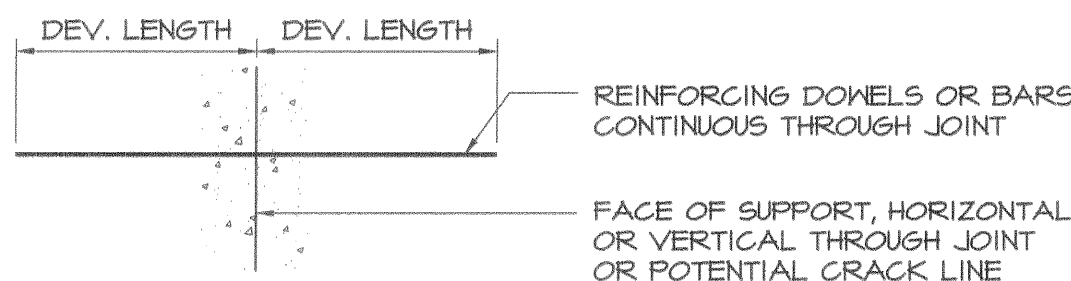


STRAIGHT REINFORCEMENT DEVELOPMENT AND SPLICE LENGTH SCHEDULE

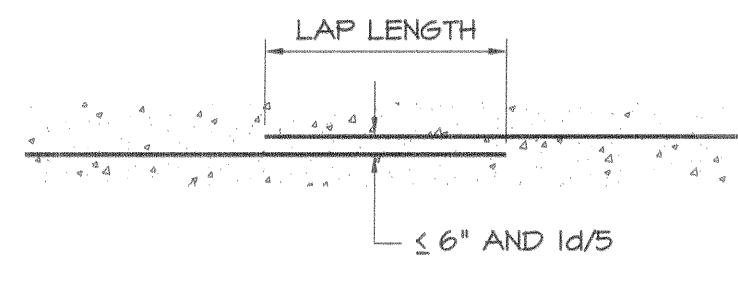
BAR SIZE	DEVELOPMENT LENGTH, (ld)						LAP SPLICE LENGTH				
	TENSION DEVELOPMENT LENGTH			COMPRESSIVE DEVELOPMENT LENGTH			TENSION LAP LENGTH		COMPRESSIVE LAP LENGTH		
	TOP BARS		OTHER BARS	ALL BARS			TOP BARS	OTHER BARS	ALL BARS		
	3000	4000	3000	4000	3000	4000	3000	4000	3000	4000	ALL BARS
#3	21"	18"	16"	14"	8"	8"	28"	24"	21"	18"	12"
#4	28"	25"	22"	19"	11"	10"	37"	32"	28"	25"	15"
#5	36"	31"	27"	24"	14"	12"	46"	40"	36"	31"	19"
#6	43"	37"	33"	28"	16"	14"	56"	48"	43"	37"	23"
#7	62"	54"	48"	42"	19"	17"	81"	70"	62"	54"	26"
#8	71"	62"	55"	47"	22"	19"	93"	80"	71"	62"	30"
#9	80"	69"	62"	53"	25"	21"	104"	90"	80"	69"	34"
#10	88"	77"	68"	59"	27"	24"	116"	100"	89"	77"	38"
#11	98"	85"	75"	65"	30"	26"	127"	110"	98"	85"	42"

SEE NOTES FOR LIGHT WEIGHT CONCRETE EPOXY-COATING, COVER, SPACING AND BUNDLE BAR FACTORS



DEVELOPMENT

REFER TO "HOOKED REINFORCEMENT TENSION DEVELOPMENT LENGTH SCHEDULE" WHEN THE STRAIGHT DEV. LENGTH IN TENSION CANNOT BE ACCOMMODATED IN THE CONCRETE.



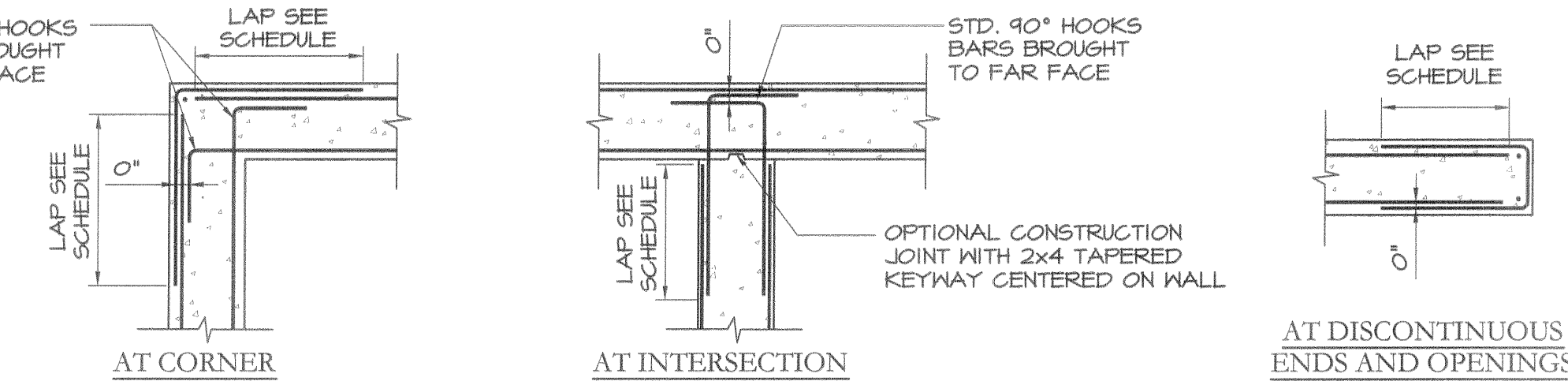
LAP SPLICES

LAP SPLICES IN ADJACENT BARS SHALL BE STAGGERED A MINIMUM OF 24 INCHES. WELDED OR MECHANICAL SPLICES IN ADJACENT BARS SHALL BE STAGGERED A MINIMUM OF 30 INCHES.

NOTES:

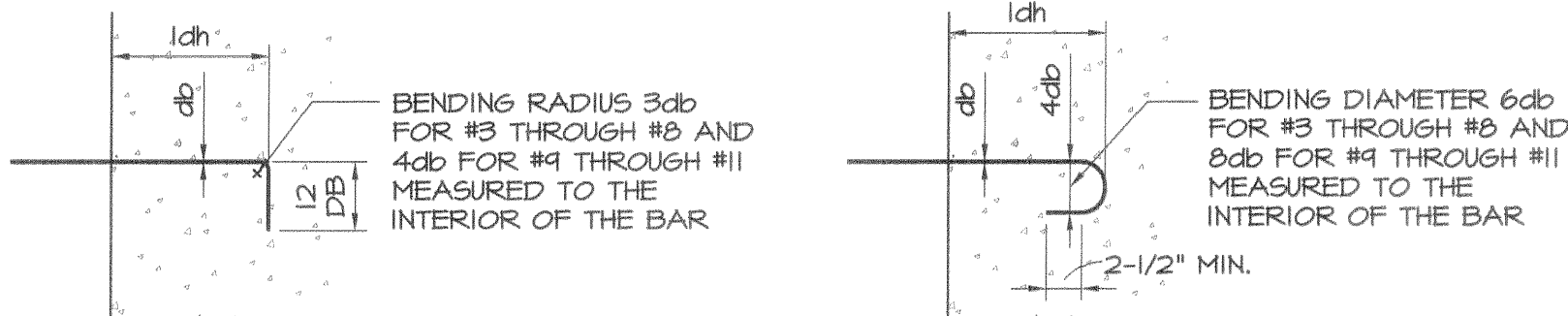
- ALWAYS USE TENSION DEVELOPMENT LENGTH AND TENSION LAP SPLICE LENGTH VALUES, EXCEPT WHEN THE PLANS OR DETAILS NOTE SPECIFICALLY COMPRESS LENGTHS.
- TABULATED DEVELOPMENT AND LAP SPLICE LENGTHS ARE BASED ON REINFORCING YIELD STRENGTH  $F_y = 60$  KSI, NORMAL WEIGHT CONCRETE AND CLASS B LAPS.
- TOP BARS ARE DEFINED AS HORIZONTAL BARS WITH MORE THAN 12 INCHES OF FRESH CONCRETE CAST IN THE MEMBER BELOW THE DEVELOPMENT LENGTH OR SPLICE.
- WHEN DIFFERENT BAR DIAMETERS ARE SPLICED, USE LARGER BAR LAP SPLICE LENGTH.
- ALL TABULATED VALUES ARE MINIMUM LENGTHS. IN CASE OF CONFLICT WITH THE PLANS, SECTIONS OR DETAILS, USE THE LONGER LENGTH.
- FOR TENSION DEVELOPMENT AND TENSION LAP SPLICE LENGTHS, THE LIGHTWEIGHT CONCRETE FACTOR IS 1.30, THE EPOXY-COATED BAR FACTOR FOR TENSION DEVELOPMENT AND TENSION LAP SPLICE LENGTHS IS 1.2. THIS FACTOR INCREASES TO 1.5 WHEN THE COVER OF THE BARS IS LESS THAN  $3d_b$  OR THE CLEAR SPACING IS LESS THAN  $6d_b$ . TABULATED VALUES FOR DEVELOPMENT AND LAP LENGTHS IN TENSION SHALL BE FACTORED BY 1.5 WHEN THE CLEAR COVER IS LESS THAN  $d_b$  AND THE CLEAR SPACING IS LESS THAN  $d_b$  (AND THERE ARE STIRRUPS OR TIES ALONG  $l_d$  OR 15 LESS THAN  $2d_b$  (AND THERE ARE NO STIRRUPS OR TIES ALONG  $l_d$ ), TABULATED DEVELOPMENT AND LAP LENGTHS IN TENSION AND COMPRESSION FOR BUNDLED BARS SHALL BE FACTORED BY 1.2 FOR 3 BAR BUNDLES AND 1.33 FOR 4 BAR BUNDLES.
- WELDED AND/OR MECHANICAL SPLICES MAY BE USED AT THE GENERAL CONTRACTORS' OPTION PROVIDED THAT THE SPLICE IS CAPABLE OF DEVELOPING AT LEAST 125 PERCENT OF THE YIELD STRENGTH OF THE LARGER BAR IN TENSION. THE GENERAL CONTRACTOR SHALL USE WELDED AND/OR MECHANICAL SPLICES WHERE LAP SPLICES WOULD CREATE BAR CONGESTION THAT WOULD INTERFERE WITH THE PLACING AND FINISHING OF THE CONCRETE. SPLICES IN "TENSION-TIE" MEMBERS SHALL BE FULL WELDED OR FULL MECHANICAL SPLICES. WHERE WELDED AND/OR MECHANICAL SPLICES ARE TO BE USED, THE GENERAL CONTRACTOR SHALL SUBMIT FILL DATA ON THE PROPOSED MATERIALS, PROCEDURES AND INSTALLATION INSTRUCTIONS TO THE ENGINEER FOR REVIEW AS A SHOP DRAWING SUBMISSION.
- ALL STRAIGHT BAR DEVELOPMENTS AND SPLICES SHALL BE IN ACCORDANCE WITH THE LATEST EDITION OF ACI 318. ALL WELDED SPLICES SHALL BE IN ACCORDANCE WITH THE LATEST EDITION OF AWS D1.4.
- $d_b$  = BAR DIAMETER.

CORNER REINFORCEMENT DETAILS



HOOKED REINFORCEMENT TENSION DEVELOPMENT LENGTH SCHEDULE

BAR SIZE	TENSION DEVELOPMENT LENGTH, (ldh)	
	$f'c = 3$ KSI	$f'c = 4$ KSI
#3	9"	8"
#4	11"	10"
#5	14"	12"
#6	17"	15"
#7	20"	17"
#8	22"	19"
#9	25"	22"
#10	28"	24"
#11	31"	27"



NOTES:

- TABULATED DEVELOPMENT LENGTHS ARE BASED ON REINFORCING YIELD STRENGTH  $F_y = 60$  KSI AND NORMAL WEIGHT CONCRETE.
- ALL TABULATED VALUES ARE MINIMUM LENGTHS. IN CASE OF CONFLICT WITH THE PLANS, SECTIONS OR DETAILS, USE THE LONGER LENGTH.
- ADJUST TABULATED LENGTHS BY THE FOLLOWING FACTORS WHERE APPLICABLE. NOTE THAT THE FACTORS ARE CUMULATIVE.
  - REINFORCING BAR YIELD STRENGTH OTHER THAN 60 KSI:  $f_y/60,000$
  - LIGHT WEIGHT CONCRETE: 1.30
  - EPOXY-COATED REINFORCEMENT: 1.20
- $d_b$  = BAR DIAMETER

Structural General Notes & Design Criteria

GENERAL NOTES:

FOUNDATIONS:

- See section 2400 of the Project Specification titled Piles for H pile and pipe pile specifications.
- Concrete pile caps shall bear on H piles or concrete filled pipe piles as defined in the geotechnical report by S.W. Cole Engineering of Gray, ME dated 2/1/06. See the geotechnical report referenced above for additional information pertaining to the said piles.
- All exterior pile caps and grade beams are to be placed, with the bottom of the concrete at a minimum of 4'-6" below finish grade. Such elevations on drawings are to be used as a guide. Finish grade elevations, as indicated in the civil documents by DeLuca-Hoffman Associates, Inc of South Portland, ME, dated 2/13/06, must be verified by the contractor.
- Prior to foundation construction, the project geotechnical engineer must certify that filling, ground preparation and other work as documented in their report, has been performed under their supervision and complies with their requirements.
- Backfill material, whether imported or used from the site, must be a well graded granular fill approved by the geotechnical engineer. Said material shall be compacted as determined by the geotechnical engineer.
- Concrete for pile caps and slabs shall be placed in dry excavations. The contractor must utilize dewatering procedures as required to conform to this requirement.
- Concrete for pile caps and slabs shall not be placed on frozen ground. During cold weather, the contractor must utilize procedures in accordance with ACI 306R.
- During hot weather, the contractor must utilize hot weather concrete procedures in accordance with ACI 305R.
- All foundation walls and grade beams shall be formed. Forms for concrete walls or grade beams shall not be stripped within 36 hours of the placement.
- Backfilling of concrete walls below grade or grade beams shall not be performed until the first floor framing and basement slab have been completed.
- Backfilling of concrete foundation walls or grade beams shall be performed evenly on both sides, to avoid an unbalanced loading on the concrete. The contractor shall use bracing procedures as required for the walls or beams in the event that such unbalanced loading conditions cannot be avoided. Bracing must remain in place until permanent support is provided.
- Notify architect a minimum of 24 hours in advance of concrete placement for review of reinforcement placed (where applicable) by the structural engineer or special inspector and a review of the sub-grade as required by the geotechnical engineer.

CONCRETE:

- All concrete and steel reinforcement shall be fabricated, installed and placed in compliance with the "Building Code Requirements for Structural Concrete and Commentary (ACI 318-02)" and the "Specifications for Structural Concrete for Buildings (ACI 301-99)".
- Exterior concrete shall be 6% air entrained (+/- 1%).
- Calcium chloride or admixtures containing calcium chloride shall not be used in any concrete mix.
- Slab control joints shall be saw-cut in accordance with the drawings (where applicable) 12 hours maximum after placement. Spacing of control joints shall be the closest of the following:
  - As given on the drawings
  - Maximum spacing of 3x the slab thickness (slab thickness in inches and spacing in feet)
- Concrete shall be cured in accordance with the A.C.I. specifications. Curing method shall be approved by the engineer. See the project specifications for additional information.
- Maximum slump of concrete shall be 4" for slabs and 5" for remaining work. These slumps may be modified in a submitted concrete mix design, if approved by the structural engineer.
- Concrete slab thickness: concrete slab thickness shown on plan shall be a minimum. Allowances must be made for additional concrete required in composite construction from the deflection of steel beams.
- All concrete shall attain a 28 day compressive strength of 4000 psi, unless otherwise noted below or on the drawings:
  - Spread footings, pile caps and foundation walls not exposed to weather: 4000 psi
  - Concrete exposed to weather: 4000 psi with 6% air entrainment
  - Interior concrete slabs on grade or metal deck: 3000 psi
  - Reinforced structural basement slab: 4000 psi
  - Concrete beams, concrete grade beams and concrete columns: 4000 psi

REINFORCING STEEL:

- Reinforcing steel bars shall be ASTM A615-Grade 60 (yield stress minimum = 60,000 psi) and shall be fabricated, and installed in compliance with the "Building Code Requirements for Structural Concrete and Commentary (ACI 318-02)" and the "Details and Detailing of Concrete Reinforcement (ACI 315-99)".
- Welded wire reinforcement (WWR) shall be ASTM A183, provided in flat sheet stock. WWR shall be installed at the proper height and secured in place to prevent movement at concrete placement. Maintain a 6" minimum lap at all splices and wire together.
- Reinforcing shop drawings must indicate all required accessories, including but not limited to, chairs and bolsters, to secure reinforcing bars and WWR in place.
- The following clear cover requirements must be adhered to (these shall be actual dimensions):
  - Concrete cast against and permanently exposed to earth = 3 inches
  - Formed surfaces exposed to earth or weather:
    - No. 6 through No. 18 bars = 2"
    - No. 5 bars and smaller = 1-1/2"
  - Concrete not exposed to earth or weather:
    - Slabs and walls = 3/4"
    - Beams and columns (primary reinforcement, ties, stirrups and spirals) = 1-1/2"
- All bars horizontal bars in walls, footings, grade beams, slabs, etc... shall be continuous (unless otherwise noted) and shall be lapped in accordance with the requirements given in this section.
- Reinforcing bars designated as continuous shall be lapped as follows:
  - Class B tension lap splice
  - Top bars to be lapped at mid-span
  - Bottom bars to be lapped over support
- Reinforcement shall be continuous through all construction joints and shall be discontinuous, as indicated on the drawings, through all control joints.
- Submit a complete set of shop drawings for the rebar, including but not limited to, a plan and/or elevation drawing indicating the extent of the required pieces, the materials' list indicating all bar details, and the chairs/bolsters required to secure the rebar in place during the concrete placement. Shop drawings are to be produced by the manufacturer. Copies of structural drawings for use as shop drawings will not be accepted.

STRUCTURAL STEEL:

- All structural steel shall be detailed, fabricated and erected in accordance with the latest A.I.S.C. specifications.
- Structural steel grades shall be as follows:
  - Wide Flange Shapes: ASTM A992 (minimum  $F_y = 50$  ksi)
  - Channels, angles, plates, and bars: ASTM A36 (minimum  $F_y = 36$  ksi)
  - Tubular shapes: ASTM A500 Grade B (minimum  $F_y = 46$  ksi)
  - Pipe Columns: ASTM A53 Type E (minimum  $F_y = 36$  ksi)
- Shop and field connections shall be as follows:
  - Welds: Welded connections shall be made using E70xx electrodes by a certified welder. Welding equipment and procedures shall comply with the A.I.S.C. and A.W.S. specifications. Provide/remove backing bars and/or spacers as required for satisfactory welding in conformance with the local building code.
  - Bolts: 7/8" diameter A-325 high strength bolts shall be used in all bolted connections (unless otherwise noted).
  - For non-composite steel beam construction, connections must be designed to develop the end reaction of the beam. This reaction is equivalent to the product of 1/2 of the connected beam span (ft) and the value given for the uniform load carrying capacity based on full lateral support, as given in part 2 of the "ASD Manual of Steel Construction" 9th edition. For composite steel beam constructed this reaction value shall be the minimum of the following:
    - Reaction given on structural drawings
    - Reaction calculated for non-composite construction x 1.25
  - Moment connections shall be designed for the moments as given on plan. These values shall be adhered to as a minimum. However, the connection design must be no more than 20% of the moment design value given. In the absence of moment design values on the drawings, the moment connection must be designed to support the full plastic moment of the connected beam.
  - The structural steel fabricator must employ the services of a structural engineer licensed in the state in which this project is located to certify the structural steel connection design.
  - All framed beam connections shall be detailed with double web angle connections to their supports.
- All interior exposed structural steel shall be shop primed with a rust-inhibitive standard gray primer. The structural steel erector is responsible for touching up scratches, weld burners or other deficient areas resulting from the steel erection.
- All structural steel exposed to the weather must be hot-dipped galvanized.
- Punch holes must be provided in structural and miscellaneous steel where required on the architectural or structural drawings for wood nailer attachment.
- Coordinate spray fire proofing for structural steel and metal decking with architectural drawings and specifications.

COMPOSITE METAL FLOOR DECK:

- Composite metal floor deck shall be lock-floor galvanized deck, ASTM A1008 or ASTM A653 with a minimum yield stress of 33 ksi (unless otherwise noted), conforming to requirements of the Steel Deck Institute (SDI) and the height and thickness on the drawings.
- All decking shall be continuous over a minimum of (3) spans (unless otherwise noted on the drawings) and bear a minimum of 2" on supports.
- Metal floor deck shall be erected in accordance with the approved erection layout, the latest edition of the "SDI manual of Construction with Steel Deck" and the minimum fastening requirements as follows (unless more stringent requirements are given on the drawings):
  - Arc puddle welds, 5/8" in diameter, @ 12" o/c max on intermediate supports, longitudinal edges, panel ends and end laps.
  - Arc puddle welds, 5/8" in diameter, @ 24" o/c max at side laps.
- Metal deck manufacturer to provide all necessary accessories, including but not limited to, pour stops and closure pieces as required for a complete installation.
- Composite metal floor deck installation contractor shall coordinate all sizes and locations of floor penetrations with architectural and mechanical drawings.
- Submit a complete set of shop drawings for review. Shop drawings are to be produced by the manufacturer. Copies of structural drawings for use as shop drawings will not be accepted.

METAL ROOF DECK:

- Metal roof deck shall be type B galvanized deck, ASTM A653 Grade 33, 40, 50 or 80 with a minimum yield stress of 33 ksi (unless otherwise noted), conforming to requirements of the Steel Deck Institute (SDI) and the height and thickness on the drawings.
- All decking shall be continuous over a minimum of (3) spans (unless otherwise noted on the drawings) and bear a minimum of 2" on supports.
- Metal roof deck shall be erected in accordance with the approved erection layout, the latest edition of the "SDI manual of Construction with Steel Deck" and the minimum fastening requirements as follows (unless more stringent requirements are given on the drawings):
  - Arc puddle welds, 5/8" in diameter or #10 screws, @ 12" o/c max on intermediate supports, longitudinal edges, panel ends and end laps.
  - #10 side lap screws @ 24" o/c max.
- Metal deck manufacturer to provide all necessary accessories, including but not limited to, pour stops and closure pieces as required for a complete installation.
- Metal roof deck installation contractor shall coordinate all sizes and locations of roof penetrations with architectural and mechanical drawings.
- Submit a complete set of shop drawings for review. Shop drawings are to be produced by the manufacturer. Copies of structural drawings for use as shop drawings will not be accepted.

MASONRY:

- All masonry work shall comply with the following:
  - "Building Code Requirements for Masonry Structures & Specifications for Masonry Structures & Commentaries (ACI 530/530.1-02)"
  - Latest edition of the "Specification for the design and construction of load-bearing concrete masonry" by the National Concrete Masonry Association (NCMA)
- Materials shall be as follows:
  - Concrete masonry units (CMU) shall be two celled, end or jamb block, normal weight load bearing units conforming to ASTM C90-03, Grade N, Type I, with  $F'm = 1500$  psi. Minimum required compressive strength of the unit = 3000 psi.
  - GROUT shall be fine or coarse, conforming to ASTM C476-02. Minimum compressive strength shall be 3000 psi, with a maximum slump of 10".
  - Mortar shall be type "M" or "S" with a minimum compressive strength of 1800 psi, conforming to ASTM C270-03.
- All masonry walls on this project shall be reinforced as indicated on the drawings. Vertical reinforcing bars shall be installed in the center of cells filled solid with grout (mortar is not acceptable for this purpose). Vertical reinforcing shall meet the requirements set forth in ASTM A615 (See "Reinforcing Steel" section for additional details). Vertical reinforcement must be verified by the testing agency or registered design professional, prior to the solid grouting of cells.
- Solid grouting of all cells shall be provided at all anchors, vertical reinforcement and beam bearings. Low lift grouting procedures shall be utilized on this project. High lift grouting procedures are permitted with approval of the registered design professional for this project (clean out hole must be provided at the base of each grouted cell for this procedure).
- Bond beams, 8" in height, shall be provided at 8'-0" o/c maximum and shall be provided at all floor levels. Horizontal reinforcement shall be (2) #5's continuous in all bond beams (unless otherwise noted).
- Horizontal joint reinforcement shall be provided at 16" on center vertically. Material shall be #9 gauge wire ladder type by "Dur-o-val" or approved equal and shall be installed per manufacturer's specifications.
- Contractor shall be responsible for temporary bracing of masonry walls during construction. Said bracing must remain in place until supporting structure has been completed.

LIGHT GAUGE STEEL FRAMING:

- All light gauge steel framing shall be designed, fabricated and erected in compliance with the 2001 edition of the American Iron and Steel Institute's (A.I.S.I.) "North American Specification for the Design of Cold-Formed Steel Structural Members".
- All light gauge steel sections shall be manufactured to comply with the minimum section properties as designated in the 2000 edition of the "Product Technical Information" by the Steel Stud Manufacturers Association. The minimum galvanized coating on all sections shall be a G-60 coating in compliance with ASTM A653-03.
- Light gauge steel framing grades shall be as follows:
  - Grade 33 for uncoated thickness of .0428" and less
  - Grade 50 for uncoated thickness of greater than .0428"
- Provide blocking and strapping for all light gauge steel framing walls at a minimum of 4'-0" on center. Web stiffeners at joist and rafter bearing points shall be provided as required in the latest A.I.S.I. indicated above.
- Sections must be fastened together securely and fastened securely to their supports by welds or screw fasteners per the manufacturers' recommendations. All welds shall comply with the American Welding Society (A.W.S.) publication D1.3-98, using 3/32" or 1/8" welding rods.
- Light gauge steel framing manufacturer shall submit calculations all members shown and not shown on the drawings. These calculations shall be signed and sealed by an engineer licensed in the state in which this project is located.
- Light gauge steel framing manufacturer shall submit a complete set of shop drawings. Said shop drawings shall include, but not be limited to, size and gauge of members, spacing of members, connection details, and details at corners and openings (jamb, sills, etc...). Shop drawings shall be signed and sealed by an engineer licensed in the state in which this project is located. Shop drawings are to be produced by the manufacturer. Copies of structural drawings for use as shop drawings will not be accepted.

SPECIAL INSPECTIONS:

- In accordance with the requirements set forth in chapter 17 of the IBC 2003, "Structural Tests and Special Inspections", the owner or the registered design professional in responsible charge acting as the owner's agent, shall employ one or more inspectors to provide inspection during construction for the applicable sections for this project, as listed below. The inspector(s) shall be a qualified person, who shall demonstrate competence, to the satisfaction of the building official.
  - 1704.2 Inspection of fabricators
  - 1704.3 Steel Construction
  - 1704.4 Concrete Construction
  - 1704.5 Masonry
  - 1704.7 Soils
  - 1704.8 Pier Foundations
  - 1704.9 Pier Foundations
  - 1704.10 Wall Panels and veneers
  - 1704.11 Sprayed Fire-Resistant Materials
- A statement of special inspections shall be prepared by the registered design professional in responsible charge in accordance with Section 106.1. This statement shall include a detailed account of the inspections to be performed for each of the applicable sections referenced above.

All work shall comply with the IBC 2003 Building Code

Floor loads:

Live loads: All floors = 100 psf

Roof loads:

Dead Load = 20 psf  
Top chord live load = "see Roof snow load"

Roof snow load:

Ground snow load,  $P_g = 50$  psf  
Flat roof snow load,  $P_f = 35$  psf  
Snow exposure factor,  $C_e = 1.0$   
Snow load importance factor,  $I_s = 1.0$   
Thermal factor,  $C_t = 1.0$

Wind load:

Basic wind speed = 100 mph  
Wind importance factor,  $I_w = 1.0$   
Wind exposure: C  
Internal pressure coefficients: +.18, -.18  
Components and cladding wind pressures (psf)\*:

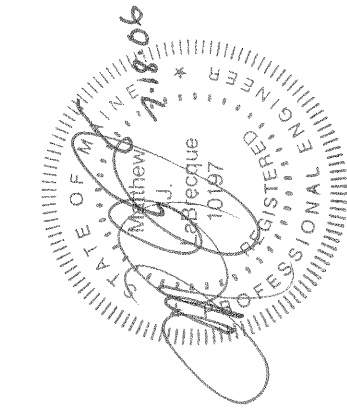
	10 ft <sup>2</sup>	20 ft <sup>2</sup>	50 ft <sup>2</sup>	100 ft <sup>2</sup>
roof:				
Zone 1	12, -29	11, -28	10, -27	9, -27
Zone 2	12, -49	11, -44	10, -37	9, -32
Zone 3	12, -74	11, -61	10, -44	9, -32
walls:				
Zone 4	29, -32	28, -30	26, -29	25, -27
Zone 5	29, -39	28, -36	26, -33	25, -30
opening:				
Zone 2	-42	-41	-40	-40
Zone 3	-69	-54	-35	-20

\* All zones are per figure 1609.6.2.2 of code.

Earthquake design data:

Seismic Importance Factor,  $I_e = 1.0$   
Seismic use group: I  
Mapped spectral response accelerations:  
 $S_s = .375$   
 $S_1 = .10$   
Site class: E  
Spectral response coefficients:  
 $S_{ds} = .525$   
 $S_{d1} = .233$   
Seismic design category: D  
Basic seismic-force-resisting system: Ordinary Steel Moment Frames  
Design base shear = 196 k  
Seismic response coefficient,  $C_s = .15$   
Response modification factor,  $R = 3.5$   
Analysis procedure: Equivalent lateral force procedure

PRO CON INCORPORATED  
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ISSUE: 05/26/2006 - ISSUED FOR PRICING 07/11/2006 - ISSUED FOR PERMIT

CUSTOM HOUSE SQUARE  
300 FORE STREET  
PORTLAND, MAINE  
STRUCTURAL GENERAL NOTES

PROJECT ARCHITECT: MW  
DRAWN BY: AC  
PROJECT #: 300506

S0.1