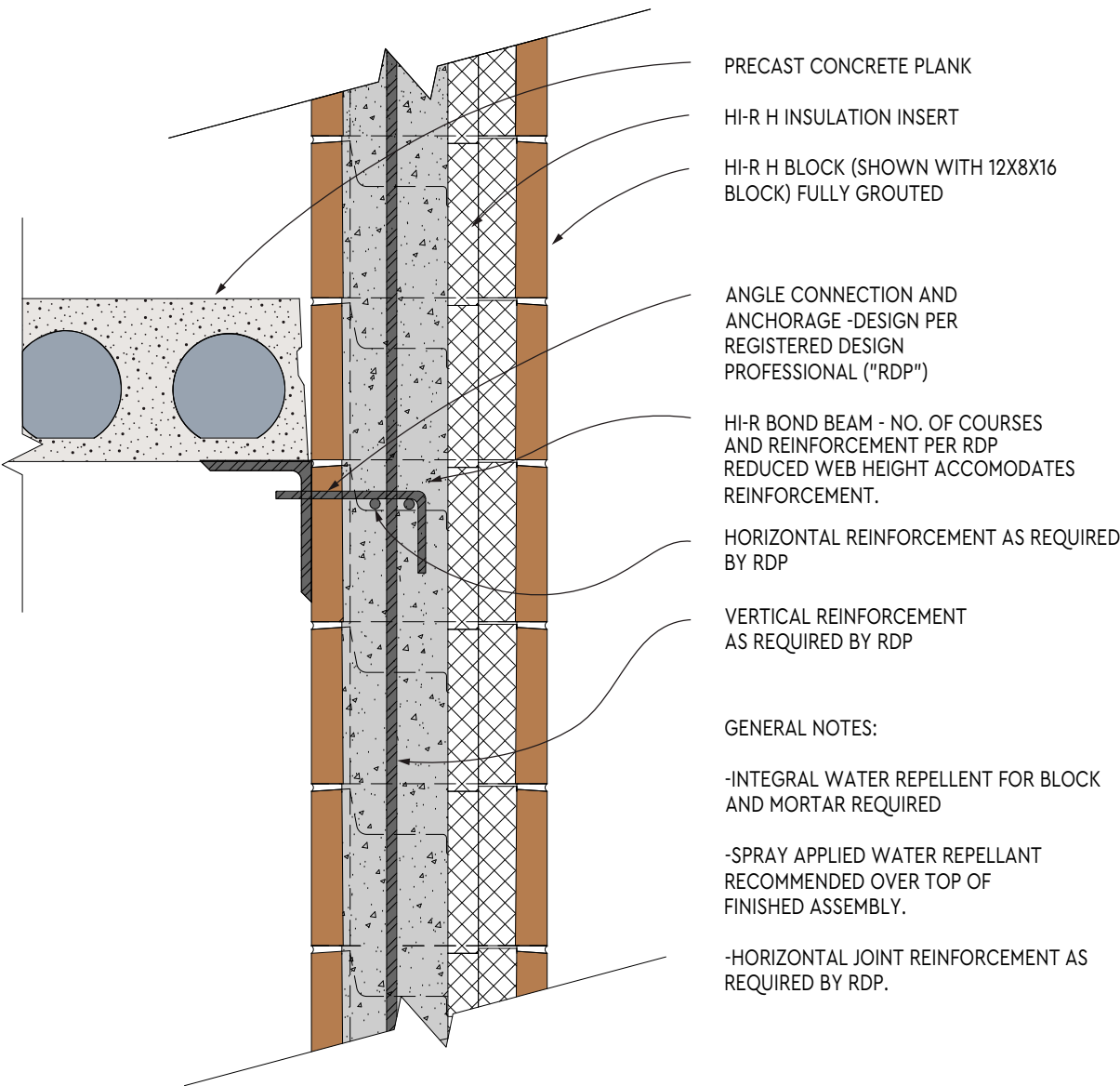
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Figure 48. HI-R-H Plank at Non-Bearing Wall Fully Grouted



Notes:

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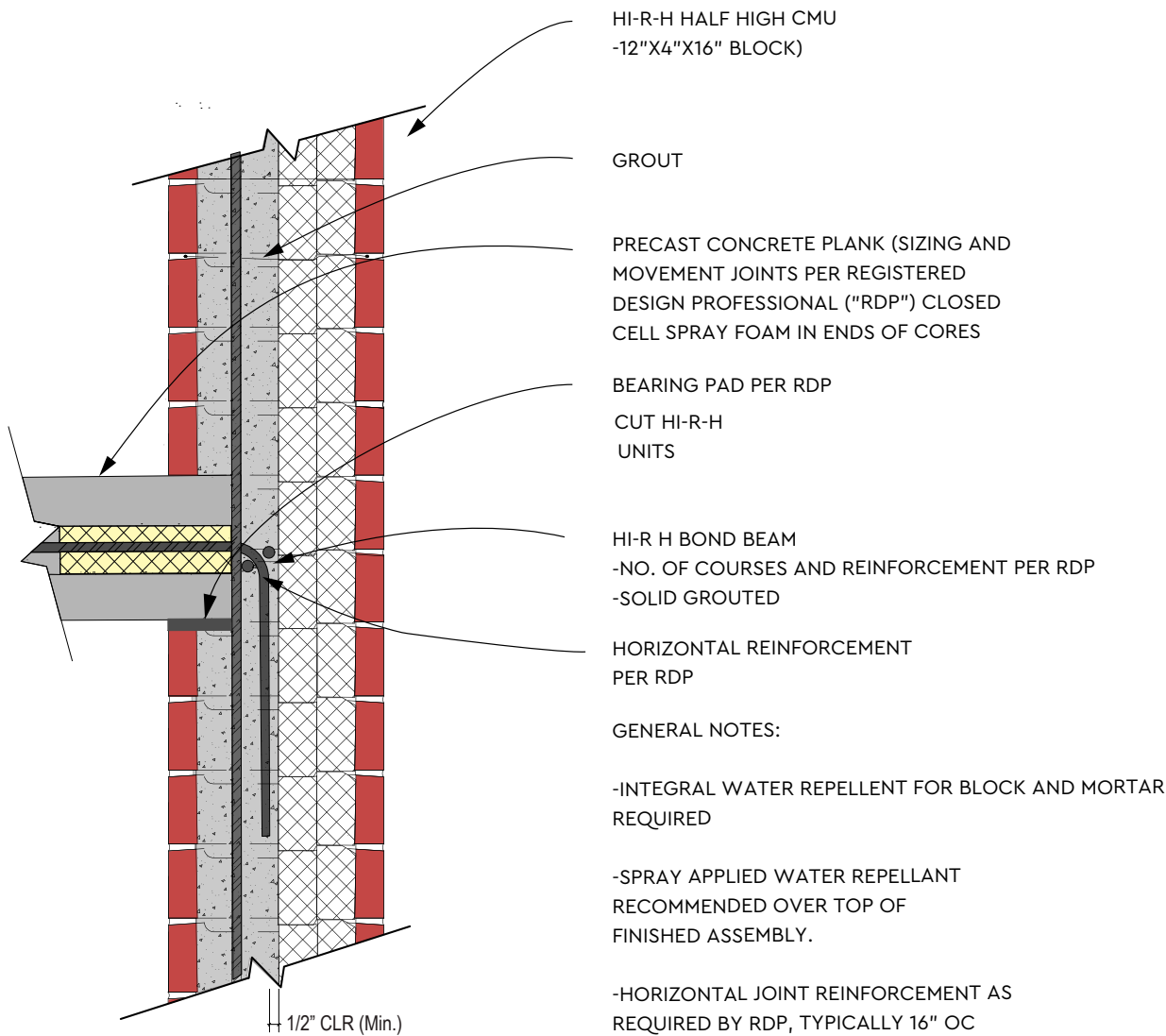
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Figure 49. HI-R-H Half High Bearing Wall Plank



Notes:

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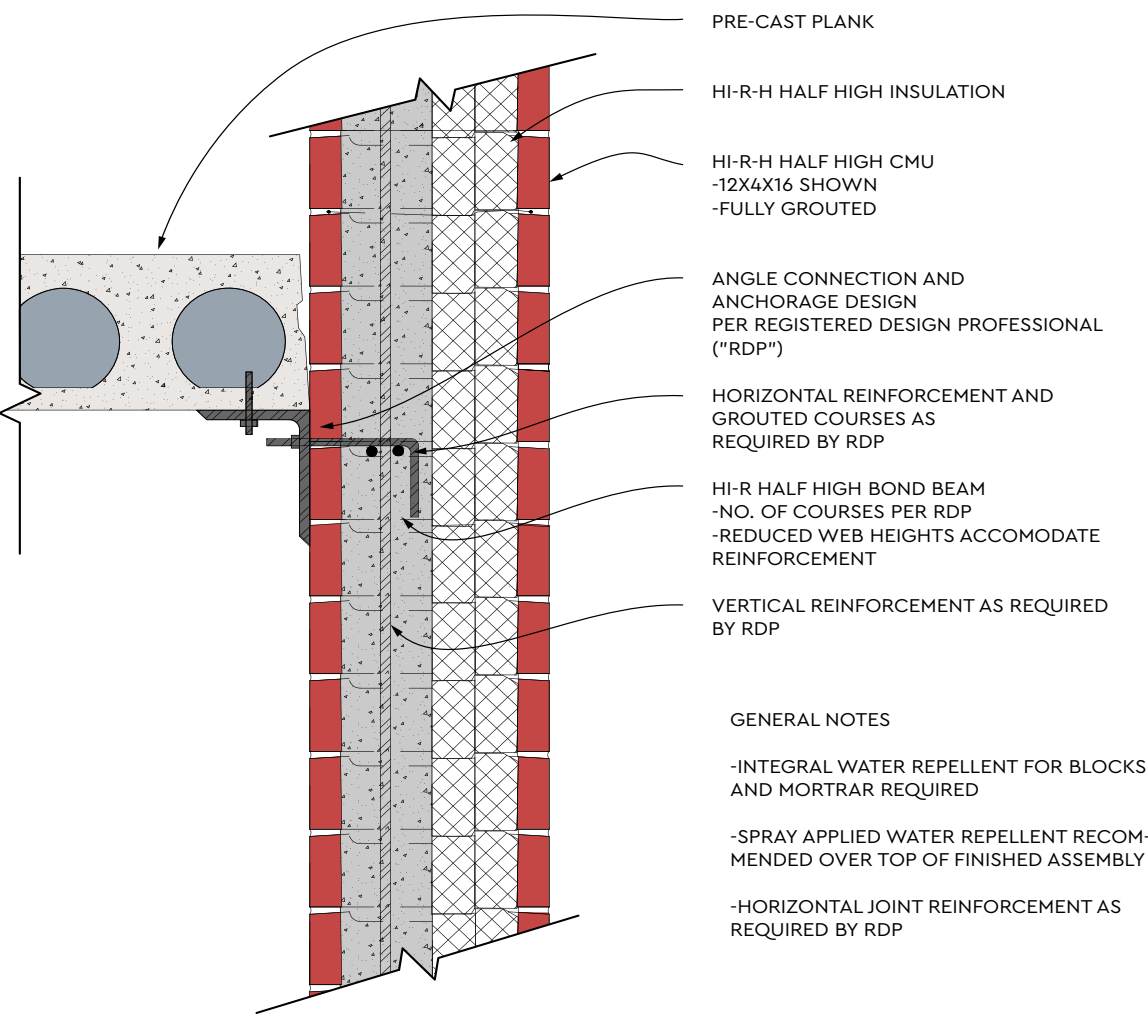
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Table of Contents

1	Introduction
2	General Notes
3	Codes and Standards References
4	Notes
5	Figure 49. HI-R-H Half High Bearing Wall Plank
6	Figure 50. HI-R-H Full High Bearing Wall Plank
7	Figure 51. HI-R-H Full High Bearing Wall Plank
8	Figure 52. HI-R-H Full High Bearing Wall Plank
9	Figure 53. HI-R-H Full High Bearing Wall Plank
10	Figure 54. HI-R-H Full High Bearing Wall Plank
11	Figure 55. HI-R-H Full High Bearing Wall Plank
12	Figure 56. HI-R-H Full High Bearing Wall Plank
13	Figure 57. HI-R-H Full High Bearing Wall Plank
14	Figure 58. HI-R-H Full High Bearing Wall Plank
15	Figure 59. HI-R-H Full High Bearing Wall Plank
16	Figure 60. HI-R-H Full High Bearing Wall Plank
17	Figure 61. HI-R-H Full High Bearing Wall Plank
18	Figure 62. HI-R-H Full High Bearing Wall Plank
19	Figure 63. HI-R-H Full High Bearing Wall Plank
20	Figure 64. HI-R-H Full High Bearing Wall Plank
21	Figure 65. HI-R-H Full High Bearing Wall Plank
22	Figure 66. HI-R-H Full High Bearing Wall Plank
23	Figure 67. HI-R-H Full High Bearing Wall Plank
24	Figure 68. HI-R-H Full High Bearing Wall Plank
25	Figure 69. HI-R-H Full High Bearing Wall Plank
26	Figure 70. HI-R-H Full High Bearing Wall Plank
27	Figure 71. HI-R-H Full High Bearing Wall Plank
28	Figure 72. HI-R-H Full High Bearing Wall Plank
29	Figure 73. HI-R-H Full High Bearing Wall Plank
30	Figure 74. HI-R-H Full High Bearing Wall Plank
31	Figure 75. HI-R-H Full High Bearing Wall Plank
32	Figure 76. HI-R-H Full High Bearing Wall Plank
33	Figure 77. HI-R-H Full High Bearing Wall Plank
34	Figure 78. HI-R-H Full High Bearing Wall Plank
35	Figure 79. HI-R-H Full High Bearing Wall Plank
36	Figure 80. HI-R-H Full High Bearing Wall Plank
37	Figure 81. HI-R-H Full High Bearing Wall Plank
38	Figure 82. HI-R-H Full High Bearing Wall Plank
39	Figure 83. HI-R-H Full High Bearing Wall Plank
40	Figure 84. HI-R-H Full High Bearing Wall Plank
41	Figure 85. HI-R-H Full High Bearing Wall Plank
42	Figure 86. HI-R-H Full High Bearing Wall Plank
43	Figure 87. HI-R-H Full High Bearing Wall Plank
44	Figure 88. HI-R-H Full High Bearing Wall Plank
45	Figure 89. HI-R-H Full High Bearing Wall Plank
46	Figure 90. HI-R-H Full High Bearing Wall Plank
47	Figure 91. HI-R-H Full High Bearing Wall Plank
48	Figure 92. HI-R-H Full High Bearing Wall Plank
49	Figure 93. HI-R-H Full High Bearing Wall Plank
50	Figure 94. HI-R-H Full High Bearing Wall Plank
51	Figure 95. HI-R-H Full High Bearing Wall Plank
52	Figure 96. HI-R-H Full High Bearing Wall Plank
53	Figure 97. HI-R-H Full High Bearing Wall Plank
54	Figure 98. HI-R-H Full High Bearing Wall Plank
55	Figure 99. HI-R-H Full High Bearing Wall Plank
56	Figure 100. HI-R-H Full High Bearing Wall Plank
57	Figure 101. HI-R-H Full High Bearing Wall Plank
58	Figure 102. HI-R-H Full High Bearing Wall Plank
59	Figure 103. HI-R-H Full High Bearing Wall Plank
60	Figure 104. HI-R-H Full High Bearing Wall Plank
61	Figure 105. HI-R-H Full High Bearing Wall Plank
62	Figure 106. HI-R-H Full High Bearing Wall Plank
63	Figure 107. HI-R-H Full High Bearing Wall Plank
64	Figure 108. HI-R-H Full High Bearing Wall Plank
65	Figure 109. HI-R-H Full High Bearing Wall Plank
66	Figure 110. HI-R-H Full High Bearing Wall Plank
67	Figure 111. HI-R-H Full High Bearing Wall Plank
68	Figure 112. HI-R-H Full High Bearing Wall Plank
69	Figure 113. HI-R-H Full High Bearing Wall Plank
70	Figure 114. HI-R-H Full High Bearing Wall Plank
71	Figure 115. HI-R-H Full High Bearing Wall Plank
72	Figure 116. HI-R-H Full High Bearing Wall Plank
73	Figure 117. HI-R-H Full High Bearing Wall Plank
74	Figure 118. HI-R-H Full High Bearing Wall Plank
75	Figure 119. HI-R-H Full High Bearing Wall Plank
76	Figure 120. HI-R-H Full High Bearing Wall Plank
77	Figure 121. HI-R-H Full High Bearing Wall Plank
78	Figure 122. HI-R-H Full High Bearing Wall Plank
79	Figure 123. HI-R-H Full High Bearing Wall Plank
80	Figure 124. HI-R-H Full High Bearing Wall Plank
81	Figure 125. HI-R-H Full High Bearing Wall Plank
82	Figure 126. HI-R-H Full High Bearing Wall Plank
83	Figure 127. HI-R-H Full High Bearing Wall Plank
84	Figure 128. HI-R-H Full High Bearing Wall Plank
85	Figure 129. HI-R-H Full High Bearing Wall Plank
86	Figure 130. HI-R-H Full High Bearing Wall Plank
87	Figure 131. HI-R-H Full High Bearing Wall Plank
88	Figure 132. HI-R-H Full High Bearing Wall Plank
89	Figure 133. HI-R-H Full High Bearing Wall Plank
90	Figure 134. HI-R-H Full High Bearing Wall Plank
91	Figure 135. HI-R-H Full High Bearing Wall Plank
92	Figure 136. HI-R-H Full High Bearing Wall Plank
93	Figure 137. HI-R-H Full High Bearing Wall Plank
94	Figure 138. HI-R-H Full High Bearing Wall Plank
95	Figure 139. HI-R-H Full High Bearing Wall Plank
96	Figure 140. HI-R-H Full High Bearing Wall Plank
97	Figure 141. HI-R-H Full High Bearing Wall Plank
98	Figure 142. HI-R-H Full High Bearing Wall Plank
99	Figure 143. HI-R-H Full High Bearing Wall Plank
100	Figure 144. HI-R-H Full High Bearing Wall Plank



Figure 50. HI-R-H Half High Plank at Non-Bearing Wall Fully Grouted



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Table of Contents

1	Introduction
2	General Notes
3	Foundation Details
4	Wall Details
5	Roof Details
6	Window Details
7	Door Details
8	Staircase Details
9	Other Details
10	Index



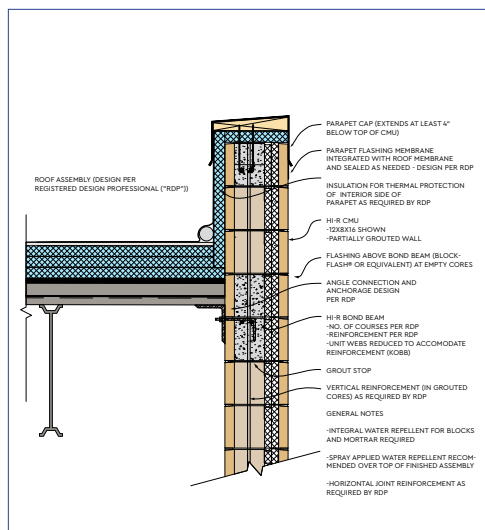


Figure 51. Roof and Parapet
HI-R Partially Grouted (Non-Bearing)

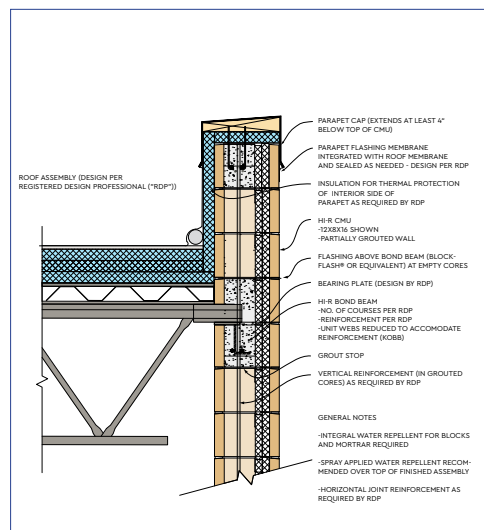


Figure 52. Roof and Parapet
HI-R Partially Grouted (Bearing)

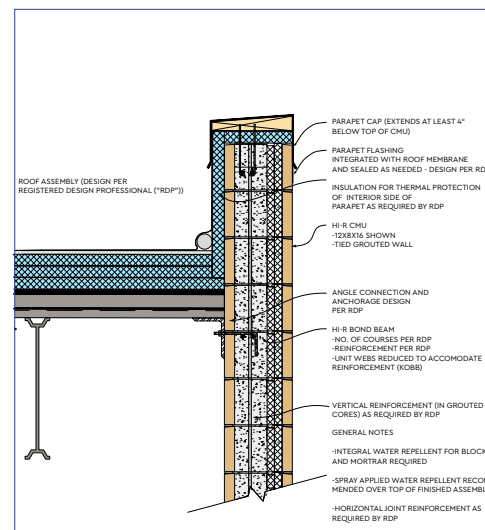


Figure 53. Roof and Parapet
HI-R Fully Grouted (Non-Bearing)

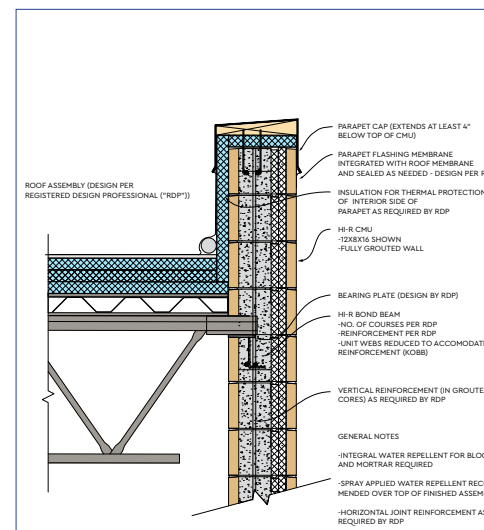


Figure 54. Roof and Parapet
HI-R Fully Grouted (Bearing)

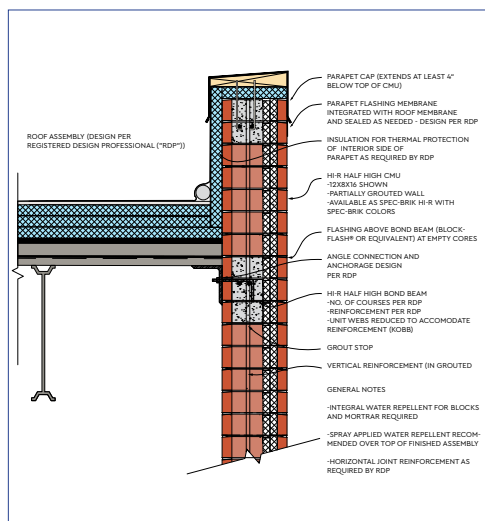


Figure 55. Roof and Parapet
HI-R HH Partially Grouted (Non-Bearing)

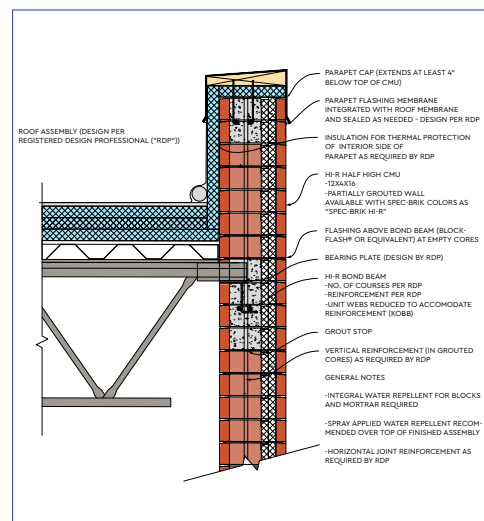


Figure 56. Roof and Parapet
HI-R HH Partially Grouted (Bearing)

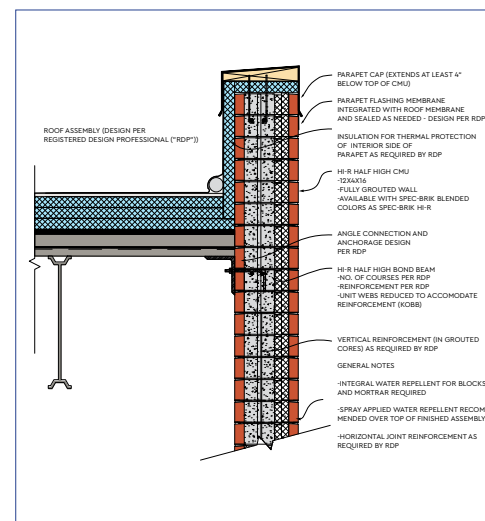


Figure 57. Roof and Parapet
HI-R HH Fully Grouted (Non-Bearing)

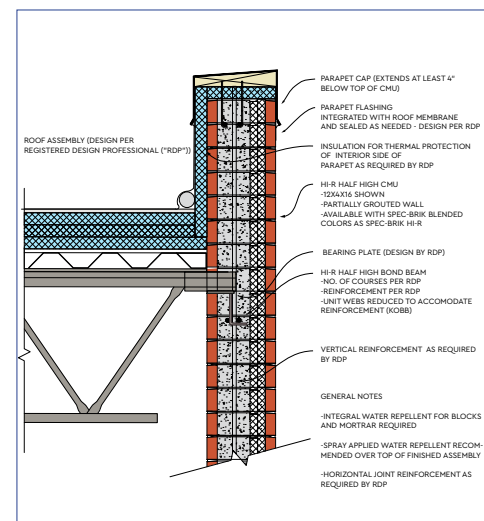


Figure 58. Roof and Parapet
HI-R HH Fully Grouted (Bearing)

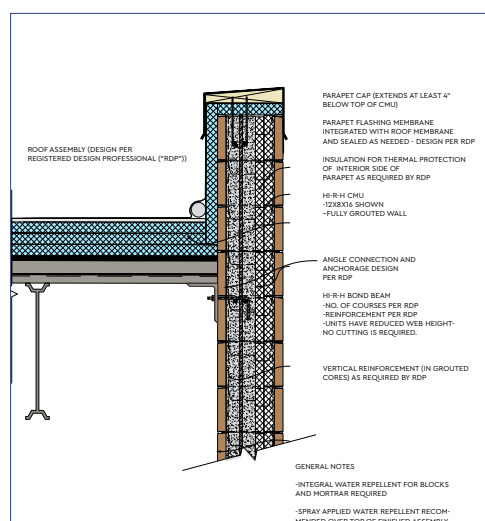


Figure 59. Roof and Parapet
HI-R-H Fully Grouted (Non-Bearing)

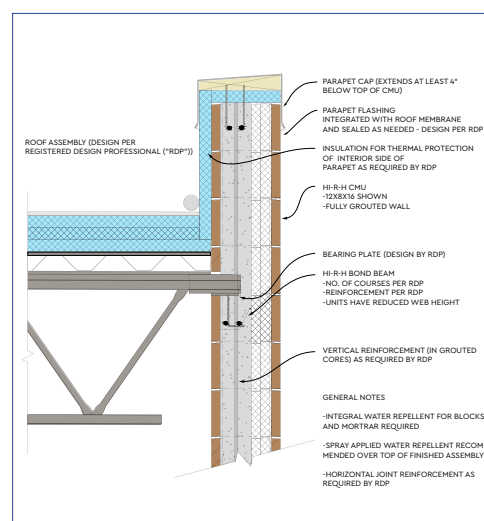


Figure 60. Roof and Parapet
HI-R-H Fully Grouted (Bearing)

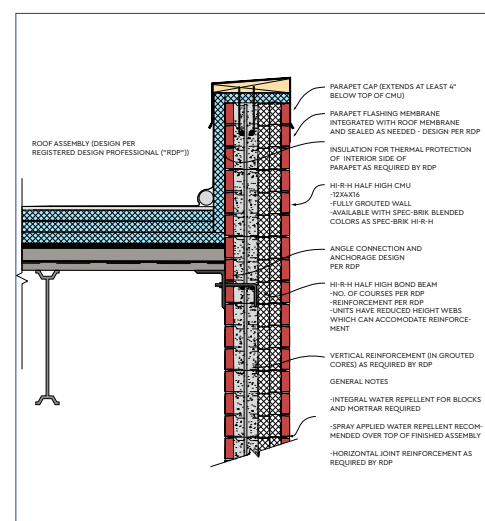


Figure 61. Roof and Parapet
HI-R-H HH Fully Grouted (Non-Bearing)

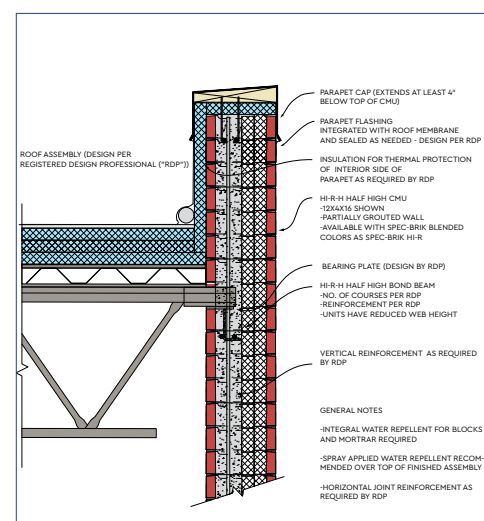


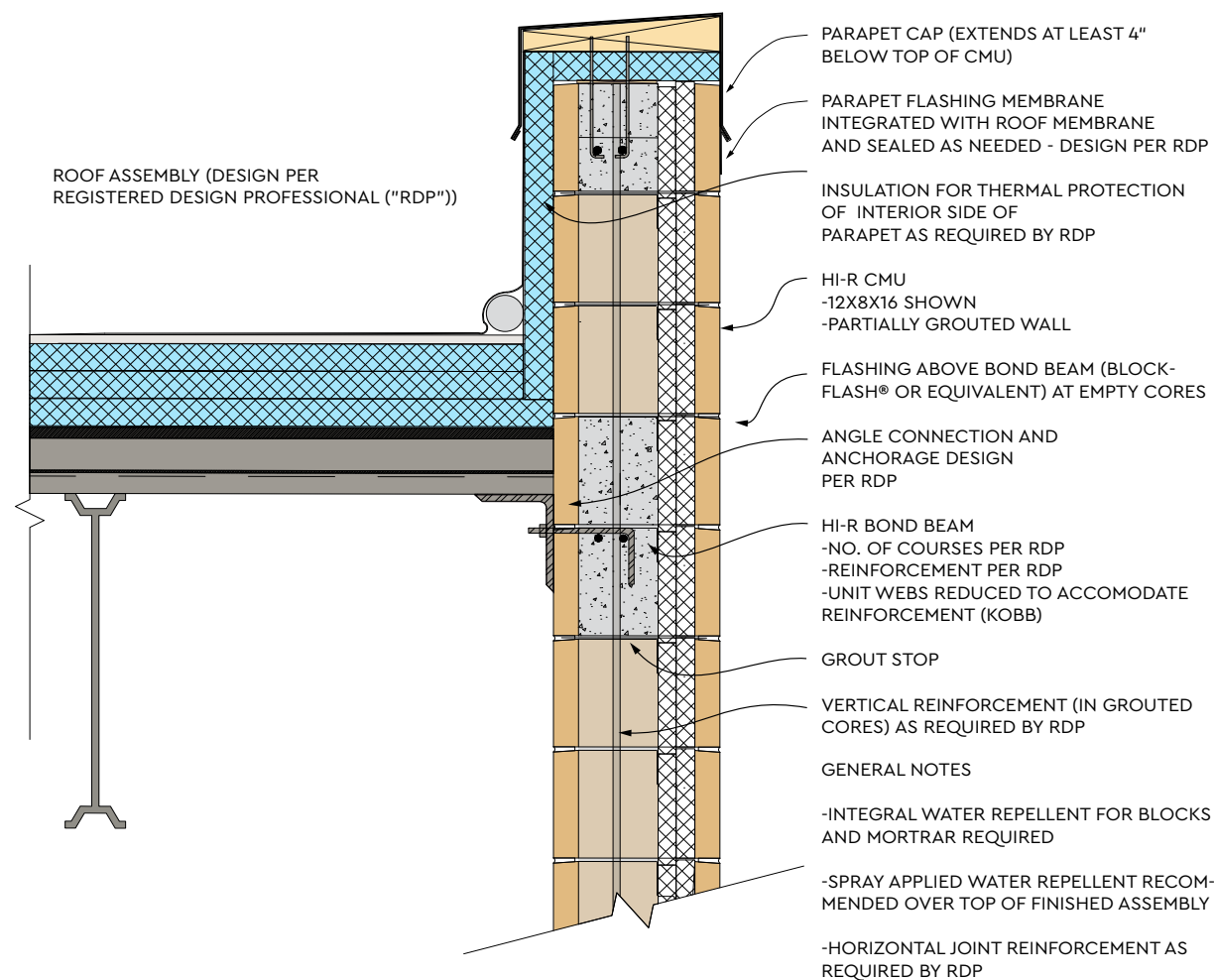
Figure 62. Roof and Parapet
HI-R-H HH Fully Grouted (Bearing)

[Click on drawings to enlarge](#)

Table of Contents	
1	Introduction
2	Roof and Parapet Details
3	Roof and Parapet Details
4	Roof and Parapet Details
5	Roof and Parapet Details
6	Roof and Parapet Details
7	Roof and Parapet Details
8	Roof and Parapet Details
9	Roof and Parapet Details
10	Roof and Parapet Details
11	Roof and Parapet Details
12	Roof and Parapet Details
13	Roof and Parapet Details
14	Roof and Parapet Details
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70	Roof and Parapet Details
71	Roof and Parapet Details
72	Roof and Parapet Details
73	Roof and Parapet Details
74	Roof and Parapet Details
75	Roof and Parapet Details
76	Roof and Parapet Details
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95	Roof and Parapet Details
96	Roof and Parapet Details
97	Roof and Parapet Details
98	Roof and Parapet Details
99	Roof and Parapet Details
100	Roof and Parapet Details

Roof and Parapet

Figure 51. Roof and Parapet HI-R Partially Grouted (Non-Bearing)



Notes:

1. This detail depicts a partially grouted wall. HI-R walls may be built either fully or partially grouted, while the HI-R-H products are fully grouted only. Fully grouting masonry walls is a cost-effective alternative to partially grouted walls. In many areas of the country where seismic design considerations are important, highly reinforced and fully grouted masonry is the preferred solution. Fully grouted walls do not require flashing at bond beam locations, and meet Code air barrier requirements.
2. For projects located in California, or other projects where compliance to vertical wall shear testing is required, alternate moisture control techniques that omit integral water repellent may be used (e.g. use IWR within mortar; use post-applied breathable penetrating sealants or drainable film forming coatings; use High Range Water Reducer in grout).
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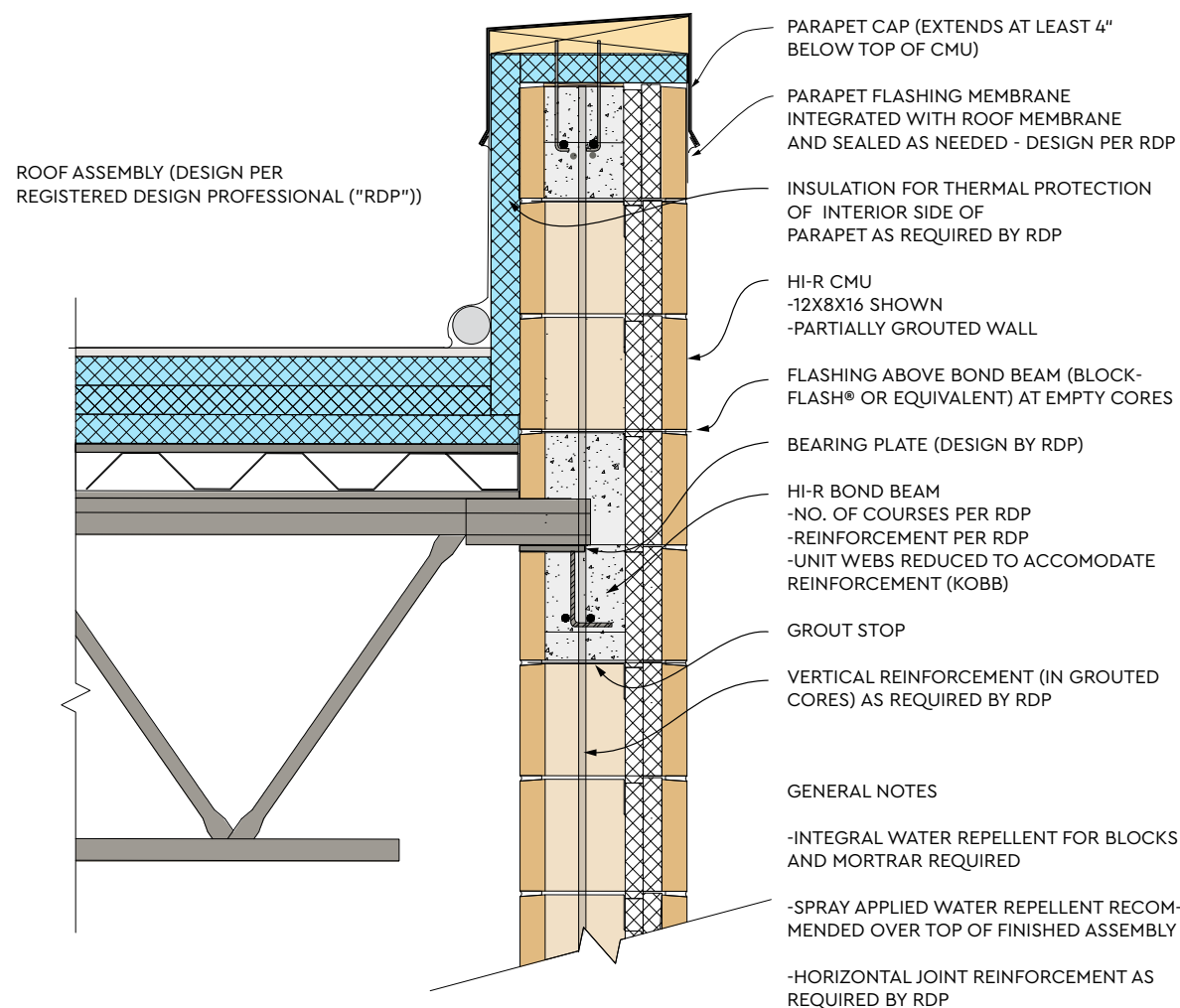
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Figure 52. Roof and Parapet HI-R Partially Grouted (Bearing)



Notes:

1. This detail depicts a partially grouted wall. HI-R walls may be built either fully or partially grouted, while the HI-R-H products are fully grouted only. Fully grouting masonry walls is a cost-effective alternative to partially grouted walls. In many areas of the country where seismic design considerations are important, highly reinforced and fully grouted masonry is the preferred solution. Fully grouted walls do not require flashing at bond beam locations, and meet Code air barrier requirements.
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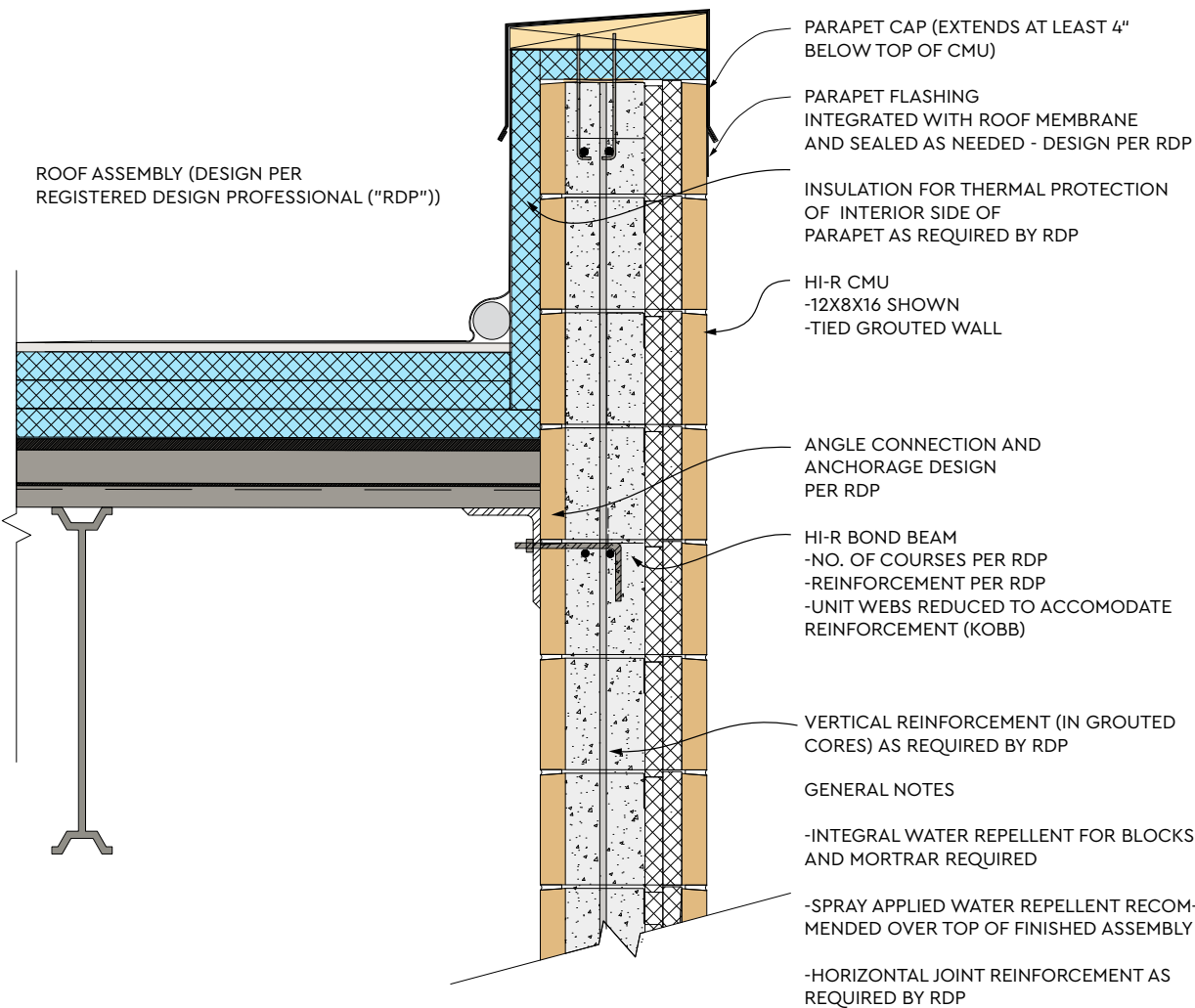
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Figure 53. Roof and Parapet HI-R Fully Grouted (Non-Bearing)



Notes:

1. This detail depicts a fully grouted wall. HI-R walls may be built either fully or partially grouted, while the HI-R-H products are fully grouted only. Fully grouting masonry walls is a cost-effective alternative to partially grouted walls. In many areas of the country where seismic design considerations are important, highly reinforced and fully grouted masonry is the preferred solution. Fully grouted walls do not require flashing at bond beam locations, and meet Code air barrier requirements.
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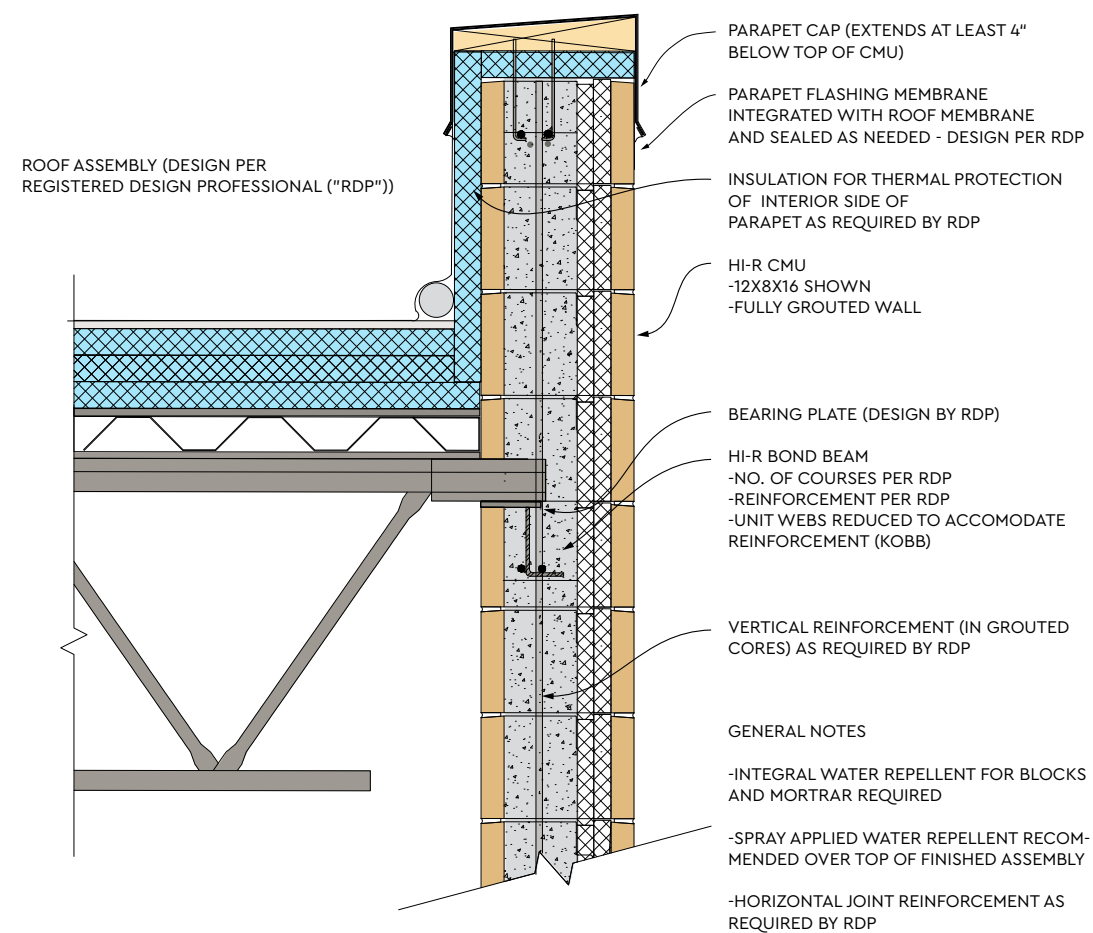
Figure 54. Roof and Parapet HI-R Fully Grouted (Bearing)

Notes:

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- 4. Single wythe walls rely upon a belt-and-suspenders approach to moisture control. Design typically will integrate flashing and weeps, integral water repellent, post-applied moisture control means and measures, sealants, movement joints, damp-checks, crack control, thermal bridging/condensate control, as well as soil elevation offsets and below-grade damp-proofing.

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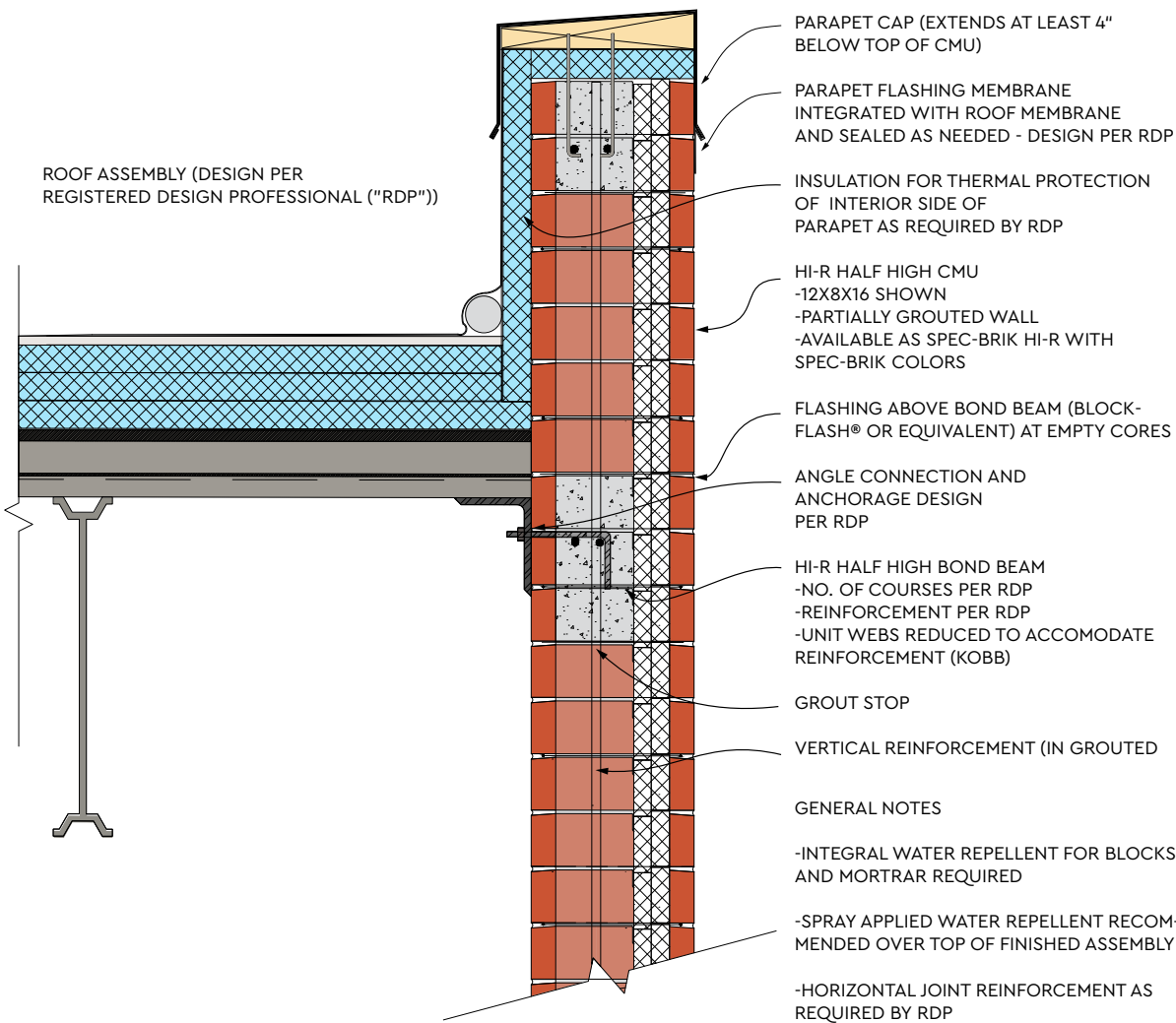
Table of Contents

1	Introduction
2	General Notes
3	Codes and Standards References
4	Applicable References are found in Section III.
5	Notes
6	Codes and Standards References
7	Applicable References are found in Section III.
8	Notes
9	Codes and Standards References
10	Applicable References are found in Section III.
11	Notes
12	Codes and Standards References
13	Applicable References are found in Section III.
14	Notes
15	Codes and Standards References
16	Applicable References are found in Section III.
17	Notes
18	Codes and Standards References
19	Applicable References are found in Section III.
20	Notes
21	Codes and Standards References
22	Applicable References are found in Section III.
23	Notes
24	Codes and Standards References
25	Applicable References are found in Section III.
26	Notes
27	Codes and Standards References
28	Applicable References are found in Section III.
29	Notes
30	Codes and Standards References
31	Applicable References are found in Section III.
32	Notes
33	Codes and Standards References
34	Applicable References are found in Section III.
35	Notes
36	Codes and Standards References
37	Applicable References are found in Section III.
38	Notes
39	Codes and Standards References
40	Applicable References are found in Section III.
41	Notes
42	Codes and Standards References
43	Applicable References are found in Section III.
44	Notes
45	Codes and Standards References
46	Applicable References are found in Section III.
47	Notes
48	Codes and Standards References
49	Applicable References are found in Section III.
50	Notes
51	Codes and Standards References
52	Applicable References are found in Section III.
53	Notes
54	Codes and Standards References
55	Applicable References are found in Section III.
56	Notes
57	Codes and Standards References
58	Applicable References are found in Section III.
59	Notes
60	Codes and Standards References
61	Applicable References are found in Section III.
62	Notes
63	Codes and Standards References
64	Applicable References are found in Section III.
65	Notes
66	Codes and Standards References
67	Applicable References are found in Section III.
68	Notes
69	Codes and Standards References
70	Applicable References are found in Section III.
71	Notes
72	Codes and Standards References
73	Applicable References are found in Section III.
74	Notes
75	Codes and Standards References
76	Applicable References are found in Section III.
77	Notes
78	Codes and Standards References
79	Applicable References are found in Section III.
80	Notes
81	Codes and Standards References
82	Applicable References are found in Section III.
83	Notes
84	Codes and Standards References
85	Applicable References are found in Section III.
86	Notes
87	Codes and Standards References
88	Applicable References are found in Section III.
89	Notes
90	Codes and Standards References
91	Applicable References are found in Section III.
92	Notes
93	Codes and Standards References
94	Applicable References are found in Section III.
95	Notes
96	Codes and Standards References
97	Applicable References are found in Section III.
98	Notes
99	Codes and Standards References
100	Applicable References are found in Section III.

Table of Contents

1	Introduction
2	General Notes
3	Codes and Standards References
4	Applicable References are found in Section III.
5	Notes
6	Codes and Standards References
7	Applicable References are found in Section III.
8	Notes
9	Codes and Standards References
10	Applicable References are found in Section III.
11	Notes
12	Codes and Standards References
13	Applicable References are found in Section III.
14	Notes
15	Codes and Standards References
16	Applicable References are found in Section III.
17	Notes
18	Codes and Standards References
19	Applicable References are found in Section III.
20	Notes
21	Codes and Standards References
22	Applicable References are found in Section III.
23	Notes
24	Codes and Standards References
25	Applicable References are found in Section III.
26	Notes
27	Codes and Standards References
28	Applicable References are found in Section III.
29	Notes
30	Codes and Standards References
31	Applicable References are found in Section III.
32	Notes
33	Codes and Standards References
34	Applicable References are found in Section III.
35	Notes
36	Codes and Standards References
37	Applicable References are found in Section III.
38	Notes
39	Codes and Standards References
40	Applicable References are found in Section III.
41	Notes
42	Codes and Standards References
43	Applicable References are found in Section III.
44	Notes
45	Codes and Standards References
46	Applicable References are found in Section III.
47	Notes
48	Codes and Standards References
49	Applicable References are found in Section III.
50	Notes
51	Codes and Standards References
52	Applicable References are found in Section III.
53	Notes
54	Codes and Standards References
55	Applicable References are found in Section III.
56	Notes
57	Codes and Standards References
58	Applicable References are found in Section III.
59	Notes
60	Codes and Standards References
61	Applicable References are found in Section III.
62	Notes
63	Codes and Standards References
64	Applicable References are found in Section III.
65	Notes
66	Codes and Standards References
67	Applicable References are found in Section III.
68	Notes
69	Codes and Standards References
70	Applicable References are found in Section III.
71	Notes
72	Codes and Standards References
73	Applicable References are found in Section III.
74	Notes
75	Codes and Standards References
76	Applicable References are found in Section III.
77	Notes
78	Codes and Standards References
79	Applicable References are found in Section III.
80	Notes
81	Codes and Standards References
82	Applicable References are found in Section III.
83	Notes
84	Codes and Standards References
85	Applicable References are found in Section III.
86	Notes
87	Codes and Standards References
88	Applicable References are found in Section III.
89	Notes
90	Codes and Standards References
91	Applicable References are found in Section III.
92	Notes
93	Codes and Standards References
94	Applicable References are found in Section III.
95	Notes
96	Codes and Standards References
97	Applicable References are found in Section III.
98	Notes
99	Codes and Standards References
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Figure 55. Roof and Parapet HI-R Half High Partially Grouted (Non-Bearing)



Notes:

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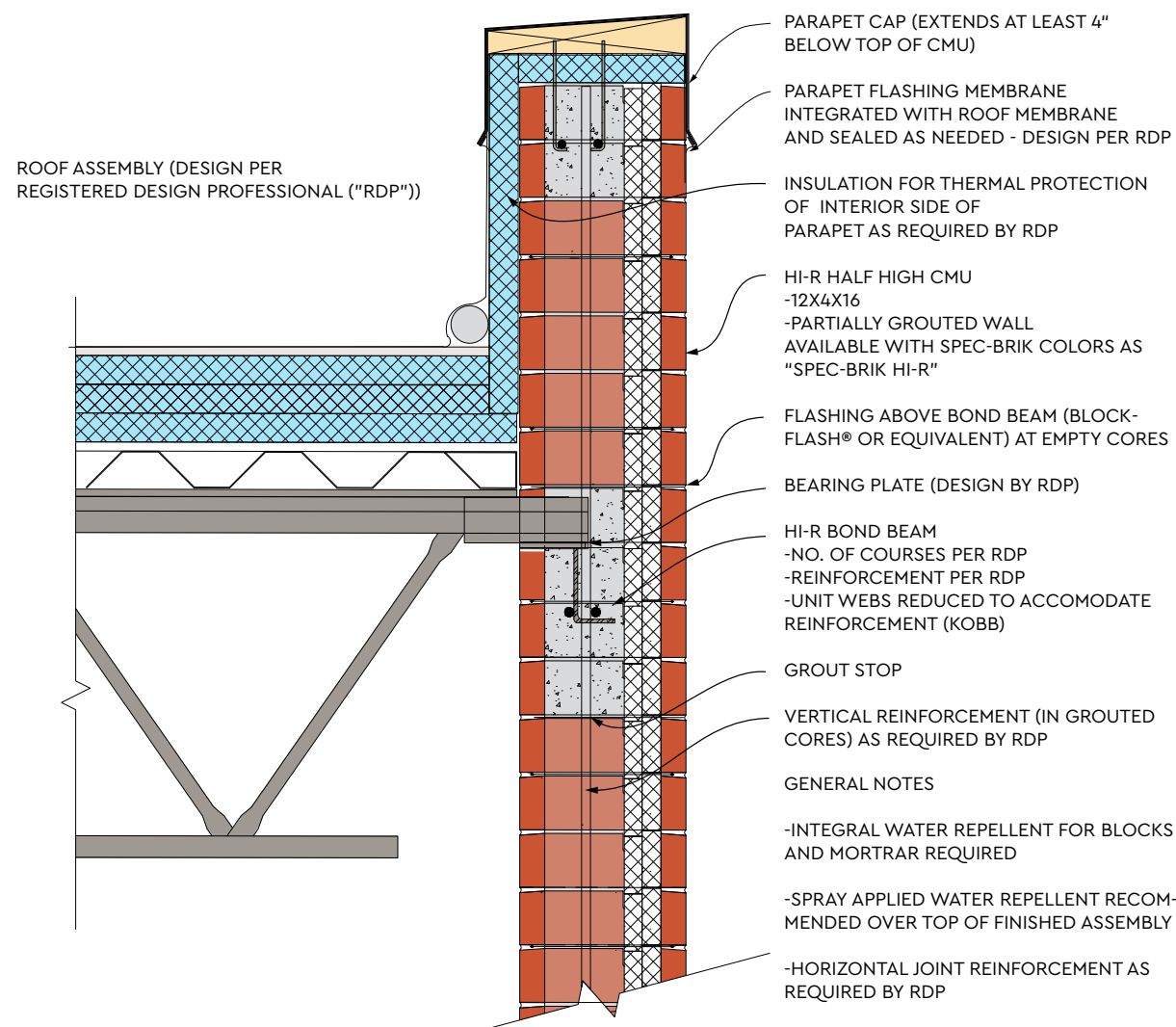
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Figure 56. Roof and Parapet HI-R HH Partially Grouted (Bearing)



Notes:

1. This detail depicts a partially grouted wall. HI-R walls may be built either fully or partially grouted, while the HI-R-H products are fully grouted only. Fully grouting masonry walls is a cost-effective alternative to partially grouted walls. In many areas of the country where seismic design considerations are important, highly reinforced and fully grouted masonry is the preferred solution. Fully grouted walls do not require flashing at bond beam locations, and meet Code air barrier requirements.
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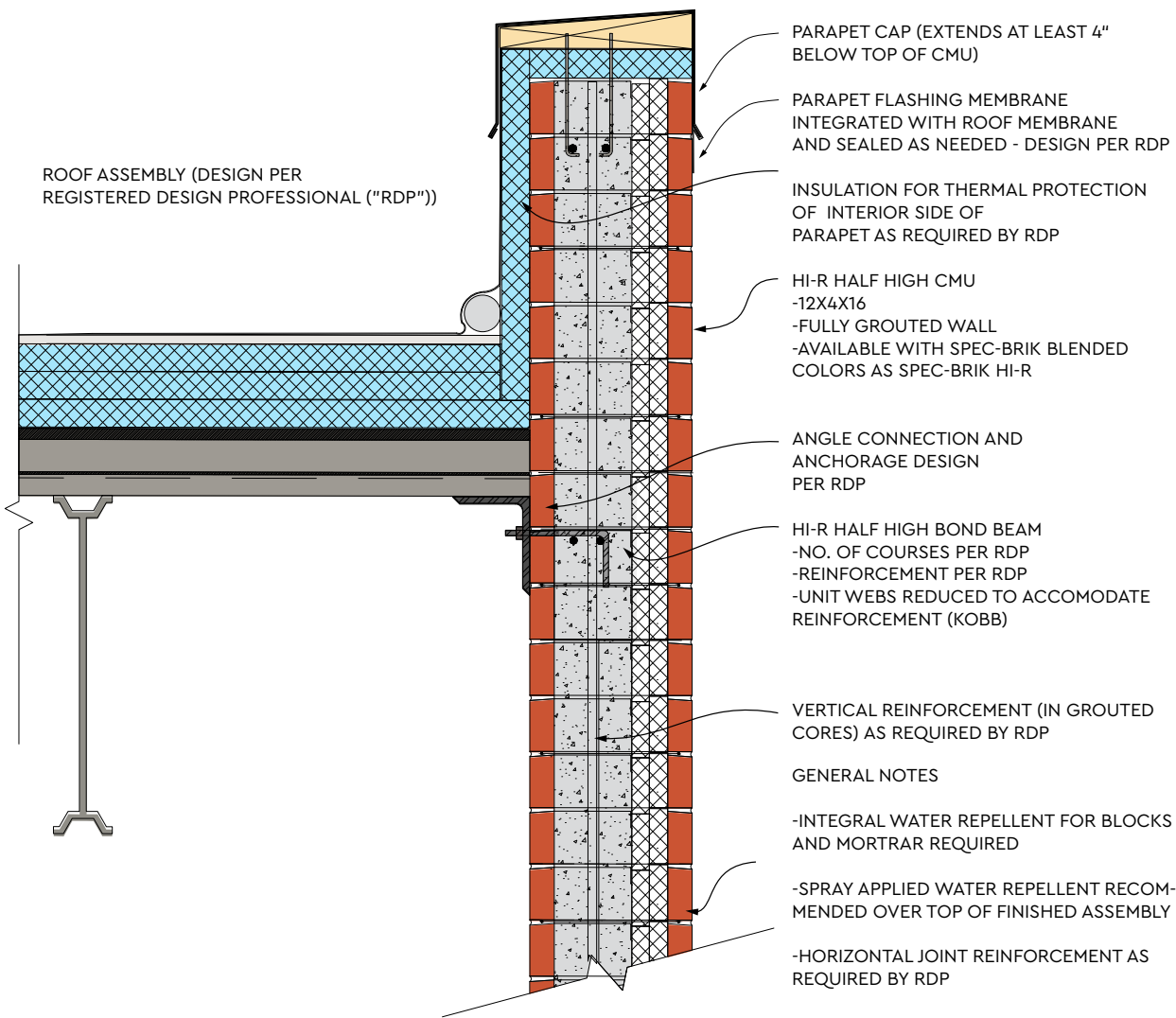
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Table of Contents

Introduction	1
Section I: General Information	2
Section II: Design Requirements	3
Section III: Codes and Standards References	4
Section IV: Construction Details	5
Section V: Maintenance and Repair	6
Section VI: Quality Control and Assurance	7
Section VII: Safety and Health	8
Section VIII: Environmental Protection	9
Section IX: Accessibility	10
Section X: Energy Efficiency	11
Section XI: Sustainability	12
Section XII: Other Requirements	13



Figure 57. Roof and Parapet HI-R Half High Fully Grouted (Non-Bearing)



Notes:

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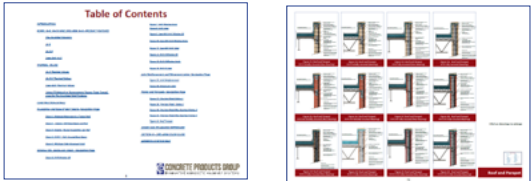
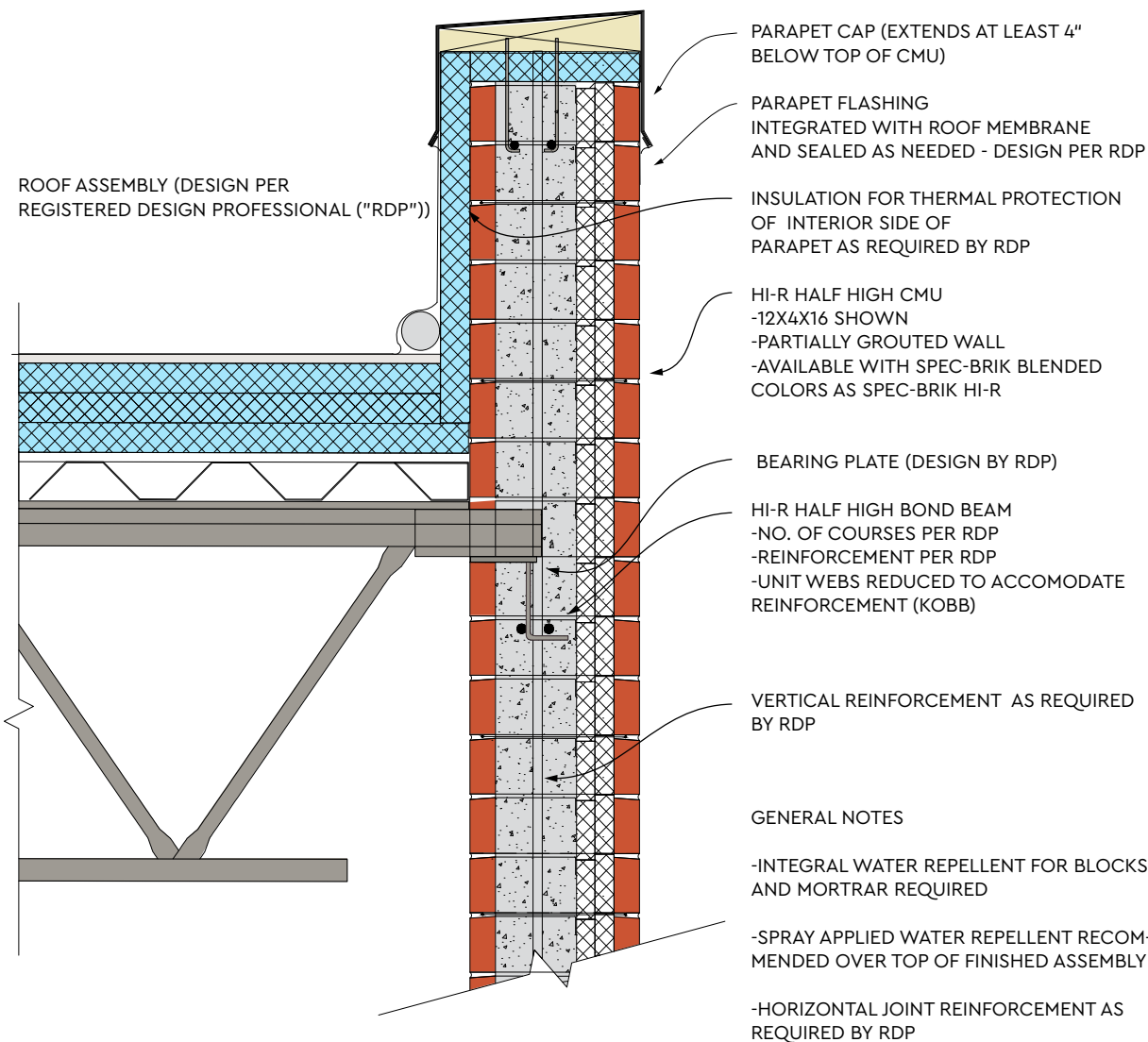


Figure 58. Roof and Parapet HI-R Half High Fully Grouted (Bearing)



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2. For projects located in California, or other projects where compliance to vertical wall shear testing is required, alternate moisture control techniques that omit integral water repellent may be used (e.g. use IWR within mortar; use post-applied breathable penetrating sealants or drainable film forming coatings; use High Range Water Reducer in grout).
3. Request evidence in writing of adequate head joint mortar bond to IWR-containing CMU for Properties-based mortars. Request in writing evidence of sufficient composite-action bond to IWR-containing CMU of Properties-based grout.
4. Single wythe walls rely upon a belt-and-suspenders approach to moisture control. Design typically will integrate flashing and weeps, integral water repellent, post-applied moisture control means and measures, sealants, movement joints, damp-checks, crack control, thermal bridging/condensate control, as well as soil elevation offsets and below-grade damp-proofing.

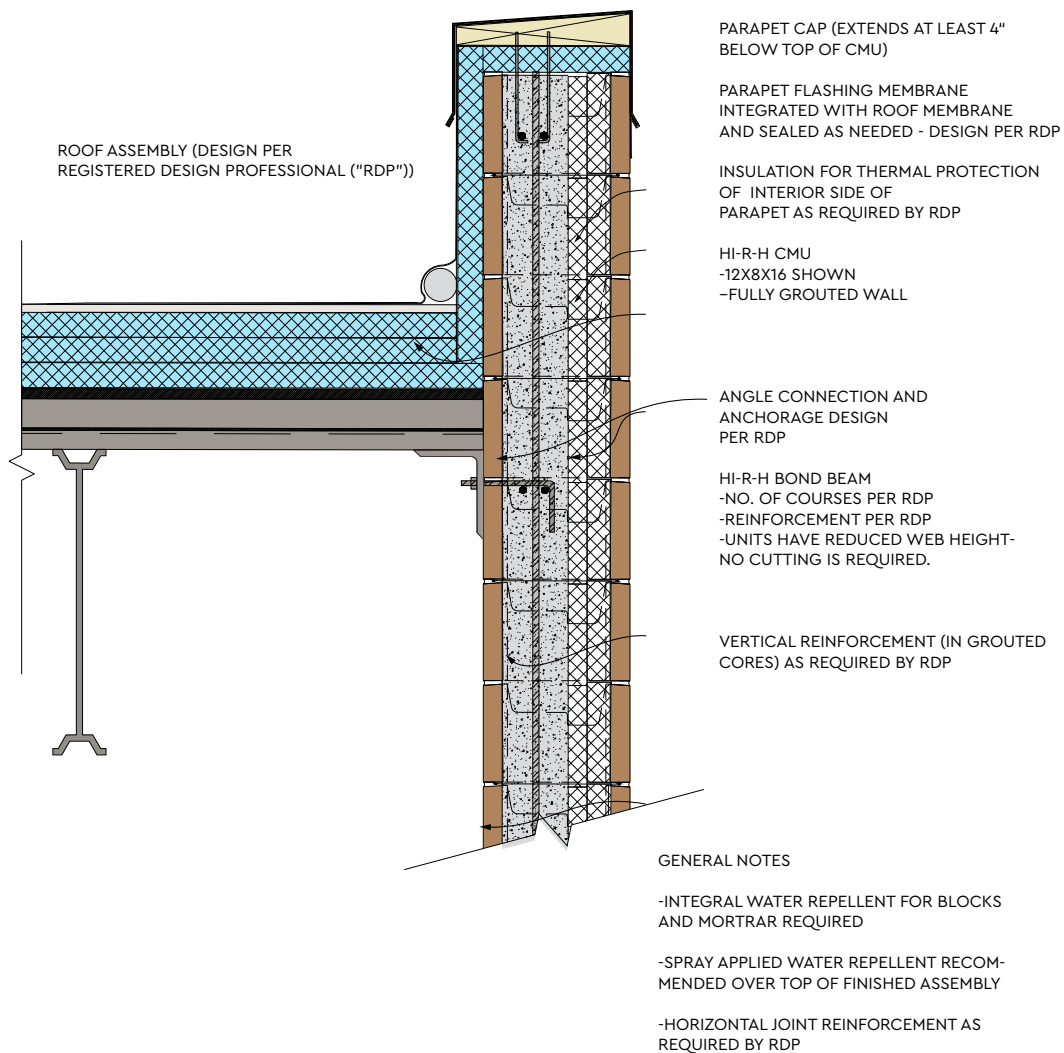
Codes and Standards References

Applicable References are found in Section III.

Table of Contents	
1. Introduction	1
2. General Notes	2
3. Codes and Standards References	3
4. Details	4
5. Construction	5
6. Maintenance	6
7. Appendix	7
8. Index	8

Table of Contents	
1. Introduction	1
2. General Notes	2
3. Codes and Standards References	3
4. Details	4
5. Construction	5
6. Maintenance	6
7. Appendix	7
8. Index	8

Figure 59. Roof and Parapet HI-R-H Fully Grouted (Non-Bearing)



Notes:

1. This detail depicts a fully grouted wall. HI-R walls may be built either fully or partially grouted, while the HI-R-H products are fully grouted only. Fully grouting masonry walls is a cost-effective alternative to partially grouted walls. In many areas of the country where seismic design considerations are important, highly reinforced and fully grouted masonry is the preferred solution. Fully grouted walls do not require flashing at bond beam locations, and meet Code air barrier requirements.
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3. Request evidence in writing of adequate head joint mortar bond to IWR-containing CMU for Properties-based mortars. Request in writing evidence of sufficient composite-action bond to IWR-containing CMU of Properties-based grout.
4. Single wythe walls rely upon a belt-and-suspenders approach to moisture control. Design typically will integrate flashing and weeps, integral water repellent, post-applied moisture control means and measures, sealants, movement joints, damp-checks, crack control, thermal bridging/condensate control, as well as soil elevation offsets and below-grade damp-proofing.

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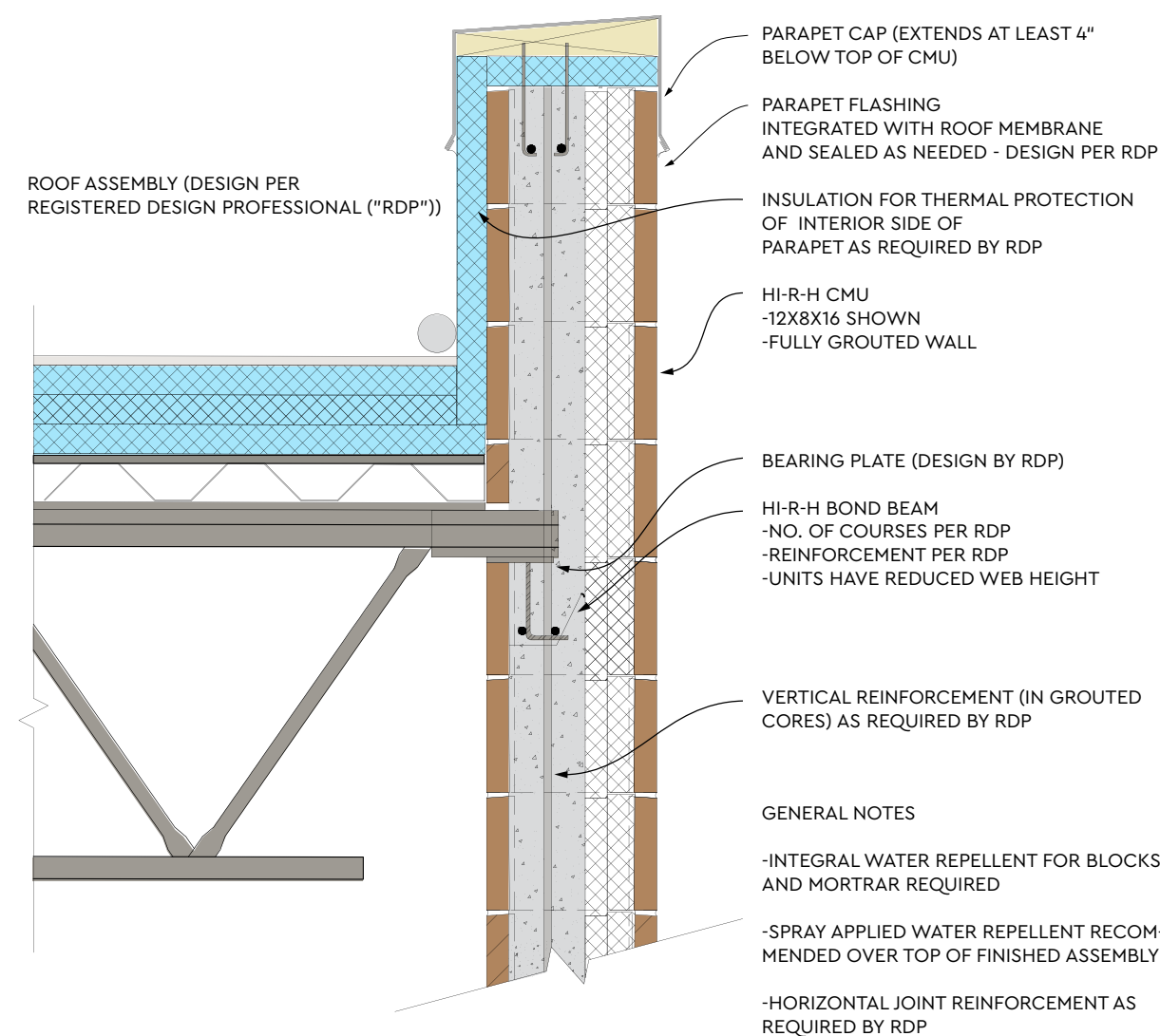
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Table of Contents	
1	Introduction
2	General Notes
3	Codes and Standards References
4	Notes
5	Table of Contents
6	Table of Contents
7	Table of Contents
8	Table of Contents
9	Table of Contents
10	Table of Contents
11	Table of Contents
12	Table of Contents
13	Table of Contents
14	Table of Contents
15	Table of Contents
16	Table of Contents
17	Table of Contents
18	Table of Contents
19	Table of Contents
20	Table of Contents
21	Table of Contents
22	Table of Contents
23	Table of Contents
24	Table of Contents
25	Table of Contents
26	Table of Contents
27	Table of Contents
28	Table of Contents
29	Table of Contents
30	Table of Contents
31	Table of Contents
32	Table of Contents
33	Table of Contents
34	Table of Contents
35	Table of Contents
36	Table of Contents
37	Table of Contents
38	Table of Contents
39	Table of Contents
40	Table of Contents
41	Table of Contents
42	Table of Contents
43	Table of Contents
44	Table of Contents
45	Table of Contents
46	Table of Contents
47	Table of Contents
48	Table of Contents
49	Table of Contents
50	Table of Contents
51	Table of Contents
52	Table of Contents
53	Table of Contents
54	Table of Contents
55	Table of Contents
56	Table of Contents
57	Table of Contents
58	Table of Contents
59	Table of Contents
60	Table of Contents
61	Table of Contents
62	Table of Contents
63	Table of Contents
64	Table of Contents
65	Table of Contents
66	Table of Contents
67	Table of Contents
68	Table of Contents
69	Table of Contents
70	Table of Contents
71	Table of Contents
72	Table of Contents
73	Table of Contents
74	Table of Contents
75	Table of Contents
76	Table of Contents
77	Table of Contents
78	Table of Contents
79	Table of Contents
80	Table of Contents
81	Table of Contents
82	Table of Contents
83	Table of Contents
84	Table of Contents
85	Table of Contents
86	Table of Contents
87	Table of Contents
88	Table of Contents
89	Table of Contents
90	Table of Contents
91	Table of Contents
92	Table of Contents
93	Table of Contents
94	Table of Contents
95	Table of Contents
96	Table of Contents
97	Table of Contents
98	Table of Contents
99	Table of Contents
100	Table of Contents

Table of Contents	
1	Introduction
2	General Notes
3	Codes and Standards References
4	Notes
5	Table of Contents
6	Table of Contents
7	Table of Contents
8	Table of Contents
9	Table of Contents
10	Table of Contents
11	Table of Contents
12	Table of Contents
13	Table of Contents
14	Table of Contents
15	Table of Contents
16	Table of Contents
17	Table of Contents
18	Table of Contents
19	Table of Contents
20	Table of Contents
21	Table of Contents
22	Table of Contents
23	Table of Contents
24	Table of Contents
25	Table of Contents
26	Table of Contents
27	Table of Contents
28	Table of Contents
29	Table of Contents
30	Table of Contents
31	Table of Contents
32	Table of Contents
33	Table of Contents
34	Table of Contents
35	Table of Contents
36	Table of Contents
37	Table of Contents
38	Table of Contents
39	Table of Contents
40	Table of Contents
41	Table of Contents
42	Table of Contents
43	Table of Contents
44	Table of Contents
45	Table of Contents
46	Table of Contents
47	Table of Contents
48	Table of Contents
49	Table of Contents
50	Table of Contents
51	Table of Contents
52	Table of Contents
53	Table of Contents
54	Table of Contents
55	Table of Contents
56	Table of Contents
57	Table of Contents
58	Table of Contents
59	Table of Contents
60	Table of Contents
61	Table of Contents
62	Table of Contents
63	Table of Contents
64	Table of Contents
65	Table of Contents
66	Table of Contents
67	Table of Contents
68	Table of Contents
69	Table of Contents
70	Table of Contents
71	Table of Contents
72	Table of Contents
73	Table of Contents
74	Table of Contents
75	Table of Contents
76	Table of Contents
77	Table of Contents
78	Table of Contents
79	Table of Contents
80	Table of Contents
81	Table of Contents
82	Table of Contents
83	Table of Contents
84	Table of Contents
85	Table of Contents
86	Table of Contents
87	Table of Contents
88	Table of Contents
89	Table of Contents
90	Table of Contents
91	Table of Contents
92	Table of Contents
93	Table of Contents
94	Table of Contents
95	Table of Contents
96	Table of Contents
97	Table of Contents
98	Table of Contents
99	Table of Contents
100	Table of Contents

Figure 60. Roof and Parapet HI-R-H Fully Grouted (Bearing)



Notes:

1. This detail depicts a fully grouted wall. HI-R walls may be built either fully or partially grouted, while the HI-R-H products are fully grouted only. Fully grouting masonry walls is a cost-effective alternative to partially grouted walls. In many areas of the country where seismic design considerations are important, highly reinforced and fully grouted masonry is the preferred solution. Fully grouted walls do not require flashing at bond beam locations, and meet Code air barrier requirements.
2. For projects located in California, or other projects where compliance to vertical wall shear testing is required, alternate moisture control techniques that omit integral water repellent may be used (e.g. use IWR within mortar; use post-applied breathable penetrating sealants or drainable film forming coatings; use High Range Water Reducer in grout).
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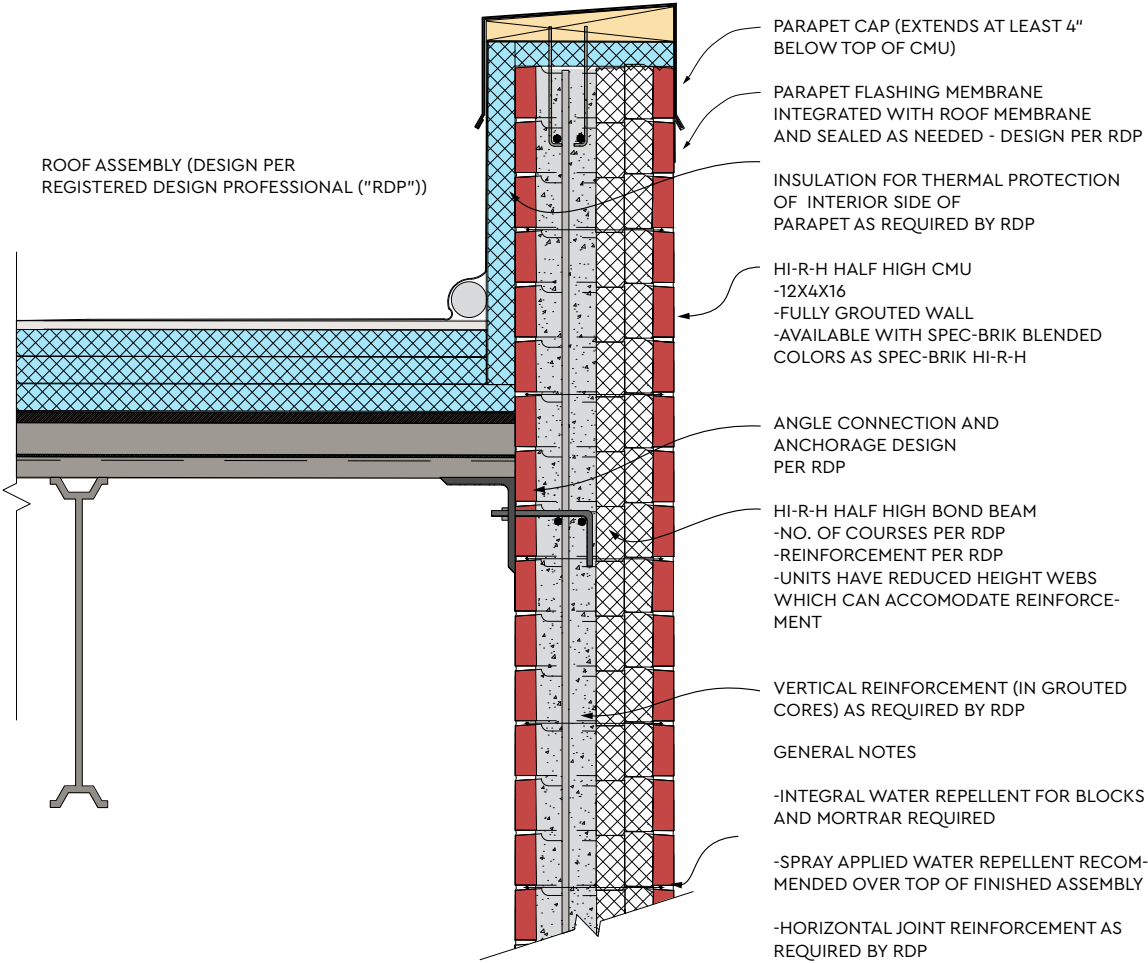
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Figure 61. Roof and Parapet HI-R-H Half High Fully Grouted (Non-Bearing)



Notes:

1. This detail depicts a fully grouted wall. HI-R walls may be built either fully or partially grouted, while the HI-R-H products are fully grouted only. Fully grouting masonry walls is a cost-effective alternative to partially grouted walls. In many areas of the country where seismic design considerations are important, highly reinforced and fully grouted masonry is the preferred solution. Fully grouted walls do not require flashing at bond beam locations, and meet Code air barrier requirements.
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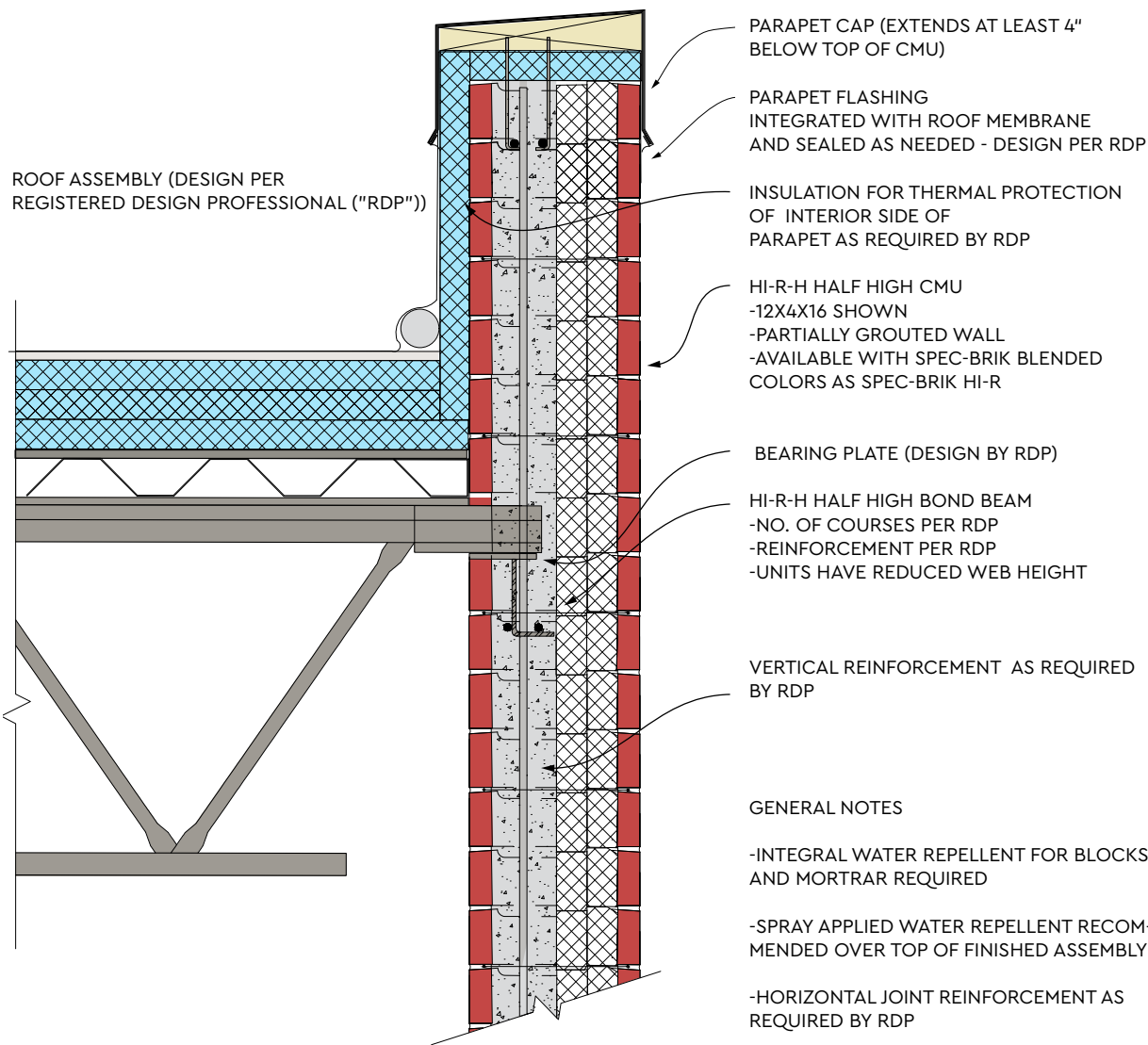
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Figure 62. Roof and Parapet HI-R-H HH Fully Grouted (Bearing)



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Codes and Standards References

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Section III

Codes and Standards References

Table of Contents	
Introduction	1
1.1 Purpose of the Manual	1
1.2 Scope of the Manual	1
1.3 Organization of the Manual	1
1.4 Use of the Manual	1
1.5 Acknowledgments	1
1.6 Disclaimer	1
1.7 Contact Information	1
1.8 Revision History	1
1.9 Approval	1
1.10 Distribution	1
1.11 Copyright	1
1.12 Trademarks	1
1.13 Abbreviations	1
1.14 Symbols	1
1.15 Units	1
1.16 References	1
1.17 Glossary	1
1.18 Index	1
1.19 Appendix A	1
1.20 Appendix B	1
1.21 Appendix C	1
1.22 Appendix D	1
1.23 Appendix E	1
1.24 Appendix F	1
1.25 Appendix G	1
1.26 Appendix H	1
1.27 Appendix I	1
1.28 Appendix J	1
1.29 Appendix K	1
1.30 Appendix L	1
1.31 Appendix M	1
1.32 Appendix N	1
1.33 Appendix O	1
1.34 Appendix P	1
1.35 Appendix Q	1
1.36 Appendix R	1
1.37 Appendix S	1
1.38 Appendix T	1
1.39 Appendix U	1
1.40 Appendix V	1
1.41 Appendix W	1
1.42 Appendix X	1
1.43 Appendix Y	1
1.44 Appendix Z	1
1.45 Appendix AA	1
1.46 Appendix AB	1
1.47 Appendix AC	1
1.48 Appendix AD	1
1.49 Appendix AE	1
1.50 Appendix AF	1
1.51 Appendix AG	1
1.52 Appendix AH	1
1.53 Appendix AI	1
1.54 Appendix AJ	1
1.55 Appendix AK	1
1.56 Appendix AL	1
1.57 Appendix AM	1
1.58 Appendix AN	1
1.59 Appendix AO	1
1.60 Appendix AP	1
1.61 Appendix AQ	1
1.62 Appendix AR	1
1.63 Appendix AS	1
1.64 Appendix AT	1
1.65 Appendix AU	1
1.66 Appendix AV	1
1.67 Appendix AW	1
1.68 Appendix AX	1
1.69 Appendix AY	1
1.70 Appendix AZ	1
1.71 Appendix BA	1
1.72 Appendix BB	1
1.73 Appendix BC	1
1.74 Appendix BD	1
1.75 Appendix BE	1
1.76 Appendix BF	1
1.77 Appendix BG	1
1.78 Appendix BH	1
1.79 Appendix BI	1
1.80 Appendix BJ	1
1.81 Appendix BK	1
1.82 Appendix BL	1
1.83 Appendix BM	1
1.84 Appendix BN	1
1.85 Appendix BO	1
1.86 Appendix BP	1
1.87 Appendix BQ	1
1.88 Appendix BR	1
1.89 Appendix BS	1
1.90 Appendix BT	1
1.91 Appendix BU	1
1.92 Appendix BV	1
1.93 Appendix BW	1
1.94 Appendix BX	1
1.95 Appendix BY	1
1.96 Appendix BZ	1
1.97 Appendix CA	1
1.98 Appendix CB	1
1.99 Appendix CC	1
1.100 Appendix CD	1
1.101 Appendix CE	1
1.102 Appendix CF	1
1.103 Appendix CG	1
1.104 Appendix CH	1
1.105 Appendix CI	1
1.106 Appendix CJ	1
1.107 Appendix CK	1
1.108 Appendix CL	1
1.109 Appendix CM	1
1.110 Appendix CN	1
1.111 Appendix CO	1
1.112 Appendix CP	1
1.113 Appendix CQ	1
1.114 Appendix CR	1
1.115 Appendix CS	1
1.116 Appendix CT	1
1.117 Appendix CU	1
1.118 Appendix CV	1
1.119 Appendix CW	1
1.120 Appendix CX	1
1.121 Appendix CY	1
1.122 Appendix CZ	1
1.123 Appendix DA	1
1.124 Appendix DB	1
1.125 Appendix DC	1
1.126 Appendix DD	1
1.127 Appendix DE	1
1.128 Appendix DF	1
1.129 Appendix DG	1
1.130 Appendix DH	1
1.131 Appendix DI	1
1.132 Appendix DJ	1
1.133 Appendix DK	1
1.134 Appendix DL	1
1.135 Appendix DM	1
1.136 Appendix DN	1
1.137 Appendix DO	1
1.138 Appendix DP	1
1.139 Appendix DQ	1
1.140 Appendix DR	1
1.141 Appendix DS	1
1.142 Appendix DT	1
1.143 Appendix DU	1
1.144 Appendix DV	1
1.145 Appendix DW	1
1.146 Appendix DX	1
1.147 Appendix DY	1
1.148 Appendix DZ	1
1.149 Appendix EA	1
1.150 Appendix EB	1
1.151 Appendix EC	1
1.152 Appendix ED	1
1.153 Appendix EE	1
1.154 Appendix EF	1
1.155 Appendix EG	1
1.156 Appendix EH	1
1.157 Appendix EI	1
1.158 Appendix EJ	1
1.159 Appendix EK	1
1.160 Appendix EL	1
1.161 Appendix EM	1
1.162 Appendix EN	1
1.163 Appendix EO	1
1.164 Appendix EP	1
1.165 Appendix EQ	1
1.166 Appendix ER	1
1.167 Appendix ES	1
1.168 Appendix ET	1
1.169 Appendix EU	1
1.170 Appendix EV	1
1.171 Appendix EW	1
1.172 Appendix EX	1
1.173 Appendix EY	1
1.174 Appendix EZ	1
1.175 Appendix FA	1
1.176 Appendix FB	1
1.177 Appendix FC	1
1.178 Appendix FD	1
1.179 Appendix FE	1
1.180 Appendix FF	1
1.181 Appendix FG	1
1.182 Appendix FH	1
1.183 Appendix FI	1
1.184 Appendix FJ	1
1.185 Appendix FK	1
1.186 Appendix FL	1
1.187 Appendix FM	1
1.188 Appendix FN	1
1.189 Appendix FO	1
1.190 Appendix FP	1
1.191 Appendix FQ	1
1.192 Appendix FR	1
1.193 Appendix FS	1
1.194 Appendix FT	1
1.195 Appendix FU	1
1.196 Appendix FV	1
1.197 Appendix FW	1
1.198 Appendix FX	1
1.199 Appendix FY	1
1.200 Appendix FZ	1
1.201 Appendix GA	1
1.202 Appendix GB	1
1.203 Appendix GC	1
1.204 Appendix GD	1
1.205 Appendix GE	1
1.206 Appendix GF	1
1.207 Appendix GG	1
1.208 Appendix GH	1
1.209 Appendix GI	1
1.210 Appendix GJ	1
1.211 Appendix GK	1
1.212 Appendix GL	1
1.213 Appendix GM	1
1.214 Appendix GN	1
1.215 Appendix GO	1
1.216 Appendix GP	1
1.217 Appendix GQ	1
1.218 Appendix GR	1
1.219 Appendix GS	1
1.220 Appendix GT	1
1.221 Appendix GU	1
1.222 Appendix GV	1
1.223 Appendix GW	1
1.224 Appendix GX	1
1.225 Appendix GY	1
1.226 Appendix GZ	1
1.227 Appendix HA	1
1.228 Appendix HB	1
1.229 Appendix HC	1
1.230 Appendix HD	1
1.231 Appendix HE	1
1.232 Appendix HF	1
1.233 Appendix HG	1
1.234 Appendix HH	1
1.235 Appendix HI	1
1.236 Appendix HJ	1
1.237 Appendix HK	1
1.238 Appendix HL	1
1.239 Appendix HM	1
1.240 Appendix HN	1
1.241 Appendix HO	1
1.242 Appendix HP	1
1.243 Appendix HQ	1
1.244 Appendix HR	1
1.245 Appendix HS	1
1.246 Appendix HT	1
1.247 Appendix HU	1
1.248 Appendix HV	1
1.249 Appendix HW	1
1.250 Appendix HX	1
1.251 Appendix HY	1
1.252 Appendix HZ	1
1.253 Appendix IA	1
1.254 Appendix IB	1
1.255 Appendix IC	1
1.256 Appendix ID	1
1.257 Appendix IE	1
1.258 Appendix IF	1
1.259 Appendix IG	1
1.260 Appendix IH	1
1.261 Appendix II	1
1.262 Appendix IJ	1
1.263 Appendix IK	1
1.264 Appendix IL	1
1.265 Appendix IM	1
1.266 Appendix IN	1
1.267 Appendix IO	1
1.268 Appendix IP	1
1.269 Appendix IQ	1
1.270 Appendix IR	1
1.271 Appendix IS	1
1.272 Appendix IT	1
1.273 Appendix IU	1
1.274 Appendix IV	1
1.275 Appendix IW	1
1.276 Appendix IX	1
1.277 Appendix IY	1
1.278 Appendix IZ	1
1.279 Appendix JA	1
1.280 Appendix JB	1
1.281 Appendix JC	1
1.282 Appendix JD	1
1.283 Appendix JE	1
1.284 Appendix JF	1
1.285 Appendix JG	1
1.286 Appendix JH	1
1.287 Appendix JI	1
1.288 Appendix JJ	1
1.289 Appendix JK	1
1.290 Appendix JL	1
1.291 Appendix JM	1
1.292 Appendix JN	1
1.293 Appendix JO	1
1.294 Appendix JP	1
1.295 Appendix JQ	1
1.296 Appendix JR	1
1.297 Appendix JS	1
1.298 Appendix JT	1
1.299 Appendix JU	1
1.300 Appendix JV	1
1.301 Appendix JW	1
1.302 Appendix JX	1
1.303 Appendix JY	1
1.304 Appendix JZ	1
1.305 Appendix KA	1
1.306 Appendix KB	1
1.307 Appendix KC	1
1.308 Appendix KD	1
1.309 Appendix KE	1
1.310 Appendix KF	1
1.311 Appendix KG	1
1.312 Appendix KH	1
1.313 Appendix KI	1
1.314 Appendix KJ	1
1.315 Appendix KK	1
1.316 Appendix KL	1
1.317 Appendix KM	1
1.318 Appendix KN	1
1.319 Appendix KO	1
1.320 Appendix KP	1
1.321 Appendix KQ	1
1.322 Appendix KR	1
1.323 Appendix KS	1
1.324 Appendix KT	1
1.325 Appendix KU	1
1.326 Appendix KV	1
1.327 Appendix KW	1
1.328 Appendix KX	1
1.329 Appendix KY	1
1.330 Appendix KZ	1
1.331 Appendix LA	1
1.332 Appendix LB	1
1.333 Appendix LC	1
1.334 Appendix LD	1
1.335 Appendix LE	1
1.336 Appendix LF	1
1.337 Appendix LG	1
1.338 Appendix LH	1
1.339 Appendix LI	1
1.340 Appendix LJ	1
1.341 Appendix LK	1
1.342 Appendix LL	1
1.343 Appendix LM	1
1.344 Appendix LN	1
1.345 Appendix LO	1
1.346 Appendix LP	1
1.347 Appendix LQ	1
1.348 Appendix LR	1
1.349 Appendix LS	1
1.350 Appendix LT	1
1.351 Appendix LU	1
1.352 Appendix LV	1
1.353 Appendix LW	1
1.354 Appendix LX	1
1.355 Appendix LY	1
1.356 Appendix LZ	1
1.357 Appendix MA	1
1.358 Appendix MB	1
1.359 Appendix MC	1
1.360 Appendix MD	1
1.361 Appendix ME	1
1.362 Appendix MF	1
1.363 Appendix MG	1
1.364 Appendix MH	1
1.365 Appendix MI	1
1.366 Appendix MJ	1
1.367 Appendix MK	1
1.368 Appendix ML	1
1.369 Appendix MM	1
1.370 Appendix MN	1
1.371 Appendix MO	1
1.372 Appendix MP	1
1.373 Appendix MQ	1
1.374 Appendix MR	1
1.375 Appendix MS	1
1.376 Appendix MT	1
1.377 Appendix MU	1
1.378 Appendix MV	1
1.379 Appendix MW	1
1.380 Appendix MX	1
1.381 Appendix MY	1
1.382 Appendix MZ	1
1.383 Appendix NA	1
1.384 Appendix NB	1
1.385 Appendix NC	1
1.386 Appendix ND	1
1.387 Appendix NE	1
1.388 Appendix NF	1
1.389 Appendix NG	1
1.390 Appendix NH	1
1.391 Appendix NI	1
1.392 Appendix NJ	1
1.393 Appendix NK	1
1.394 Appendix NL	1
1.395 Appendix NM	1
1.396 Appendix NN	1
1.397 Appendix NO	1
1.398 Appendix NP	1
1.399 Appendix NQ	1
1.400 Appendix NR	1
1.401 Appendix NS	1
1.402 Appendix NT	1
1.403 Appendix NU	1
1.404 Appendix NV	1
1.405 Appendix NW	1
1.406 Appendix NX	1
1.407 Appendix NY	1
1.408 Appendix NZ	1
1.409 Appendix OA	1
1.410 Appendix OB	1
1.411 Appendix OC	1
1.412 Appendix OD	1
1.413 Appendix OE	1
1.414 Appendix OF	1
1.415 Appendix OG	1
1.416 Appendix OH	1
1.417 Appendix OI	1
1.418 Appendix OJ	1
1.419 Appendix OK	1
1.420 Appendix OL	1
1.421 Appendix OM	1
1.422 Appendix ON	1
1.423 Appendix OO	1
1.424 Appendix OP	1
1.425 Appendix OQ	1
1.426 Appendix OR	1
1.427 Appendix OS	1
1.428 Appendix OT	1
1.429 Appendix OU	1
1.430 Appendix OV	1
1.431 Appendix OW	1
1.432 Appendix OX	1
1.433 Appendix OY	1
1.434 Appendix OZ	1
1.435 Appendix PA	1
1.436 Appendix PB	1
1.437 Appendix PC	1
1.438 Appendix PD	1
1.439 Appendix PE	1
1.440 Appendix PF	1
1.441 Appendix PG	1
1.442 Appendix PH	1
1.443 Appendix PI	1
1.444 Appendix PJ	1
1.445 Appendix PK	1
1.446 Appendix PL	1
1.447 Appendix PM	1
1.448 Appendix PN	1
1.449 Appendix PO	1
1.450 Appendix PP	1
1.451 Appendix PQ	1
1.452 Appendix PR	1
1.453 Appendix PS	1
1.454 Appendix PT	1
1.455 Appendix PU	1
1.456 Appendix PV	1
1.457 Appendix PW	1
1.458 Appendix PX	1
1.459 Appendix PY	1
1.460 Appendix PZ	1
1.461 Appendix QA	1
1.462 Appendix QB	1
1.463 Appendix QC	1
1.464 Appendix QD	1
1.465 Appendix QE	1
1.466 Appendix QF	1
1.467 Appendix QG	1
1.468 Appendix QH	1
1.469 Appendix QI	1
1.470 Appendix QJ	1
1.471 Appendix QK	1
1.472 Appendix QL	1
1.473 Appendix QM	1
1.474 Appendix QN	1
1.475 Appendix QO	1
1.476 Appendix QP	1
1.477 Appendix QQ	1
1.478 Appendix QR	1
1.479 Appendix QS	1
1.480 Appendix QT	1
1.481 Appendix QU	1
1.482 Appendix QV	1
1.483 Appendix QW	1
1.484 Appendix QX	1
1.485 Appendix QY	1
1.486 Appendix QZ	1
1.487 Appendix RA	1
1.488 Appendix RB	1
1.489 Appendix RC	1
1.490 Appendix RD	1
1.491 Appendix RE	1
1.492 Appendix RF	1
1.493 Appendix RG	1
1.494 Appendix RH	1
1.495 Appendix RI	1
1.496 Appendix RJ	1
1.497 Appendix RK	1
1.498 Appendix RL	1
1.499 Appendix RM	1
1.500 Appendix RN	1
1.501 Appendix RO	1
1.502 Appendix RP	1
1.503 Appendix RQ	1
1.504 Appendix RR	1
1.505 Appendix RS	1
1.506 Appendix RT	1
1.507 Appendix RU	1
1.508 Appendix RV	1
1.509 Appendix RW	1
1.510 Appendix RX	1
1.511 Appendix RY	1
1.512 Appendix RZ	1
1.513 Appendix SA	1
1.514 Appendix SB	1
1.515 Appendix SC	1
1.516 Appendix SD	1
1.517 Appendix SE	1
1.518 Appendix SF	1
1.519 Appendix SG	1
1.520 Appendix SH	1
1.521 Appendix SI	1
1.522 Appendix SJ	1
1.523 Appendix SK	1
1.524 Appendix SL	1
1.525 Appendix SM	1
1.526 Appendix SN	1
1.527 Appendix SO	1
1.528 Appendix SP	1
1.529 Appendix SQ	1
1.530 Appendix SR	1
1.531 Appendix SS	1
1.532 Appendix ST	1
1.533 Appendix SU	1
1.534 Appendix SV	1
1.535 Appendix SW	1
1.536 Appendix SX	1
1.537 Appendix SY	1
1.538 Appendix SZ	1
1.539 Appendix TA	1
1.540 Appendix TB	1
1.541 Appendix TC	1
1.542 Appendix TD	1
1.543 Appendix TE	1
1.544 Appendix TF	1
1.545 Appendix TG	1
1.546 Appendix TH	1
1.547 Appendix TI	1
1.548 Appendix TJ	1
1.549 Appendix TK	1
1.550 Appendix TL	1
1.551 Appendix TM	1
1.552 Appendix TN	1
1.553 Appendix TO	1
1.554 Appendix TP</	

Applicable Code References for Single Wythe Walls

These references are intended to be a guide to the portions of the Model Codes that apply or relate to the construction of Single Wythe Walls. This set of references is only a starting point, and you should be sure to check the underlying Code itself and be sure to check the local Code that the Authority Having Jurisdiction has authorized for the location applicable to your project.

International Building Code ("IBC") (2006 and 2009); INTERNATIONAL CODE COUNCIL, INC., 4051 West Flossmoor Road, Country Club Hills, IL 60478, including but not limited to:

CHAPTER 1 SCOPE AND ADMINISTRATION; 101.3 Intent, 104.11 Alternative materials, design and methods of construction and equipment, **SECTION 105 PERMITS** 105.1 Required, 105.2 Work exempt from permit, **SECTION 107 SUBMITTAL DOCUMENTS** 107.1 General, 107.2.4 Exterior wall envelope, 107.3.4 Design professional in responsible charge, **SECTION 110 INSPECTIONS** 110.1 General, 110.3.1 Footing and foundation inspection, 110.3.2 Concrete slab and under-floor inspection, 110.3.7 Energy efficiency inspections, 110.3.8 Other inspections, 110.3.9 Special inspections, **SECTION 115 STOP WORK ORDER.**

CHAPTER 2 DEFINITIONS (multiple applicable references).

CHAPTER 7 FIRE AND SMOKE PROTECTION FEATURES; SECTION 703 FIRE-RESISTANCE RATINGS AND FIRE TESTS, 703.2 Fire-resistance ratings, 703.2.2 Combustible components, 703.3 Alternative methods for determining fire resistance, **SECTION 704 FIRE-RESISTANCE RATING OF STRUCTURAL MEMBERS,** 704.10 Exterior structural members, 705.4 Materials, 705.5 Fire-resistance ratings, **SECTION 719 THERMAL- AND SOUND-INSULATING MATERIALS,** 719.4 Loose-fill insulation, **SECTION 720 PRESCRIPTIVE FIRE RESISTANCE,** 720.1.2 Unit masonry protection, **SECTION 721 CALCULATED FIRE RESISTANCE,** 721.1 General, **TABLE 720.1(2) RATED FIRE-RESISTANCE PERIODS FOR VARIOUS WALLS AND PARTITIONS,** 721.3 Concrete masonry.

CHAPTER 8 INTERIOR FINISHES; SECTION 801 GENERAL, 801.8 Foam plastics, SECTION 803 WALL AND CEILING FINISHES, 803.4 Foam plastics, SECTION 807 INSULATION. CHAPTER 12 INTERIOR ENVIRONMENT; SECTION 1207 SOUND TRANSMISSION, 1207.2 Air-borne sound, 1207.2.1 Masonry, **SECTION 1210 SURROUNDING MATERIALS,** 1210.2 Walls and partitions, 1210.3 Showers.

CHAPTER 13 ENERGY EFFICIENCY; SECTION 1301 GENERAL, 1301.1.1 Criteria.

CHAPTER 14 EXTERIOR WALLS; SECTION 1403 PERFORMANCE REQUIREMENTS, 1403.2 Weather protection, **SECTION 1404 MATERIALS** 1404.4 Masonry, 1404.7 Glass-unit masonry, **SECTION 1405 INSTALLATION OF WALL COVERINGS,** 1405.2 Weather protection, 1405.3 Vapor retarders, 1405.4 Flashing, 1405.4.1 Exterior wall pockets, 1405.4.2 Masonry, 1405.5 Wood veneers (Comparative Requirements), 1405.6 Anchored masonry veneer (Comparative requirements or possible interior placement), 1405.7 Stone veneer (Comparative Requirements), 1405.8 Slab-type veneer (Comparative Requirements), 1405.9 Terra cotta (Comparative Requirements), 1405.10 Adhered masonry veneer, (Comparative Requirements), 1405.10.1 Interior adhered masonry veneers, 1405.11 Metal veneers (Comparative Requirements), 1405.12 Glass veneer (Comparative Requirements), 1405.13 Exterior windows and doors (Comparative Requirements), 1405.14 Vinyl siding (Comparative Requirements), 1405.15 Cement plaster (Comparative Requirements), 1405.16 Fiber-cement siding (Comparative Requirements), 1405.17 Fastening (More Comparative Requirements), **SECTION 1406 COMBUSTIBLE MATERIALS ON THE EXTERIOR SIDE OF EXTERIOR WALLS** (Comparative requirements), **SECTION 1407 METAL COMPOSITE MATERIALS (MCM)** (Comparative Requirements), **SECTION 1408 EXTERIOR INSULATION AND FINISH SYSTEMS (EIFS);** Comparative requirements).

CHAPTER 15 ROOF ASSEMBLIES AND ROOFTOP STRUCTURES (Includes effects of scuppers, drains, and gutters – or their omissions; plumbing and drainage – including blockage and ice dams – affects lower masonry courses, leakage at interfaces with footing, foundation, and slab, as well as below-grade construction), **SECTION 1503 WEATHER PROTECTION,** 1503.1 General, 1503.2 Flashing, 1503.2.1 Locations, 1503.4 Roof drainage, 1503.4.1 Secondary drainage required, 1503.4.2 Scuppers, 1503.4.3 Gutters.

Table of Contents	
CHAPTER 1 SCOPE AND ADMINISTRATION	1
CHAPTER 2 DEFINITIONS	1
CHAPTER 3 PLUMBING	1
CHAPTER 4 MECHANICAL	1
CHAPTER 5 ELECTRICAL	1
CHAPTER 6 FIRE AND SMOKE PROTECTION	1
CHAPTER 7 FIRE AND SMOKE PROTECTION FEATURES	1
CHAPTER 8 INTERIOR FINISHES	1
CHAPTER 9 INTERIOR ENVIRONMENT	1
CHAPTER 10 ENERGY EFFICIENCY	1
CHAPTER 11 EXTERIOR WALLS	1
CHAPTER 12 EXTERIOR WALLS	1
CHAPTER 13 EXTERIOR WALLS	1
CHAPTER 14 EXTERIOR WALLS	1
CHAPTER 15 EXTERIOR WALLS	1
CHAPTER 16 EXTERIOR WALLS	1
CHAPTER 17 EXTERIOR WALLS	1
CHAPTER 18 EXTERIOR WALLS	1
CHAPTER 19 EXTERIOR WALLS	1
CHAPTER 20 EXTERIOR WALLS	1
CHAPTER 21 EXTERIOR WALLS	1
CHAPTER 22 EXTERIOR WALLS	1
CHAPTER 23 EXTERIOR WALLS	1
CHAPTER 24 EXTERIOR WALLS	1
CHAPTER 25 EXTERIOR WALLS	1
CHAPTER 26 EXTERIOR WALLS	1
CHAPTER 27 EXTERIOR WALLS	1
CHAPTER 28 EXTERIOR WALLS	1
CHAPTER 29 EXTERIOR WALLS	1
CHAPTER 30 EXTERIOR WALLS	1
CHAPTER 31 EXTERIOR WALLS	1
CHAPTER 32 EXTERIOR WALLS	1
CHAPTER 33 EXTERIOR WALLS	1
CHAPTER 34 EXTERIOR WALLS	1
CHAPTER 35 EXTERIOR WALLS	1
CHAPTER 36 EXTERIOR WALLS	1
CHAPTER 37 EXTERIOR WALLS	1
CHAPTER 38 EXTERIOR WALLS	1
CHAPTER 39 EXTERIOR WALLS	1
CHAPTER 40 EXTERIOR WALLS	1
CHAPTER 41 EXTERIOR WALLS	1
CHAPTER 42 EXTERIOR WALLS	1
CHAPTER 43 EXTERIOR WALLS	1
CHAPTER 44 EXTERIOR WALLS	1
CHAPTER 45 EXTERIOR WALLS	1
CHAPTER 46 EXTERIOR WALLS	1
CHAPTER 47 EXTERIOR WALLS	1
CHAPTER 48 EXTERIOR WALLS	1
CHAPTER 49 EXTERIOR WALLS	1
CHAPTER 50 EXTERIOR WALLS	1
CHAPTER 51 EXTERIOR WALLS	1
CHAPTER 52 EXTERIOR WALLS	1
CHAPTER 53 EXTERIOR WALLS	1
CHAPTER 54 EXTERIOR WALLS	1
CHAPTER 55 EXTERIOR WALLS	1
CHAPTER 56 EXTERIOR WALLS	1
CHAPTER 57 EXTERIOR WALLS	1
CHAPTER 58 EXTERIOR WALLS	1
CHAPTER 59 EXTERIOR WALLS	1
CHAPTER 60 EXTERIOR WALLS	1
CHAPTER 61 EXTERIOR WALLS	1
CHAPTER 62 EXTERIOR WALLS	1
CHAPTER 63 EXTERIOR WALLS	1
CHAPTER 64 EXTERIOR WALLS	1
CHAPTER 65 EXTERIOR WALLS	1
CHAPTER 66 EXTERIOR WALLS	1
CHAPTER 67 EXTERIOR WALLS	1
CHAPTER 68 EXTERIOR WALLS	1
CHAPTER 69 EXTERIOR WALLS	1
CHAPTER 70 EXTERIOR WALLS	1
CHAPTER 71 EXTERIOR WALLS	1
CHAPTER 72 EXTERIOR WALLS	1
CHAPTER 73 EXTERIOR WALLS	1
CHAPTER 74 EXTERIOR WALLS	1
CHAPTER 75 EXTERIOR WALLS	1
CHAPTER 76 EXTERIOR WALLS	1
CHAPTER 77 EXTERIOR WALLS	1
CHAPTER 78 EXTERIOR WALLS	1
CHAPTER 79 EXTERIOR WALLS	1
CHAPTER 80 EXTERIOR WALLS	1
CHAPTER 81 EXTERIOR WALLS	1
CHAPTER 82 EXTERIOR WALLS	1
CHAPTER 83 EXTERIOR WALLS	1
CHAPTER 84 EXTERIOR WALLS	1
CHAPTER 85 EXTERIOR WALLS	1
CHAPTER 86 EXTERIOR WALLS	1
CHAPTER 87 EXTERIOR WALLS	1
CHAPTER 88 EXTERIOR WALLS	1
CHAPTER 89 EXTERIOR WALLS	1
CHAPTER 90 EXTERIOR WALLS	1
CHAPTER 91 EXTERIOR WALLS	1
CHAPTER 92 EXTERIOR WALLS	1
CHAPTER 93 EXTERIOR WALLS	1
CHAPTER 94 EXTERIOR WALLS	1
CHAPTER 95 EXTERIOR WALLS	1
CHAPTER 96 EXTERIOR WALLS	1
CHAPTER 97 EXTERIOR WALLS	1
CHAPTER 98 EXTERIOR WALLS	1
CHAPTER 99 EXTERIOR WALLS	1
CHAPTER 100 EXTERIOR WALLS	1
CHAPTER 101 EXTERIOR WALLS	1
CHAPTER 102 EXTERIOR WALLS	1
CHAPTER 103 EXTERIOR WALLS	1
CHAPTER 104 EXTERIOR WALLS	1
CHAPTER 105 EXTERIOR WALLS	1
CHAPTER 106 EXTERIOR WALLS	1
CHAPTER 107 EXTERIOR WALLS	1
CHAPTER 108 EXTERIOR WALLS	1
CHAPTER 109 EXTERIOR WALLS	1
CHAPTER 110 EXTERIOR WALLS	1
CHAPTER 111 EXTERIOR WALLS	1
CHAPTER 112 EXTERIOR WALLS	1
CHAPTER 113 EXTERIOR WALLS	1
CHAPTER 114 EXTERIOR WALLS	1
CHAPTER 115 EXTERIOR WALLS	1
CHAPTER 116 EXTERIOR WALLS	1
CHAPTER 117 EXTERIOR WALLS	1
CHAPTER 118 EXTERIOR WALLS	1
CHAPTER 119 EXTERIOR WALLS	1
CHAPTER 120 EXTERIOR WALLS	1
CHAPTER 121 EXTERIOR WALLS	1
CHAPTER 122 EXTERIOR WALLS	1
CHAPTER 123 EXTERIOR WALLS	1
CHAPTER 124 EXTERIOR WALLS	1
CHAPTER 125 EXTERIOR WALLS	1
CHAPTER 126 EXTERIOR WALLS	1
CHAPTER 127 EXTERIOR WALLS	1
CHAPTER 128 EXTERIOR WALLS	1
CHAPTER 129 EXTERIOR WALLS	1
CHAPTER 130 EXTERIOR WALLS	1
CHAPTER 131 EXTERIOR WALLS	1
CHAPTER 132 EXTERIOR WALLS	1
CHAPTER 133 EXTERIOR WALLS	1
CHAPTER 134 EXTERIOR WALLS	1
CHAPTER 135 EXTERIOR WALLS	1
CHAPTER 136 EXTERIOR WALLS	1
CHAPTER 137 EXTERIOR WALLS	1
CHAPTER 138 EXTERIOR WALLS	1
CHAPTER 139 EXTERIOR WALLS	1
CHAPTER 140 EXTERIOR WALLS	1
CHAPTER 141 EXTERIOR WALLS	1
CHAPTER 142 EXTERIOR WALLS	1
CHAPTER 143 EXTERIOR WALLS	1
CHAPTER 144 EXTERIOR WALLS	1
CHAPTER 145 EXTERIOR WALLS	1
CHAPTER 146 EXTERIOR WALLS	1
CHAPTER 147 EXTERIOR WALLS	1
CHAPTER 148 EXTERIOR WALLS	1
CHAPTER 149 EXTERIOR WALLS	1
CHAPTER 150 EXTERIOR WALLS	1
CHAPTER 151 EXTERIOR WALLS	1
CHAPTER 152 EXTERIOR WALLS	1
CHAPTER 153 EXTERIOR WALLS	1
CHAPTER 154 EXTERIOR WALLS	1
CHAPTER 155 EXTERIOR WALLS	1
CHAPTER 156 EXTERIOR WALLS	1
CHAPTER 157 EXTERIOR WALLS	1
CHAPTER 158 EXTERIOR WALLS	1
CHAPTER 159 EXTERIOR WALLS	1
CHAPTER 160 EXTERIOR WALLS	1
CHAPTER 161 EXTERIOR WALLS	1
CHAPTER 162 EXTERIOR WALLS	1
CHAPTER 163 EXTERIOR WALLS	1
CHAPTER 164 EXTERIOR WALLS	1
CHAPTER 165 EXTERIOR WALLS	1
CHAPTER 166 EXTERIOR WALLS	1
CHAPTER 167 EXTERIOR WALLS	1
CHAPTER 168 EXTERIOR WALLS	1
CHAPTER 169 EXTERIOR WALLS	1
CHAPTER 170 EXTERIOR WALLS	1
CHAPTER 171 EXTERIOR WALLS	1
CHAPTER 172 EXTERIOR WALLS	1
CHAPTER 173 EXTERIOR WALLS	1
CHAPTER 174 EXTERIOR WALLS	1
CHAPTER 175 EXTERIOR WALLS	1
CHAPTER 176 EXTERIOR WALLS	1
CHAPTER 177 EXTERIOR WALLS	1
CHAPTER 178 EXTERIOR WALLS	1
CHAPTER 179 EXTERIOR WALLS	1
CHAPTER 180 EXTERIOR WALLS	1
CHAPTER 181 EXTERIOR WALLS	1
CHAPTER 182 EXTERIOR WALLS	1
CHAPTER 183 EXTERIOR WALLS	1
CHAPTER 184 EXTERIOR WALLS	1
CHAPTER 185 EXTERIOR WALLS	1
CHAPTER 186 EXTERIOR WALLS	1
CHAPTER 187 EXTERIOR WALLS	1
CHAPTER 188 EXTERIOR WALLS	1
CHAPTER 189 EXTERIOR WALLS	1
CHAPTER 190 EXTERIOR WALLS	1
CHAPTER 191 EXTERIOR WALLS	1
CHAPTER 192 EXTERIOR WALLS	1
CHAPTER 193 EXTERIOR WALLS	1
CHAPTER 194 EXTERIOR WALLS	1
CHAPTER 195 EXTERIOR WALLS	1
CHAPTER 196 EXTERIOR WALLS	1
CHAPTER 197 EXTERIOR WALLS	1
CHAPTER 198 EXTERIOR WALLS	1
CHAPTER 199 EXTERIOR WALLS	1
CHAPTER 200 EXTERIOR WALLS	1
CHAPTER 201 EXTERIOR WALLS	1
CHAPTER 202 EXTERIOR WALLS	1
CHAPTER 203 EXTERIOR WALLS	1
CHAPTER 204 EXTERIOR WALLS	1
CHAPTER 205 EXTERIOR WALLS	1
CHAPTER 206 EXTERIOR WALLS	1
CHAPTER 207 EXTERIOR WALLS	1
CHAPTER 208 EXTERIOR WALLS	1
CHAPTER 209 EXTERIOR WALLS	1
CHAPTER 210 EXTERIOR WALLS	1
CHAPTER 211 EXTERIOR WALLS	1
CHAPTER 212 EXTERIOR WALLS	1
CHAPTER 213 EXTERIOR WALLS	1
CHAPTER 214 EXTERIOR WALLS	1
CHAPTER 215 EXTERIOR WALLS	1
CHAPTER 216 EXTERIOR WALLS	1
CHAPTER 217 EXTERIOR WALLS	1
CHAPTER 218 EXTERIOR WALLS	1
CHAPTER 219 EXTERIOR WALLS	1
CHAPTER 220 EXTERIOR WALLS	1
CHAPTER 221 EXTERIOR WALLS	1
CHAPTER 222 EXTERIOR WALLS	1
CHAPTER 223 EXTERIOR WALLS	1
CHAPTER 224 EXTERIOR WALLS	1
CHAPTER 225 EXTERIOR WALLS	1
CHAPTER 226 EXTERIOR WALLS	1
CHAPTER 227 EXTERIOR WALLS	1
CHAPTER 228 EXTERIOR WALLS	1
CHAPTER 229 EXTERIOR WALLS	1
CHAPTER 230 EXTERIOR WALLS	1
CHAPTER 231 EXTERIOR WALLS	1
CHAPTER 232 EXTERIOR WALLS	1
CHAPTER 233 EXTERIOR WALLS	1
CHAPTER 234 EXTERIOR WALLS	1
CHAPTER 235 EXTERIOR WALLS	1
CHAPTER 236 EXTERIOR WALLS	1
CHAPTER 237 EXTERIOR WALLS	1
CHAPTER 238 EXTERIOR WALLS	1
CHAPTER 239 EXTERIOR WALLS	1
CHAPTER 240 EXTERIOR WALLS	1
CHAPTER 241 EXTERIOR WALLS	1
CHAPTER 242 EXTERIOR WALLS	1
CHAPTER 243 EXTERIOR WALLS	1
CHAPTER 244 EXTERIOR WALLS	1
CHAPTER 245 EXTERIOR WALLS	1
CHAPTER 246 EXTERIOR WALLS	1
CHAPTER 247 EXTERIOR WALLS	1
CHAPTER 248 EXTERIOR WALLS	1
CHAPTER 249 EXTERIOR WALLS	1
CHAPTER 250 EXTERIOR WALLS	1
CHAPTER 251 EXTERIOR WALLS	1
CHAPTER 252 EXTERIOR WALLS	1
CHAPTER 253 EXTERIOR WALLS	1
CHAPTER 254 EXTERIOR WALLS	1
CHAPTER 255 EXTERIOR WALLS	1
CHAPTER 256 EXTERIOR WALLS	1
CHAPTER 257 EXTERIOR WALLS	1
CHAPTER 258 EXTERIOR WALLS	1
CHAPTER 259 EXTERIOR WALLS	1
CHAPTER 260 EXTERIOR WALLS	1
CHAPTER 261 EXTERIOR WALLS	1
CHAPTER 262 EXTERIOR WALLS	1
CHAPTER 263 EXTERIOR WALLS	1
CHAPTER 264 EXTERIOR WALLS	1
CHAPTER 265 EXTERIOR WALLS	1
CHAPTER 266 EXTERIOR WALLS	1
CHAPTER 267 EXTERIOR WALLS	1
CHAPTER 268 EXTERIOR WALLS	1
CHAPTER 269 EXTERIOR WALLS	1
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CHAPTER 271 EXTERIOR WALLS	1
CHAPTER 272 EXTERIOR WALLS	1
CHAPTER 273 EXTERIOR WALLS	1
CHAPTER 274 EXTERIOR WALLS	1
CHAPTER 275 EXTERIOR WALLS	1
CHAPTER 276 EXTERIOR WALLS	1
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CHAPTER 278 EXTERIOR WALLS	1
CHAPTER 279 EXTERIOR WALLS	1
CHAPTER 280 EXTERIOR WALLS	1
CHAPTER 281 EXTERIOR WALLS	1
CHAPTER 282 EXTERIOR WALLS	1
CHAPTER 283 EXTERIOR WALLS	1
CHAPTER 284 EXTERIOR WALLS	1
CHAPTER 285 EXTERIOR WALLS	1
CHAPTER 286 EXTERIOR WALLS	1
CHAPTER 287 EXTERIOR WALLS	1
CHAPTER 288 EXTERIOR WALLS	1
CHAPTER 289 EXTERIOR WALLS	1
CHAPTER 290 EXTERIOR WALLS	1
CHAPTER 291 EXTERIOR WALLS	1
CHAPTER 292 EXTERIOR WALLS	1
CHAPTER 293 EXTERIOR WALLS	1
CHAPTER 294 EXTERIOR WALLS	1
CHAPTER 295 EXTERIOR WALLS	1
CHAPTER 296 EXTERIOR WALLS	1
CHAPTER 297 EXTERIOR WALLS	1
CHAPTER 298 EXTERIOR WALLS	1
CHAPTER 299 EXTERIOR WALLS	1
CHAPTER 300 EXTERIOR WALLS	1
CHAPTER 301 EXTERIOR WALLS	1
CHAPTER 302 EXTERIOR WALLS	1
CHAPTER 303 EXTERIOR WALLS	1
CHAPTER 304 EXTERIOR WALLS	1
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CHAPTER 306 EXTERIOR WALLS	1
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CHAPTER 310 EXTERIOR WALLS	1
CHAPTER 311 EXTERIOR WALLS	1
CHAPTER 312 EXTERIOR WALLS	1
CHAPTER 313 EXTERIOR WALLS	1
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CHAPTER 315 EXTERIOR WALLS	1
CHAPTER 316 EXTERIOR WALLS	1
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CHAPTER 320 EXTERIOR WALLS	1
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CHAPTER 331 EXTERIOR WALLS	1
CHAPTER 332 EXTERIOR WALLS	1
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CHAPTER 336 EXTERIOR WALLS	1
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CHAPTER 343 EXTERIOR WALLS	1
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CHAPTER 385 EXTERIOR WALLS	1
CHAPTER 386 EXTERIOR WALLS	1
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CHAPTER 388 EXTERIOR WALLS	1
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CHAPTER 414 EXTERIOR WALLS	1
CHAPTER 415 EXTERIOR WALLS	1
CHAPTER 416 EXTERIOR WALLS	1
CHAPTER 417 EXTERIOR WALLS	1
CHAPTER 418 EXTERIOR WALLS	1
CHAPTER 419 EXTERIOR WALLS	1
CHAPTER 420 EXTERIOR WALLS	1
CHAPTER 421 EXTERIOR WALLS	1
CHAPTER 422 EXTERIOR WALLS	1
CHAPTER 423 EXTERIOR WALLS	1
CHAPTER 424 EXTERIOR WALLS	1
CHAPTER 425 EXTERIOR WALLS	1
CHAPTER 426 EXTERIOR WALLS	1
CHAPTER 427 EXTERIOR WALLS	1

CHAPTER 16 STRUCTURAL DESIGN (In general, an awareness of the many different types of loads, geographic effects, and building categories – each affecting CMU walls requirements, and effect on costs, along with competitive wall requirements and effect on costs), 1603.1.6 Geotechnical information, 1603.1.9 Systems and components requiring special inspections for seismic resistance, 1603.1.7 Flood design data, **SECTION 1604 GENERAL DESIGN REQUIREMENTS**, 1604.2 Strength, 1604.3.4 Masonry, 1604.5 Occupancy category, **TABLE 1604.5 OCCUPANCY CATEGORY OF BUILDINGS AND OTHER STRUCTURES**, 1604.8 Anchorage, 1607.7 Loads on handrails, guards, grab bars, seats and vehicle barrier systems, 1607.7.3 Vehicle barrier systems, 1607.8 Impact loads, 1607.8.1 Elevators, 1607.8.2 Machinery, 1607.11.3 Landscaped roofs, 1607.13 Interior walls and partitions, **SECTION 1608, SNOW LOADS**, **SECTION 1609 WIND LOADS**, 1609.5 Roof systems, 1609.6.4 Design procedure, **SECTION 1610 SOIL LATERAL LOADS**, **SECTION 1611 RAIN LOADS**, **[P] FIGURE 1611.1 100-YEAR, 1-HOUR RAINFALL (INCHES)**, 1611.2 Ponding instability, 1611.3 Controlled drainage, **SECTION 1612 FLOOD LOADS**, **SECTION 1613 EARTHQUAKE LOADS**, **FIGURE 1613.5(1-14) MAXIMUM CONSIDERED EARTHQUAKE GROUND MOTION**.

CHAPTER 17 STRUCTURAL TESTS AND SPECIAL INSPECTIONS, **SECTION 1703 APPROVALS**, 1703.1 Approved agency, 1703.2 Written approval, **SECTION 1704 SPECIAL INSPECTIONS**, 1704.1.1 Statement of special inspections, 1704.3 Steel construction, 1704.4 Concrete construction, 1704.5 Masonry construction, **TABLE 1704.5.1 LEVEL 1 REQUIRED VERIFICATION AND INSPECTION OF MASONRY CONSTRUCTION**, **TABLE 1704.5.3 LEVEL 2 REQUIRED VERIFICATION AND INSPECTION OF MASONRY CONSTRUCTION**, 1704.5.1 Empirically designed masonry, glass unit masonry and masonry veneer in Occupancy Category IV, 1704.5.2 Engineered masonry in Occupancy Category I, II or III, 1704.5.3 Engineered masonry in Occupancy Category IV, 1704.6 Wood construction, 1704.7 Soils, 1704.8 Driven deep foundations, 1704.9 Cast-in-place deep foundations, 1704.10 Helical pile foundations, 1704.11 Vertical masonry foundation elements, 1704.12 Sprayed fire-resistant materials, 1704.13 Mastic and intumescent fire-resistant coatings, 1704.14 Exterior insulation and finish systems (EIFS), 1704.16 Special inspection for smoke control, **SECTION 1705 STATEMENT OF SPECIAL INSPECTIONS**,

CHAPTER 18 SOILS AND FOUNDATIONS; SECTION 1801 GENERAL; 1801.1 Scope, **SECTION 1803 GEOTECHNICAL INVESTIGATIONS**, 1803.1 General, 1803.3 Basis of investigation, 1803.5 Investigated conditions, 1803.5.1 Classification, 1803.5.2 Questionable soil, 1803.5.3 Expansive soil, 1803.5.4 Ground-water table, Exception, 1803.5.5 Deep foundations, 1803.5.6 Rock strata, 1803.5.8 Compacted fill material, 1803.5.9 Controlled low-strength material (CLSM), 1803.5.10 Alternate setback and clearance, 1803.5.11 Seismic Design Categories C through F, 1803.5.12 Seismic Design Categories D through F, 1803.6 Reporting, **SECTION 1804 EXCAVATION, GRADING AND FILL**, **SECTION 1805 DAMPPROOFING AND WATERPROOFING**, 1805.1 General, 1805.1.1 Story above grade plane, 1805.1.3 Ground-water control, 1805.2 Dampproofing, 1805.2.1 Floors, 1805.2.2 Walls, 1805.2.2.1 Surface preparation of walls, 1805.3 Waterproofing, 1805.3.1 Floors, 1805.3.2 Walls, 1805.3.2.1 Surface preparation of walls, 1805.3.3 Joints and penetrations, 1805.4 Subsoil drainage system, 1805.4.1 Floor base course, Exception, 1805.4.2 Foundation drain, 1805.4.3 Drainage discharge, **SECTION 1807 FOUNDATION WALLS, RETAINING WALLS AND EMBEDDED POSTS AND POLES**, 1807.1.5 Concrete and masonry foundation walls, Exception, 1807.1.6 Prescriptive design of concrete and masonry foundation walls, 1807.1.6.1 Foundation wall thickness, 1807.1.6.2.1 Seismic requirements, 1807.1.6.3 Masonry foundation walls, 1807.1.6.3.1 Alternative foundation wall reinforcement, 1807.1.6.3.2 Seismic requirements, 1807.2 Retaining walls, 1807.2.1 General, 1807.3 Embedded posts and poles (masonry bracing) 1808.5 Shifting or moving soils, 1808.6 Design for expansive soils, 1808.7 Foundations on or adjacent to slopes, 1808.9 Vertical masonry foundation elements, **SECTION 1809 SHALLOW FOUNDATIONS**, 1809.7 Prescriptive footings for light-frame construction (masonry unit footings) 1809.9 Masonry-unit footings, 1809.10 Pier and curtain wall foundations (includes masonry piers and foundations).

CHAPTER 19 CONCRETE; SECTION 1904 DURABILITY REQUIREMENTS, 1904.1 Water-cementitious materials ratio, 1904.2 Exposure categories and classes (sulfates, etc.), 1904.3 Concrete properties, **TABLE 1904.3 MINIMUM SPECIFIED COMPRESSIVE STRENGTH (f'c)** (relates to exposure, sulfates, etc.) 1904.4 Freezing and thawing exposures, 1904.5 Alternative cementitious materials for sulfate exposure.

CHAPTER 21 MASONRY

CHAPTER 22 STEEL; 2206.2 Design (anchorage; masonry in-fill needs be anchored one way or another).

CHAPTER 23 WOOD; 2304.10.2 Floor framing (on masonry), 2304.10.4 Floor decks (and masonry), 2304.11.2.3 Exterior walls

CHAPTER 16 STRUCTURAL DESIGN	1603.1.6 Geotechnical information	1603.1.9 Systems and components requiring special inspections for seismic resistance	1603.1.7 Flood design data	SECTION 1604 GENERAL DESIGN REQUIREMENTS	1604.2 Strength	1604.3.4 Masonry	1604.5 Occupancy category	TABLE 1604.5 OCCUPANCY CATEGORY OF BUILDINGS AND OTHER STRUCTURES	1604.8 Anchorage	1607.7 Loads on handrails, guards, grab bars, seats and vehicle barrier systems	1607.7.3 Vehicle barrier systems	1607.8 Impact loads	1607.8.1 Elevators	1607.8.2 Machinery	1607.11.3 Landscaped roofs	1607.13 Interior walls and partitions	SECTION 1608, SNOW LOADS	SECTION 1609 WIND LOADS	1609.5 Roof systems	1609.6.4 Design procedure	SECTION 1610 SOIL LATERAL LOADS	SECTION 1611 RAIN LOADS	[P] FIGURE 1611.1 100-YEAR, 1-HOUR RAINFALL (INCHES)	1611.2 Ponding instability	1611.3 Controlled drainage	SECTION 1612 FLOOD LOADS	SECTION 1613 EARTHQUAKE LOADS	FIGURE 1613.5(1-14) MAXIMUM CONSIDERED EARTHQUAKE GROUND MOTION
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below grade (and masonry), 2304.11.2.5 Girder ends (and masonry walls), 2304.11.2.7 Posts or columns (and masonry), 2304.12 Long-term loading (and masonry), TABLE 2306.6 (a. masonry bracing limit), TABLE 2306.7 (a. masonry shear load), 2308.3.3 Sill anchorage (masonry foundation)

CHAPTER 25 GYPSUM BOARD AND PLASTER; SECTION 2503 INSPECTION (for these purposes, as interior finish or comparative requirements), **SECTION 2504 VERTICAL AND HORIZONTAL ASSEMBLIES; SECTION 2505 SHEAR WALL CONSTRUCTION** (comparative requirements), **SECTION 2506 GYPSUM BOARD MATERIALS** (as interior finish or comparative requirements), **SECTION 2507 LATHING AND PLASTERING** (as interior finish), **SECTION 2508 GYPSUM CONSTRUCTION** (as interior finish or comparative requirements), 2508.2 Limitations, 2508.2.1 Weather protection, **SECTION 2509 GYPSUM BOARD IN SHOWERS AND WATER CLOSETS** (as interior finish or comparative requirements), **SECTION 2510 LATHING AND FURRING FOR CEMENT PLASTER (STUCCO)** (as interior finish or comparative requirements), **SECTION 2511 INTERIOR PLASTER** (as interior finish or comparative requirements),

CHAPTER 26 PLASTIC; SECTION 2601 GENERAL; 2601.1 Scope (for these purposes, primarily as Energy Conservation; insulation. Also as comparative requirements.), **SECTION 2603 FOAM PLASTIC INSULATION,** 2603.4 Thermal barrier, 2603.4.1 Thermal barrier not required, 2603.4.1.1 Masonry or concrete construction, 2603.4.1.11 Interior trim, 2603.4.1.12 Interior signs, 2603.5 Exterior walls of buildings of any height (comparative requirements), 2603.5.3 Potential heat, 2603.5.6 Label required, 2603.5.7 Ignition, Exception (as relating to masonry covering), 2603.7 Plenums (vertical wall application), 2603.8 Protection against termites (comparative requirements and separation distances), Exceptions (as masonry applicable), **SECTION 2604 INTERIOR FINISH AND TRIM, SECTION 2613 REFLECTIVE PLASTIC CORE INSULATION.**

CHAPTER 28 MECHANICAL SYSTEMS; SECTION 2801 GENERAL; 2801.1 Scope.

CHAPTER 29 PLUMBING SYSTEMS; SECTION 2901 GENERAL, [P] 2901.1 Scope.

CHAPTER 30 ELEVATORS AND CONVEYING SYSTEMS; SECTION 3002 HOISTWAY ENCLOSURES, 3002.1 Hoistway enclosure protection (as fire-resistance requirements). **SECTION 3006 MACHINE ROOMS,** 3006.4 Machine rooms and machinery spaces (as fire-resistance requirements), **SECTION 3007 FIRE SERVICE ACCESS ELEVATOR,** 3007.2 Hoistway enclosures protection (as fire-resistance requirements), **SECTION 3008 OCCUPANT EVACUATION ELEVATORS,** 3008.9 Hoistway enclosure protection, (as fire-resistance requirements),

CHAPTER 31 SPECIAL CONSTRUCTION; SECTION 3104 PEDESTRIAN WALKWAYS AND TUNNELS; 3104.3 Construction, (as fire-resistance requirements), 3104.5 Fire barriers between pedestrian walkways and Buildings, 3104.10 Tunneled walkway (as fire resistance requirements), **SECTION 3106 MARQUEES,** 3106.5 Construction (as fire and deterioration resistance requirements), **SECTION 3109 SWIMMING POOL ENCLOSURES AND SAFETY DEVICES,** 3109.3 Public swimming pools (as fencing requirements), 3109.4 Residential swimming pools (as barrier requirements),

CHAPTER 32 ENCROACHMENTS INTO THE PUBLIC RIGHT-OF-WAY; SECTION 3201 GENERAL, 3201.4 Drainage (as affects implied project ground-level construction and drainage), 3202.2 Encroachments above grade and below 8 feet in height (as restrictions and allowances),

CHAPTER 33 SAFEGUARDS DURING CONSTRUCTION; SECTION 3301 GENERAL, 3301.1 Scope, **SECTION 3303 DEMOLITION,** **3303.5** Water accumulation (applies both ways), **SECTION 3307 PROTECTION OF ADJOINING PROPERTY** (applies both ways).

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Table of Contents	
1.0 General Provisions	1.01 Scope and Administration
2.0 Building Official	2.01 Authority
3.0 Referenced Standards	3.01 Standards
4.0 Definitions	4.01 General Definitions
5.0 Building Classification	5.01 Building Classification
6.0 Occupancy Classification	6.01 Occupancy Classification
7.0 Building Height and Area	7.01 Building Height and Area
8.0 Fire Protection	8.01 Fire Protection
9.0 Life Safety	9.01 Life Safety
10.0 Structural Requirements	10.01 Structural Requirements
11.0 Mechanical	11.01 Mechanical
12.0 Electrical	12.01 Electrical
13.0 Plumbing	13.01 Plumbing
14.0 Fuel Gas	14.01 Fuel Gas
15.0 Energy Conservation	15.01 Energy Conservation
16.0 Accessibility	16.01 Accessibility
17.0 Other Provisions	17.01 Other Provisions

CHAPTER 1 ADMINISTRATION, 101.3 Intent,

CHAPTER 2 DEFINITIONS,

CHAPTER 3 CLIMATE ZONES,

CHAPTER 5 COMMERCIAL ENERGY EFFICIENCY, SECTION 502 BUILDING ENVELOPE REQUIREMENTS, TABLE 502.1.2 BUILDING ENVELOPE REQUIREMENTS OPAQUE ELEMENT, MAXIMUM U-FACTORS, TABLE 502.2(1) BUILDING ENVELOPE REQUIREMENTS – OPAQUE ASSEMBLIES (Minimum R-Values), 502.2.4 Below-grade walls, 502.2.6 Slabs on grade, 502.4 Air leakage (Mandatory), 502.4.3 Sealing of the building envelope, **SECTION 506 TOTAL BUILDING PERFORMANCE**, 506.2 Mandatory requirements, 506.3 Performance-based compliance, 506.4 Documentation, 506.5 Calculation procedure, 506.6 Calculation software tools, 506.6.1 Specific approval

American Society of Heating and Refrigeration Engineers Standard 90.1 ("ASHRAE 90.1", or "90.1"; especially 2004 and 2007 editions) (including Normative Appendices as well as Informative Appendices), American Society of Heating and Refrigeration Engineers Inc., 1791 Tullie Circle NE, Atlanta, GA 30329.

3.0 DEFINITIONS, ABBREVIATIONS, AND ACRONYMS, 3.2 Definitions,

4.0 ADMINISTRATION AND ENFORCEMENT, 4.1.7 Normative Appendices, 4.2.1 Compliance Paths,

5.0 GENERAL 5.1.4 Climate, 5.2 Compliance Paths, 5.2.1 a. 5.5 Prescriptive Building Envelope Option, 5.2.1 b. 5.6 Building Envelope Trade-Off Option, 5.2.2 (as relates to Energy Cost Budget), 5.4 Mandatory Provisions, 5.4.1 Insulation, 5.4.3 Air Leakage, 5.4.3.1 Building Envelope Sealing, 5.5 Prescriptive Building Envelope Option, Building Envelope Requirements for Climate Zones Tables 5.5-1 through 8, 5.5.3.2 Above-Grade Wall Insulation, 5.5.3.3 Below-Grade Wall Insulation, 5.5.3.4 Floor Insulation, 5.5.3.5 Slab-on-Grade Insulation, 5.6 Building Envelope Trade-Off Option.

NORMATIVE APPENDIX A RATED R-VALUE OF INSULATION AND ASSEMBLY U-FACTOR, C-FACTOR, AND F-FACTOR DETERMINATION, A.1 GENERAL, A.3 ABOVE-GRADE WALLS, A.4 BELOW-GRADE WALLS, A.5 FLOORS, A.6 SLAB-ON-GRADE FLOORS, A.9 DETERMINATION OF ALTERNATE ASSEMBLY U-FACTORS, C-FACTORS, OR HEAT CAPACITIES,

NORMATIVE APPENDIX B-BUILDING ENVELOPE CLIMATE CRITERIA,

NORMATIVE APPENDIX C METHODOLOGY FOR BUILDING ENVELOPE TRADE-OFF OPTION IN SUBSECTION 5.6.

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CHAPTER 3 GENERAL REGULATIONS, SECTION 304 INSTALLATION, 304.10 Clearances from grade (possible affect on masonry wall base course placement), 306.5 Equipment and appliances on roofs or elevated structures (affects wall loads), **SECTION 307 CONDENSATE DISPOSAL**(moisture source on, in, or adjacent to building).

Table of Contents	
CHAPTER 1 ADMINISTRATION	101.3 Intent
CHAPTER 2 DEFINITIONS	
CHAPTER 3 CLIMATE ZONES	
CHAPTER 5 COMMERCIAL ENERGY EFFICIENCY	
SECTION 502 BUILDING ENVELOPE REQUIREMENTS	
TABLE 502.1.2 BUILDING ENVELOPE REQUIREMENTS OPAQUE ELEMENT, MAXIMUM U-FACTORS	
TABLE 502.2(1) BUILDING ENVELOPE REQUIREMENTS – OPAQUE ASSEMBLIES	
502.2.4 Below-grade walls	
502.2.6 Slabs on grade	
502.4 Air leakage (Mandatory)	
502.4.3 Sealing of the building envelope	
SECTION 506 TOTAL BUILDING PERFORMANCE	
506.2 Mandatory requirements	
506.3 Performance-based compliance	
506.4 Documentation	
506.5 Calculation procedure	
506.6 Calculation software tools	
506.6.1 Specific approval	

CHAPTER 4 VENTILATION SECTION 402 NATURAL VENTILATION, [B] 402.2 Ventilation area required, [B] 402.4 Openings below grade (affects wall penetrations, drainage, moisture resistance, dampproofing, etc), 403.4 Exhaust ventilation (affects net Energy Conservation, wall penetrations and weather protection, additional supply air and related penetrations, etc.),

CHAPTER 5 EXHAUST SYSTEMS, 501.2.2 Exhaust opening protection (affects net Energy Conservation, wall penetrations and weather protection, additional supply air and related penetrations, etc).

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CHAPTER 2 DEFINITIONS, SECTION 202, GENERAL DEFINITIONS (ACCESS (TO), WASTE),

CHAPTER 3 GENERAL REGULATIONS, SECTION 314; CONDENSATE DISPOSAL; [M] 314.2.1 Condensate disposal (additional potential source of moisture or waste at walls, base courses, footings, slabs, soil, etc.),

CHAPTER 4 FIXTURES, FAUCETS AND FIXTURE FITTINGS, SECTION 417 SHOWERS; 417.4 Shower compartments; 417.4.1 Wall area,

CHAPTER 6 WATER SUPPLY AND DISTRIBUTION, SECTION 605 MATERIALS, JOINTS AND CONNECTIONS; 605.1 Soil and ground water (emphasizing problem soil identification, remediation),

CHAPTER 9 VENTS, SECTION 904 VENT TERMINALS; 904.6 Extension through the wall (wall penetration),

CHAPTER 11 STORM DRAINAGE, SECTION 1102 STORM DRAINAGE, 1101.2 Where required, 1101.7 Roof design (note design assumptions), **SECTION 1106 SIZE OF CONDUCTORS, LEADERS AND STORM DRAINS**, 1106.1 General (Similar design basis as IBC ?), 1106.5 Parapet wall scupper location (wall penetration), 1106.6 Size of roof gutters (collected rain water to drain potentially at footing, foundation, base course area), **SECTION 1107 SECONDARY (EMERGENCY) ROOF DRAINS**, 1107.1 Secondary drainage required, 1107.2 Separate systems required (overflow to footing, foundation, base course area).

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Table of Contents	
CHAPTER 1 GENERAL REGULATIONS	1
CHAPTER 2 DEFINITIONS	2
CHAPTER 3 GENERAL REGULATIONS	3
CHAPTER 4 FIXTURES, FAUCETS AND FIXTURE FITTINGS	4
CHAPTER 5 EXHAUST SYSTEMS	5
CHAPTER 6 WATER SUPPLY AND DISTRIBUTION	6
CHAPTER 7 PLUMBING	7
CHAPTER 8 VENTS	8
CHAPTER 9 VENTS	9
CHAPTER 10 VENTS	10
CHAPTER 11 STORM DRAINAGE	11
CHAPTER 12 STORM DRAINAGE	12
CHAPTER 13 STORM DRAINAGE	13
CHAPTER 14 STORM DRAINAGE	14
CHAPTER 15 STORM DRAINAGE	15
CHAPTER 16 STORM DRAINAGE	16
CHAPTER 17 STORM DRAINAGE	17
CHAPTER 18 STORM DRAINAGE	18
CHAPTER 19 STORM DRAINAGE	19
CHAPTER 20 STORM DRAINAGE	20
CHAPTER 21 STORM DRAINAGE	21
CHAPTER 22 STORM DRAINAGE	22
CHAPTER 23 STORM DRAINAGE	23
CHAPTER 24 STORM DRAINAGE	24
CHAPTER 25 STORM DRAINAGE	25
CHAPTER 26 STORM DRAINAGE	26
CHAPTER 27 STORM DRAINAGE	27
CHAPTER 28 STORM DRAINAGE	28
CHAPTER 29 STORM DRAINAGE	29
CHAPTER 30 STORM DRAINAGE	30
CHAPTER 31 STORM DRAINAGE	31
CHAPTER 32 STORM DRAINAGE	32
CHAPTER 33 STORM DRAINAGE	33
CHAPTER 34 STORM DRAINAGE	34
CHAPTER 35 STORM DRAINAGE	35
CHAPTER 36 STORM DRAINAGE	36
CHAPTER 37 STORM DRAINAGE	37
CHAPTER 38 STORM DRAINAGE	38
CHAPTER 39 STORM DRAINAGE	39
CHAPTER 40 STORM DRAINAGE	40
CHAPTER 41 STORM DRAINAGE	41
CHAPTER 42 STORM DRAINAGE	42
CHAPTER 43 STORM DRAINAGE	43
CHAPTER 44 STORM DRAINAGE	44
CHAPTER 45 STORM DRAINAGE	45
CHAPTER 46 STORM DRAINAGE	46
CHAPTER 47 STORM DRAINAGE	47
CHAPTER 48 STORM DRAINAGE	48
CHAPTER 49 STORM DRAINAGE	49
CHAPTER 50 STORM DRAINAGE	50
CHAPTER 51 STORM DRAINAGE	51
CHAPTER 52 STORM DRAINAGE	52
CHAPTER 53 STORM DRAINAGE	53
CHAPTER 54 STORM DRAINAGE	54
CHAPTER 55 STORM DRAINAGE	55
CHAPTER 56 STORM DRAINAGE	56
CHAPTER 57 STORM DRAINAGE	57
CHAPTER 58 STORM DRAINAGE	58
CHAPTER 59 STORM DRAINAGE	59
CHAPTER 60 STORM DRAINAGE	60
CHAPTER 61 STORM DRAINAGE	61
CHAPTER 62 STORM DRAINAGE	62
CHAPTER 63 STORM DRAINAGE	63
CHAPTER 64 STORM DRAINAGE	64
CHAPTER 65 STORM DRAINAGE	65
CHAPTER 66 STORM DRAINAGE	66
CHAPTER 67 STORM DRAINAGE	67
CHAPTER 68 STORM DRAINAGE	68
CHAPTER 69 STORM DRAINAGE	69
CHAPTER 70 STORM DRAINAGE	70
CHAPTER 71 STORM DRAINAGE	71
CHAPTER 72 STORM DRAINAGE	72
CHAPTER 73 STORM DRAINAGE	73
CHAPTER 74 STORM DRAINAGE	74
CHAPTER 75 STORM DRAINAGE	75
CHAPTER 76 STORM DRAINAGE	76
CHAPTER 77 STORM DRAINAGE	77
CHAPTER 78 STORM DRAINAGE	78
CHAPTER 79 STORM DRAINAGE	79
CHAPTER 80 STORM DRAINAGE	80
CHAPTER 81 STORM DRAINAGE	81
CHAPTER 82 STORM DRAINAGE	82
CHAPTER 83 STORM DRAINAGE	83
CHAPTER 84 STORM DRAINAGE	84
CHAPTER 85 STORM DRAINAGE	85
CHAPTER 86 STORM DRAINAGE	86
CHAPTER 87 STORM DRAINAGE	87
CHAPTER 88 STORM DRAINAGE	88
CHAPTER 89 STORM DRAINAGE	89
CHAPTER 90 STORM DRAINAGE	90
CHAPTER 91 STORM DRAINAGE	91
CHAPTER 92 STORM DRAINAGE	92
CHAPTER 93 STORM DRAINAGE	93
CHAPTER 94 STORM DRAINAGE	94
CHAPTER 95 STORM DRAINAGE	95
CHAPTER 96 STORM DRAINAGE	96
CHAPTER 97 STORM DRAINAGE	97
CHAPTER 98 STORM DRAINAGE	98
CHAPTER 99 STORM DRAINAGE	99
CHAPTER 100 STORM DRAINAGE	100

ASTM C 90 Standard Specification for Loadbearing Concrete Masonry Units,

ASTM C 140 Standard Test Methods for Sampling and Testing Concrete Masonry Units and Related Units.

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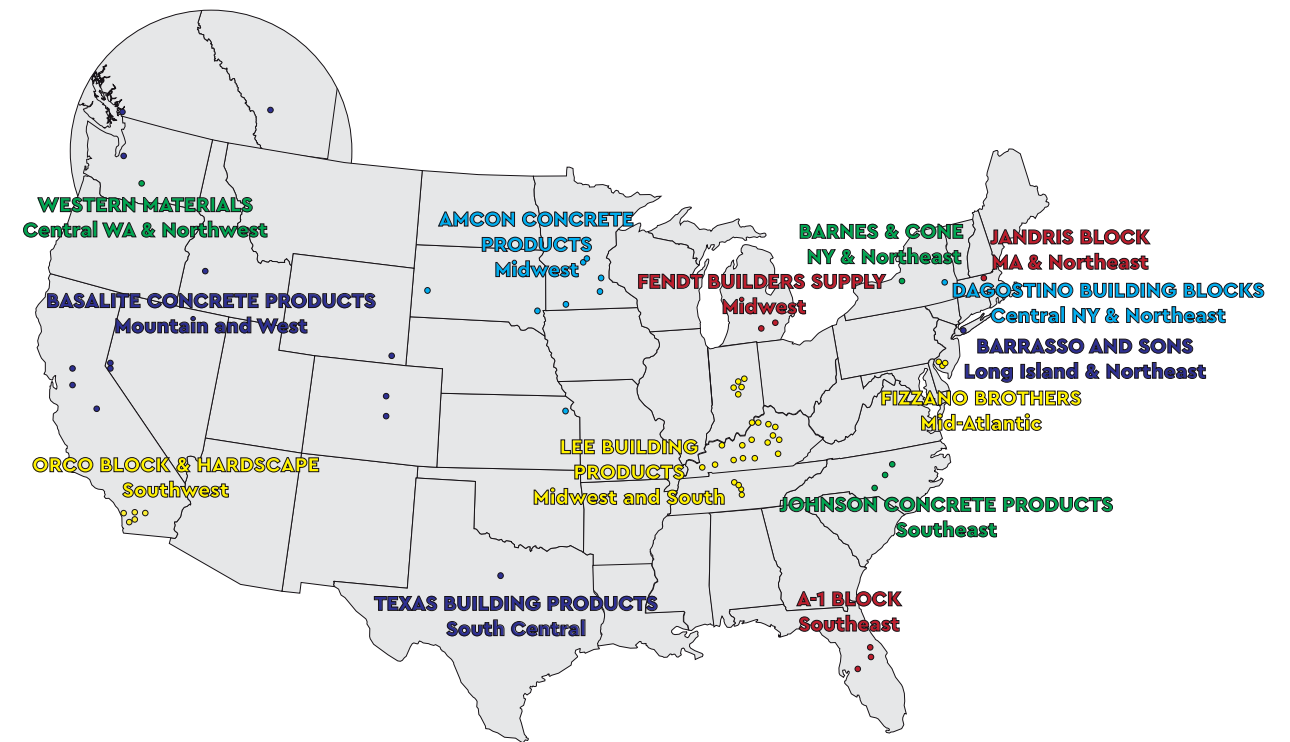
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Table of Contents

Introduction	1
1. General Information	2
2. Product Description	3
3. Installation	4
4. Maintenance	5
5. Safety	6
6. Environmental	7
7. Performance	8
8. Warranty	9
9. Index	10
10. Glossary	11
11. Appendix A	12
12. Appendix B	13
13. Appendix C	14
14. Appendix D	15
15. Appendix E	16
16. Appendix F	17
17. Appendix G	18
18. Appendix H	19
19. Appendix I	20
20. Appendix J	21
21. Appendix K	22
22. Appendix L	23
23. Appendix M	24
24. Appendix N	25
25. Appendix O	26
26. Appendix P	27
27. Appendix Q	28
28. Appendix R	29
29. Appendix S	30
30. Appendix T	31
31. Appendix U	32
32. Appendix V	33
33. Appendix W	34
34. Appendix X	35
35. Appendix Y	36
36. Appendix Z	37
37. Appendix AA	38
38. Appendix AB	39
39. Appendix AC	40
40. Appendix AD	41
41. Appendix AE	42
42. Appendix AF	43
43. Appendix AG	44
44. Appendix AH	45
45. Appendix AI	46
46. Appendix AJ	47
47. Appendix AK	48
48. Appendix AL	49
49. Appendix AM	50
50. Appendix AN	51
51. Appendix AO	52
52. Appendix AP	53
53. Appendix AQ	54
54. Appendix AR	55
55. Appendix AS	56
56. Appendix AT	57
57. Appendix AU	58
58. Appendix AV	59
59. Appendix AW	60
60. Appendix AX	61
61. Appendix AY	62
62. Appendix AZ	63
63. Appendix BA	64
64. Appendix BB	65
65. Appendix BC	66
66. Appendix BD	67
67. Appendix BE	68
68. Appendix BF	69
69. Appendix BG	70
70. Appendix BH	71
71. Appendix BI	72
72. Appendix BJ	73
73. Appendix BK	74
74. Appendix BL	75
75. Appendix BM	76
76. Appendix BN	77
77. Appendix BO	78
78. Appendix BP	79
79. Appendix BQ	80
80. Appendix BR	81
81. Appendix BS	82
82. Appendix BT	83
83. Appendix BU	84
84. Appendix BV	85
85. Appendix BW	86
86. Appendix BX	87
87. Appendix BY	88
88. Appendix BZ	89
89. Appendix CA	90
90. Appendix CB	91
91. Appendix CC	92
92. Appendix CD	93
93. Appendix CE	94
94. Appendix CF	95
95. Appendix CG	96
96. Appendix CH	97
97. Appendix CI	98
98. Appendix CJ	99
99. Appendix CK	100
100. Appendix CL	101
101. Appendix CM	102
102. Appendix CN	103
103. Appendix CO	104
104. Appendix CP	105
105. Appendix CQ	106
106. Appendix CR	107
107. Appendix CS	108
108. Appendix CT	109
109. Appendix CU	110
110. Appendix CV	111
111. Appendix CW	112
112. Appendix CX	113
113. Appendix CY	114
114. Appendix CZ	115
115. Appendix DA	116
116. Appendix DB	117
117. Appendix DC	118
118. Appendix DD	119
119. Appendix DE	120
120. Appendix DF	121
121. Appendix DG	122
122. Appendix DH	123
123. Appendix DI	124
124. Appendix DJ	125
125. Appendix DK	126
126. Appendix DL	127
127. Appendix DM	128
128. Appendix DN	129
129. Appendix DO	130
130. Appendix DP	131
131. Appendix DQ	132
132. Appendix DR	133
133. Appendix DS	134
134. Appendix DT	135
135. Appendix DU	136
136. Appendix DV	137
137. Appendix DW	138
138. Appendix DX	139
139. Appendix DY	140
140. Appendix DZ	141
141. Appendix EA	142
142. Appendix EB	143
143. Appendix EC	144
144. Appendix ED	145
145. Appendix EE	146
146. Appendix EF	147
147. Appendix EG	148
148. Appendix EH	149
149. Appendix EI	150
150. Appendix EJ	151
151. Appendix EK	152
152. Appendix EL	153
153. Appendix EM	154
154. Appendix EN	155
155. Appendix EO	156
156. Appendix EP	157
157. Appendix EQ	158
158. Appendix ER	159
159. Appendix ES	160
160. Appendix ET	161
161. Appendix EU	162
162. Appendix EV	163
163. Appendix EW	164
164. Appendix EX	165
165. Appendix EY	166
166. Appendix EZ	167
167. Appendix FA	168
168. Appendix FB	169
169. Appendix FC	170
170. Appendix FD	171
171. Appendix FE	172
172. Appendix FF	173
173. Appendix FG	174
174. Appendix FH	175
175. Appendix FI	176
176. Appendix FJ	177
177. Appendix FK	178
178. Appendix FL	179
179. Appendix FM	180
180. Appendix FN	181
181. Appendix FO	182
182. Appendix FP	183
183. Appendix FQ	184
184. Appendix FR	185
185. Appendix FS	186
186. Appendix FT	187
187. Appendix FU	188
188. Appendix FV	189
189. Appendix FW	190
190. Appendix FX	191
191. Appendix FY	192
192. Appendix FZ	193
193. Appendix GA	194
194. Appendix GB	195
195. Appendix GC	196
196. Appendix GD	197
197. Appendix GE	198
198. Appendix GF	199
199. Appendix GG	200
200. Appendix GH	201
201. Appendix GI	202
202. Appendix GJ	203
203. Appendix GK	204
204. Appendix GL	205
205. Appendix GM	206
206. Appendix GN	207
207. Appendix GO	208
208. Appendix GP	209
209. Appendix GQ	210
210. Appendix GR	211
211. Appendix GS	212
212. Appendix GT	213
213. Appendix GU	214
214. Appendix GV	215
215. Appendix GW	216
216. Appendix GX	217
217. Appendix GY	218
218. Appendix GZ	219
219. Appendix HA	220
220. Appendix HB	221
221. Appendix HC	222
222. Appendix HD	223
223. Appendix HE	224
224. Appendix HF	225
225. Appendix HG	226
226. Appendix HH	227
227. Appendix HI	228
228. Appendix HJ	229
229. Appendix HK	230
230. Appendix HL	231
231. Appendix HM	232
232. Appendix HN	233
233. Appendix HO	234
234. Appendix HP	235
235. Appendix HQ	236
236. Appendix HR	237
237. Appendix HS	238
238. Appendix HT	239
239. Appendix HU	240
240. Appendix HV	241
241. Appendix HW	242
242. Appendix HX	243
243. Appendix HY	244
244. Appendix HZ	245
245. Appendix IA	246
246. Appendix IB	247
247. Appendix IC	248
248. Appendix ID	249
249. Appendix IE	250
250. Appendix IF	251
251. Appendix IG	252
252. Appendix IH	253
253. Appendix II	254
254. Appendix IJ	255
255. Appendix IK	256
256. Appendix IL	257
257. Appendix IM	258
258. Appendix IN	259
259. Appendix IO	260
260. Appendix IP	261
261. Appendix IQ	262
262. Appendix IR	263
263. Appendix IS	264
264. Appendix IT	265
265. Appendix IU	266
266. Appendix IV	267
267. Appendix IW	268
268. Appendix IX	269
269. Appendix IY	270
270. Appendix IZ	271
271. Appendix JA	272
272. Appendix JB	273
273. Appendix JC	274
274. Appendix JD	275
275. Appendix JE	276
276. Appendix JF	277
277. Appendix JG	278
278. Appendix JH	279
279. Appendix JI	280
280. Appendix JJ	281
281. Appendix JK	282
282. Appendix JL	283
283. Appendix JM	284
284. Appendix JN	285
285. Appendix JO	286
286. Appendix JP	287
287. Appendix JQ	288
288. Appendix JR	289
289. Appendix JS	290
290. Appendix JT	291
291. Appendix JU	292
292. Appendix JV	293
293. Appendix JW	294
294. Appendix JX	295
295. Appendix JY	296
296. Appendix JZ	297
297. Appendix KA	298
298. Appendix KB	299
299. Appendix KC	300
300. Appendix KD	301
301. Appendix KE	302
302. Appendix KF	303
303. Appendix KG	304
304. Appendix KH	305
305. Appendix KI	306
306. Appendix KJ	307
307. Appendix KK	308
308. Appendix KL	309
309. Appendix KM	310
310. Appendix KN	311
311. Appendix KO	312
312. Appendix KP	313
313. Appendix KQ	314
314. Appendix KR	315
315. Appendix KS	316
316. Appendix KT	317
317. Appendix KU	318
318. Appendix KV	319
319. Appendix KW	320
320. Appendix KX	321
321. Appendix KY	322
322. Appendix KZ	323
323. Appendix LA	324
324. Appendix LB	325
325. Appendix LC	326
326. Appendix LD	327
327. Appendix LE	328
328. Appendix LF	329
329. Appendix LG	330
330. Appendix LH	331
331. Appendix LI	332
332. Appendix LJ	333
333. Appendix LK	334
334. Appendix LL	335
335. Appendix LM	336
336. Appendix LN	337
337. Appendix LO	338
338. Appendix LP	339
339. Appendix LQ	340
340. Appendix LR	341
341. Appendix LS	342
342. Appendix LT	343
343. Appendix LU	344
344. Appendix LV	345
345. Appendix LW	346
346. Appendix LX	347
347. Appendix LY	348
348. Appendix LZ	349
349. Appendix MA	350
350. Appendix MB	351
351. Appendix MC	352
352. Appendix MD	353
353. Appendix ME	354
354. Appendix MF	355
355. Appendix MG	356
356. Appendix MH	357
357. Appendix MI	358
358. Appendix MJ	359
359. Appendix MK	360
360. Appendix ML	361
361. Appendix MM	362
362. Appendix MN	363
363. Appendix MO	364
364. Appendix MP	365
365. Appendix MQ	366
366. Appendix MR	367
367. Appendix MS	368
368. Appendix MT	369
369. Appendix MU	370
370. Appendix MV	371
371. Appendix MW	372
372. Appendix MX	373
373. Appendix MY	374
374. Appendix MZ	375
375. Appendix NA	376
376. Appendix NB	377
377. Appendix NC	378
378. Appendix ND	379
379. Appendix NE	380
380. Appendix NF	381
381. Appendix NG	382
382. Appendix NH	383
383. Appendix NI	384
384. Appendix NJ	385
385. Appendix NK	386
386. Appendix NL	387
387. Appendix NM	388
388. Appendix NN	389
389. Appendix NO	390
390. Appendix NP	391
391. Appendix NQ	392
392. Appendix NR	393
393. Appendix NS	394
394. Appendix NT	395
395. Appendix NU	396
396. Appendix NV	397
397. Appendix NW	398
398. Appendix NX	399
399. Appendix NY	400
400. Appendix NZ	401
401. Appendix OA	402
402. Appendix OB	403
403. Appendix OC	404
404. Appendix OD	405
405. Appendix OE	406
406. Appendix OF	407
407. Appendix OG	408
408. Appendix OH	409
409. Appendix OI	410
410. Appendix OJ	411
411. Appendix OK	412
412. Appendix OL	413
413. Appendix OM	414
414. Appendix ON	415
415. Appendix OO	416
416. Appendix OP	417
417. Appendix OQ	418
418. Appendix OR	419
419. Appendix OS	420
420. Appendix OT	421
421. Appendix OU	422
422. Appendix OV	423
423. Appendix OW	424
424. Appendix OX	425
425. Appendix OY	426
426. Appendix OZ	427
427. Appendix PA	428
428. Appendix PB	429
429. Appendix PC	430
430. Appendix PD	431
431. Appendix PE	432
432. Appendix PF	433
433. Appendix PG	434
434. Appendix PH	435
435. Appendix PI	436
436. Appendix PJ	437
437. Appendix PK	438
438. Appendix PL	439
439. Appendix PM	440
440. Appendix PN	441
441. Appendix PO	442
442. Appendix PP	443
443. Appendix PQ	444
444. Appendix PR	445
445. Appendix PS	446
446. Appendix PT	447
447. Appendix PU	448
448. Appendix PV	449
449. Appendix PW	450
450. Appendix PX	451
451. Appendix PY	452
452. Appendix PZ	453
453. Appendix QA	454
454. Appendix QB	455
455. Appendix QC	456
456. Appendix QD	457
457. Appendix QE	458
458. Appendix QF	459
459. Appendix QG	460
460. Appendix QH	461
461. Appendix QI	462
462. Appendix QJ	463
463. Appendix QK	464
464. Appendix QL	465
465. Appendix QM	466
466. Appendix QN	467
467. Appendix QO	468
468. Appendix QP	469
469. Appendix QQ	470
470. Appendix QR	471
471. Appendix QS	472
472. Appendix QT	473
473. Appendix QU	474
474. Appendix QV	475
475. Appendix QW	476
476. Appendix QX	477
477. Appendix QY	478
478. Appendix QZ	479
479. Appendix RA	480
480. Appendix RB	481
481. Appendix RC	482
482. Appendix RD	483
483. Appendix RE	484
484. Appendix RF	485
485. Appendix RG	486
486. Appendix RH	487
487. Appendix RI	488
488. Appendix RJ	489
489. Appendix RK	490
490. Appendix RL	491
491. Appendix RM	492
492. Appendix RN	493
493. Appendix RO	494
494. Appendix RP	495
495. Appendix RQ	496
496. Appendix RR	497
497. Appendix RS	498
498. Appendix RT	499
499. Appendix RU	500
500. Appendix RV	501
501. Appendix RW	502
502. Appendix RX	503
503. Appendix RY	504
504. Appendix RZ	505
505. Appendix SA	506
506. Appendix SB	507
507. Appendix SC	508
508. Appendix SD	509
509. Appendix SE	510
510. Appendix SF	511
511. Appendix SG	512
512. Appendix SH	513
513. Appendix SI	514
514. Appendix SJ	515
515. Appendix SK	516
516. Appendix SL	517
517. Appendix SM	518
518. Appendix SN	519
519. Appendix SO	520
520. Appendix SP	521
521. Appendix SQ	522
522. Appendix SR	523
523. Appendix SS	524
524. Appendix ST	525
525. Appendix SU	526
526. Appendix SV	527
527. Appendix SW	528
528. Appendix SX	529
529. Appendix SY	530
530. Appendix SZ	531
531. Appendix TA	532
532. Appendix TB	533
533. Appendix TC	534
534. Appendix TD	535
535. Appendix TE	536
536. Appendix TF	537
537. Appendix TG	538
538. Appendix TH	539
539. Appendix TI	540
540. Appendix TJ	541
541. Appendix TK	542
542. Appendix TL	543
543. Appendix TM	544
544. Appendix TN	545

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