

STRUCTURAL NOTES

(REFER TO PROJECT MANUAL FOR ADDITIONAL INFORMATION)

1. FOOTINGS & FOUNDATION EXCAVATION:

- A. A GEOTECHNICAL ANALYSIS HAS BEEN PERFORMED ON THIS SITE. SEE PROJECT MANUAL FOR GEOTECHNICAL INFORMATION. APPROPRIATE RECOMMENDATIONS STATED IN THE GEOTECHNICAL REPORT ISSUED BY ECS MID-ATLANTIC, LLC, DATED SEPTEMBER 5, 2018 SHALL BE FOLLOWED.
- B. CONTRACTOR MUST ALSO FOLLOW ANY CONSTRUCTION REQUIREMENTS, IF ANY, FROM THE SUPPLEMENTAL SITE EXPLORATION PERFORMED TO ASSESS THE RISK OF KARST ACTIVITY. THESE DRAWINGS HAVE BEEN PREPARED UNDER THE ASSUMPTION THAT ANY RISK FROM SUBSURFACE KARST ACTIVITY WILL BE MITIGATED.
- C. THESE FOUNDATIONS HAVE BEEN DESIGNED FOR A SOIL BEARING OF 2000 PSF FOR CONTINUOUS AND ISOLATED FOOTINGS.
- D. FOUNDATIONS AND SLAB SHOULD BEAR ON ADEQUATE NATURAL RESIDUAL SOILS OR PROPERLY PLACED AND COMPACTED ENGINEERED FILL. IF HIGHLY PLASTIC SOILS ARE ENCOUNTERED AT SLAB SUBGRADE ELEVATIONS, IT MUST BE OVEREXCAVATED AND REMOVED TO A DEPTH OF UP TO 2 FEET, OR TO SUITABLE MATERIALS, BELOW THE BOTTOM OF THE SLAB. SEE GEOTECHNICAL REPORT FOR SPECIFIC REQUIREMENTS REGARDING EXCAVATION AND PREPARATION OF SUBGRADE. A GEOTECHNICAL ENGINEER SHOULD BE PRESENT TO DIRECT THE REMOVAL OF UNSUITABLE SOILS AND TO DETERMINE THE ADEQUACY OF THE BEARING SURFACE PRIOR TO PLACEMENT OF THE REINFORCEMENT AND CONCRETE.
- E. IN THE EVENT THAT HIGHLY PLASTIC SOILS ARE ENCOUNTERED AT SLAB SUBGRADE ELEVATIONS, IT SHALL BE OVER-EXCAVATED AND REMOVED TO A DEPTH OF UP TO 2 FEET.
- F. FOOTING WIDTHS TO BE AS SHOWN ON PLANS AND DETAILS. BOTTOM OF FOOTING IS TO BE EXCAVATED SQUARE AND TRUE.
- G. WHERE ANY OPEN TRENCH HAS BEEN EXPOSED TO RAIN, SNOW OR ICE PRIOR TO POURING CONCRETE, ALL REINFORCING IN THAT TRENCH SHALL BE REMOVED AND THE BOTTOM OF THE TRENCH SHALL BE DRAINED OF ALL WATER AND CLEANED OF MUD, SNOW OR ICE. A GEOTECHNICAL ENGINEER OR HIS TECHNICAL REPRESENTATIVE SHALL INSPECT THE BOTTOM OF THE TRENCH AND OBSERVE THE RE-COMPACTING OF SOILS PRIOR TO PLACING REINFORCEMENT AND POURING OF CONCRETE.
- H. ALL STRIP FOOTINGS SHALL BE CENTERED UNDER WALLS BEING SUPPORTED AND ALL ISOLATED FOOTINGS SHALL BE CENTERED UNDER COLUMNS, UNLESS NOTED OTHERWISE.
- I. MINIMUM EXTERIOR FOOTING DEPTH SHALL BE AS INDICATED ON THE FOUNDATION PLAN SHEET S2.
- J. IN THE EVENT THAT ORGANIC SOIL OR UNCOMPACTED FILL IS FOUND BELOW FOOTINGS OR FLOOR SLABS, IT SHALL BE REMOVED AND REPLACED WITH SELECT FILL, COMPACTED IN ACCORDANCE WITH THE GEOTECHNICAL REPORT.
- K. STRUCTURAL FILL SHOULD BE PLACED IN NO GREATER THAN 8" LOOSE LIFTS AND COMPACTED IN ACCORDANCE WITH THE GEOTECHNICAL REPORT. ADEQUATE DENSITY AND MOISTURE CONTENT TESTS SHOULD BE PERFORMED TO INSURE COMPLIANCE WITH PROJECT SPECIFICATIONS. SUBGRADE INSPECTION AND FILL TESTING UNDER CONTROLLED CONDITIONS IS CONSIDERED ESSENTIAL IF THE FOOTINGS ARE TO BE FOUNDED IN FILL. A TESTING FREQUENCY OF AT LEAST ONE FIELD DENSITY TEST FOR EACH 2500 SQUARE FEET OF LIFT, BUT NOT LESS THAN 3 TESTS PER LIFT IS RECOMMENDED WITHIN THE BUILDING AREAS.

2. CONCRETE:

- A. ALL READY MIX CONCRETE SHALL BE 4000 PSI FOR ALL CONCRETE PLACEMENT. DO NOT ADD WATER TO THE MIX DESIGN AFTER DELIVERY TO THE PROJECT SITE.
- B. EXPOSED EXTERIOR CONCRETE SHALL BE AIR-ENTRAINED (TOTAL AIR CONTENT = 5%). INTERIOR CONCRETE SHALL NOT BE AIR-ENTRAINED.
- C. UNLESS NOTED OTHERWISE, CONCRETE COVER OVER STEEL REINFORCEMENT SHALL CONFORM TO THE MINIMUM REQUIREMENT BY ACI 318.
- D. REINFORCEMENT DETAILING AND PLACEMENT SHALL CONFORM TO ACI 318 AND ACI 315, EXCEPT WHERE OTHERWISE INDICATED.
- E. HOT OR COLD WEATHER CONCRETING SHALL BE IN ACCORDANCE WITH ACI 308-89 AND ACI 308-1-90, RESPECTIVELY.
- F. ANY CONCRETE PLACED BY MEANS OF PUMPING SHALL BE DONE IN ACCORDANCE WITH ACI 304.2R (82).
- G. CEMENT SHALL CONFORM TO A.S.T.M. C-150 TYPE I.
- H. AGGREGATES SHALL CONFORM TO A.S.T.M. C-33 FOR NORMAL WEIGHT CONCRETE & A.S.T.M. C-330 FOR LIGHTWEIGHT CONCRETE.
- I. READY MIX CONCRETE SHALL BE MIXED AND DELIVERED IN ACCORDANCE WITH A.S.T.M. C-94.
- J. ADMIXTURES MAY BE USED WITH THE APPROVAL OF THE STRUCTURAL ENGINEER. ADMIXTURES USED TO INCREASE THE WORKABILITY OF THE CONCRETE SHALL NOT BE CONSIDERED TO REDUCE THE CEMENT CONTENT. NO CALCIUM CHLORIDE ADMIXTURES ALLOWED.

3. SLABS ON GRADE:

- A. FLOOR SLABS ARE TO BE PLACED AND FINISHED IN ACCORDANCE WITH ACI 302 (SEE PROJECT MANUAL FOR ADDITIONAL INFORMATION).
- B. THICKNESS TOLERANCE FOR ALL SLABS IS TO BE PER ACI 117 AND IS TO BE NO MORE THAN +3/8" (THICKER) AND NO MORE THAN -1/8" (THINNER) FROM THE DESIGN THICKNESS.
- C. CONCRETE USED FOR FLOOR SLABS SHALL INCLUDE SUPERPLASTICIZER. SEE PROJECT MANUAL FOR ADDITIONAL INFORMATION.

4. REINFORCING:

- A. REINFORCING BARS SHALL BE BILLET STEEL, ASTM A 615, GRADE 60. PROVIDE CONTINUOUS BENT BARS AT FOOTING STEPS AND DO NOT DEVELOP TIES AT CORNERS UNLESS OTHERWISE NOTED. LAP SPICES OR EMBEDMENT LENGTHS SHALL CONFORM TO CLASS B SPICE (SEE SPICE TABLE). ADJACENT BAR SPICES IN WALLS AND FOOTINGS TO BE ALTERNATED. ALL FOOTINGS SHALL REQUIRED HOOKED REINFORCING PROJECTED INTO WALLS, PLASTERS OR CEILING. THE SIZE AND SPACING OF DOWELS ARE TO MATCH VERTICAL REINFORCING.
- B. WELDED WIRE FABRIC (WWF) SHALL CONFORM TO THE CURRENT ASTM SPECIFICATION FOR WELD DRAWN STEEL REINFORCEMENT. LAP END AND EDGES MINIMUM 6".
- C. REINFORCING DETAILING, BENDING, AND PLACING SHALL CONFORM TO ACI 315.
- D. MINIMUM CONCRETE COVERAGE: THE MINIMUM CLEAR DISTANCES BETWEEN REINFORCING STEEL AND FACE OF CONCRETE SHALL BE MAINTAINED UNLESS NOTED OTHERWISE:
 - SLABS ON EARTH.....CENTER OF SLAB
 - CONCRETE BELOW GRADE, FORMED.....2"
 - CONCRETE BELOW GRADE, UNFORMED AND POURED AGAINST EARTH.....3"

5. LUMBER:

- A. ALL LUMBER SHALL BE FIRE TREATED IN ACCORDANCE WITH PROJECT SPECIFICATIONS. REFER TO ARCHITECTURAL AND PROJECT MANUAL FOR MORE INFORMATION AND SPECIFIC REQUIREMENTS.
- B. TREATED LUMBER: IN LOCATIONS WHERE TREATED LUMBER IS SHOWN ON DRAWINGS, THE APPROVED PRESSURE TREATED WOODS ARE ACQ-(DICARBONATE) OR CA-B TREATED WOODS WITHOUT AMMONIA CARRIERS. THE CHEMICAL RESORBIN LEVELS MUST BE NO GREATER THAN 0.4 PCF FOR ACQ-2, 0.21 PCF FOR CA-B. ALL METAL CONNECTORS ARE TO HAVE A GALVANIZED COATING OF NO LESS THAN 1.85 OZ/SY OF ZINC PER SQUARE FOOT PER ASTM A653. ALL BOLTS, SCREWS NAILS AND OTHER FASTENERS ARE TO BE GALVANIZED PER ASTM A153. WHERE TREATED LUMBER IS SHOWN ON EXTERIOR INSTALLATIONS WITH NO ROOF COVERINGS TO PROTECT DIRECT EXPOSURE TO RAIN, USE HOT DIP GALVANIZED CONNECTORS PER ASTM A123.

6. STRUCTURAL STEEL:

- A. FABRICATOR QUALITY CONTROL: FABRICATOR MUST PARTICIPATE IN THE AISC QUALITY CONTROL PROGRAM AND BE DESIGNATED AN AISC-CERTIFIED PLANT.
- B. MATERIALS:
 - STRUCTURAL STEEL.....ASTM A992, GRADE 50 UNLESS NOTED
 - PLATES, ANGLES, CHANNELS AND MISCELLANEOUS STEEL.....ASTM A36
 - ANCHOR BOLTS.....ASTM F1554, GRADE 36
 - HIGH STRENGTH BOLTS.....ASTM A325 (3/4") UNLESS NOTED (OF NORTH AMERICAN MANUFACTURE)
 - PIPING ELECTRODES.....ANSI A51 (E70XX)
 - SQUARE AND RECTANGULAR HOLLOW STRUCTURAL SECTIONS (HSS).....ASTM A500, GRADE B
- C. LIGHT GAUGE STEEL: SHALL CONFORM TO AISI (LATEST EDITION) AND THE FOLLOWING:
 - A. ALL LIGHT GAUGE METAL STUDS, JOISTS AND HEADERS ARE TO MEET OR EXCEED INDUSTRY STANDARDS AS SET FORTH BY THE STEEL STUDS MANUFACTURER'S ASSOCIATION (SSMA).
 - B. LIGHT GAUGE STEEL MEMBER DESIGNATIONS SHOWN ON THE CONSTRUCTION DOCUMENTS ARE SSMA STANDARD DESIGNATIONS.
 - C. ALL LIGHT GAUGE STEEL WALLS SHALL BE LATERALLY BRIDGED AT 48" O.C. (VERTICALLY) USING 2"x20ga STRIP BRACING ATTACHED TO EACH STUD FLANGE. SOLID BLOCKING WITHIN THE PLANE OF THE STRIP BRACING MUST BE PROVIDED AT EACH END OF WALL, ADJACENT TO WALL OPENINGS, AND AT 8' O.C. MAXIMUM. ALL BRIDGING AND BRACING IS TO BE POSITIVELY CONNECTED TO STUDS.
 - D. MINIMUM TRACK GAUGE TO MEET OR EXCEED GAUGE OF SUPPORTED STUDS.
 - E. BOTTOM TRACK FASTENERS TO BE SPACED AT EACH END OF WALL, ADJACENT TO WALL OPENINGS, AND AT 48" O.C. MAXIMUM.
 - F. POWDER ACTUATED FASTENERS SHALL BE DS HEAVY DUTY 0.177x0.12" LONG MANUFACTURED FROM MODIFIED AISI 1061 STEEL, AUTEMPERED TO A HARDNESS OF 52-56 HRC AND ZINC PLATED IN ACCORDANCE WITH ASTM B633, S01, TYPE III. FASTENERS SHALL BE INSTALLED BY A QUALIFIED OPERATOR IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS. POWDER ACTUATED FASTENERS SHALL BE AS MANUFACTURED BY "HILTI FASTENING SYSTEMS" OR EQUIVALENT.
 - G. ALL LOAD BEARING STUDS TO BE SEATED SQUARELY INTO TOP AND BOTTOM WALL TRACKS WITH NO MORE THAN A 1/8" GAP.
 - H. THE DESIGN OF SLIP TRACKS SHALL CONFORM TO THE GUIDELINES ESTABLISHED IN SSMA TECHNICAL NOTE NO. 1 PUBLISHED JANUARY, 2001.

8. CONCRETE MASONRY UNITS (CMU):

- A. ALL CMU SHALL BE 2-CELL BLOCK. CELLS WHICH CONTAIN REINFORCING STEEL SHALL BE FILLED SOLID WITH GROUT, INCLUDING BOND BEAMS AND UNTELS.
- B. VERTICAL CELLS TO BE FILLED SHALL HAVE VERTICAL ALIGNMENT SUFFICIENT TO MAINTAIN A CLEAR, UNOBSTRUCTED, CONTINUOUS VERTICAL CELL NOT LESS THAN 2"x3" IN PLAN DIMENSIONS.
- C. UNLESS NOTED OTHERWISE, FOUNDATION DOWELS SHALL EXTEND A MINIMUM 42 BAR DIAMETERS INTO THE MASONRY WALL OR PARTITION. LAPS OR SPICES SHALL BE MIN 42 BAR DIAMETERS. THERE SHALL BE A FOUNDATION DOWEL FOR EACH VERTICAL REINFORCING BAR.
- D. VERTICAL WALL REINFORCING SHALL EXTEND CONTINUOUS FROM THE TOP OF FOUNDATION TO EMBED INTO CAP BOND BEAM.
- E. AN ADDITIONAL VERTICAL BAR WITH FOUNDATION DOWEL, SAME SIZE AND LENGTH AS THE DESIGNATED WALL REINFORCING BARS, SHALL BE PLACED:
 - AT INTERSECTION OF WALLS.
 - ON EACH SIDE OF DOOR AND WINDOW OPENINGS.
 - ON EACH SIDE OF CONTROL JOINTS. (REFER TO ARCHITECTURAL ELEVATIONS FOR CONTROL JOINT LOCATIONS)
- F. BOND BEAMS AT TOP OF CMU WALLS SHALL BE CONTINUOUS. ALL INTERMEDIATE BOND BEAMS, IF ANY, SHALL BE CONTINUOUS EXCEPT WHERE INTERSECTED BY OPENINGS.
- G. HORIZONTAL MASONRY JOINT REINFORCEMENT SHALL BE FABRICATED 9 GAUGE LADDER TYPE UNITS INSTALLED IN EVERY JOINT BELOW GRADE AND AT 16" O.C. ABOVE GRADE. WHERE DOUBLE WYTHE CMU IS SHOWN, WYTHES MUST BE CONTINUOUSLY TIED TOGETHER WITH 9 GAUGE TRUSS TYPE JOINT REINFORCEMENT.
- H. CONCRETE MASONRY UNITS SHALL CONFORM TO THE PROVISIONS OF THE CURRENT BUILDING CODE, UNLESS NOTED OTHERWISE. SEE DESIGN CRITERIA FOR BUILDING CODE INFORMATION.
- I. VERTICAL REINFORCING SHALL BE #5 @ 48" O.C. - LAP SPICES TO BE 30". VERTICAL REINFORCEMENT SHALL BE CENTERED IN EACH CELL BY USE OF REBAR POSITIONERS AT A MAXIMUM SPACING OF 24" O.C. - POSITIONERS SHALL BE 9 GA. WIRE AND HOT DIP GALVANIZED.

9. GENERAL:

- A. CONTRACTOR HAS SOLE RESPONSIBILITY TO COMPLY WITH ALL OSHA REGULATIONS.
- B. THE STRUCTURAL DESIGN OF THE BUILDING IS BASED UPON THE INTERACTION OF ALL ITS COMPONENT PARTS, WITH NO PROVISION MADE FOR CONDITIONS OCCURRING DURING CONSTRUCTION. THE STRUCTURE IS STABLE ONLY IN ITS COMPLETED FORM. THE CONTRACTOR SHALL PROVIDE ADEQUATE BRACING DURING CONSTRUCTION. TEMPORARY SUPPORTS REQUIRED FOR STABILITY DURING ALL INTERMEDIATE STAGES OF CONSTRUCTION SHALL BE DESIGNED, FURNISHED AND INSTALLED BY THE CONTRACTOR. THE CONTRACTOR IS RESPONSIBLE FOR CONSTRUCTIBILITY ANALYSIS AND ERECTION PROCEDURES, INCLUDING DESIGN AND ERECTION OF FALSEWORK, TEMPORARY BRACING, ETC. THE STRUCTURAL ENGINEER ASSUMES NO LIABILITY FOR THE STRUCTURE DURING CONSTRUCTION.
- C. CORRECTIONS DUE TO UNFORESEEN FIELD CONDITIONS OR DIMENSIONAL DISCREPANCIES ON CONSTRUCTION DOCUMENTS MUST BE BROUGHT TO THE ATTENTION OF THE PROJECT ARCHITECT FOR REVIEW AND AUTHORIZATION PRIOR TO CORRECTIVE MEASURES BEING TAKEN.
- D. STRUCTURAL DRAWINGS ARE TO BE USED IN CONJUNCTION WITH ARCHITECTURAL, MECHANICAL, AND ELECTRICAL DRAWINGS.
- E. NOTES AND DETAILS ON DRAWINGS SHALL TAKE PRECEDENCE OVER THESE GENERAL NOTES.
- F. ALL SHOP DRAWINGS SHALL BE REVIEWED AND APPROVED BY THE PROJECT ARCHITECT/ENGINEER PRIOR TO SUBMITTING TO THE BUILDING DEPARTMENT FOR REVIEW AND APPROVAL.

10. SIMPSON "AT-XP" ADHESIVE SYSTEM: CONCRETE (APMO USES ER-263 - MASONRY (APMO ES-281):

- A. CONTRACTOR TO FOLLOW ALL REQUIREMENTS, INSTRUCTIONS, AND RECOMMENDATIONS FOR ADHESIVE APPLICATION.
- B. SUBSTITUTIONS FOR SIMPSON "AT-XP" ANCHORING ADHESIVE SHALL BE ONLY UPON THE APPROVAL OF THE PROJECT ENGINEER OF RECORD.

11. SPECIAL INSPECTIONS REQUIREMENTS:

- A. OWNER SHALL ENGAGE ONE OR MORE QUALIFIED SPECIAL INSPECTORS AND/OR TESTING AGENCIES TO CONDUCT STRUCTURAL TESTS, CONSTRUCTION MATERIAL TESTING, AND SPECIAL INSPECTIONS SPECIFIED IN THE "STATEMENT OF SPECIAL INSPECTIONS".
- B. FOR THE SPECIFIC RESPONSIBILITY OF THE OWNER, CONTRACTOR, AND SPECIAL INSPECTOR REFER TO SECTION 01 45 16 OF THE PROJECT MANUAL.

DESIGN CRITERIA

BUILDING CODE: 2012 VIRGINIA CONSTRUCTION CODE

DESIGN LOADS:

- ROOF DEAD LOAD.....5.5 psf
- ROOF COLLATERAL LOAD.....2.5 psf
- ADDITIONAL CEILING SYSTEM COLLATERAL
- AT PARTS AREA "A".....2.0 psf
- ROOF LIVE LOAD.....20.0 psf
- SPRINKLER LOADS
- UNIFORM BRANCH PIPE LOAD.....0.0 psf
- LINEAL LOOP/TEE MAIN PIPE LOAD.....0.0 pif

SNOW LOAD:

- $P_s = 40$ psf
- $P_f = 28$ psf
- $C_e = 1.0$
- $C_t = 1.0$
- $I_e = 1.0$

WIND CALCULATION METHOD: ENVELOPE

- $V_{ult} = 116$ mph ($V_{ad} = 95$ mph)
- EXPOSURE = C
- RISK CATEGORY = II
- BUILDING ENCLOSED $K_{zt} = 1.0, 1.8$

MAIN FORCE RESISTING SYSTEM:

- WALL AND ROOFS $q = 14.9$ psf
- PARAPETS $q_p = 16.0$ psf

WIND COMPONENTS & CLADDING: All Wind Pressures & Forces in "ASD"

(Wind pressures below were used by J.S. Smith Consulting Engineers, P.C. for design. Components designed by others for use in this project will require wind pressures derived by that supplier.)

- WALL AREAS 10 SQUARE FEET OR LESS = 21.5 psf
- WALL INTERIOR ZONES = 13.5 psf & -15.1 psf
- WALL END ZONES = 13.5 psf & -16.4 psf
- PARAPETS AT INTERIOR ZONES = 11.6 psf & -17.6 psf
- PARAPETS AT END ZONES = 11.6 psf & -17.6 psf
- ROOF INTERIOR ZONES = 10.0 psf & -16.1 psf
- ROOF EDGE ZONES = 10.0 psf & -19.1 psf
- ROOF CORNER ZONES = 10.0 psf & -19.1 psf

BASE SHEAR:

- V_f : WIND = 28.4 k
- SEISMIC = 5.3 k
- V_f : WIND = 30.9 k
- SEISMIC = 5.3 k

SEISMIC DESIGN: EQUIVALENT FORCE PROCEDURE

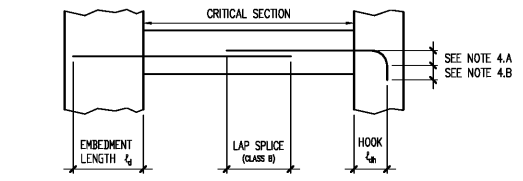
- $S_s = 0.133$
- $S_1 = 0.056$
- $S_{ps} = 0.106$
- $S_{p1} = 0.063$
- SITE CLASS = C
- SEISMIC DESIGN CATEGORY = B
- $I_e = 1.0$

SEISMIC FORCE RESISTING SYSTEM:

- STEEL NOT DETAILED FOR SEISMIC
- R = 3.00
- $C_s = 0.035$
- $p = 1.00$

BAR SIZE	LAP SPLICES (in.) ²		EMBED LENGTH (in.)		
	TOP BARS ³ Class B	OTHERS Class B	TOP BARS ³ l _d	OTHERS l _d	HOOKS ⁵ l _{dh}
#3	25	19	19	15	8
#4	33	25	25	19	10
#5	41	31	31	24	12
#6	49	37	37	29	15
#7	71	54	54	42	17

- 1. SPLICE TABLE IS BASED ON THE FOLLOWING:
 - A. CONCRETE $f_c = 4000$ psi
 - B. GRADE 60 REBAR
 - C. BAR SPACING NOT LESS THAN 2 BAR DIAMETERS OR 1"
 - D. CONCRETE COVER NOT LESS THAN ONE BAR DIAMETER
- 2. LAP LENGTHS SHOWN ARE FOR CLASS "B" TENSION SPLICES PER ACI 318-11 CHAPTER 12.
- 3. TOP BARS ARE DEFINED AS HORIZONTAL REINFORCEMENT PLACED SO THAT MORE THAN 12" OF CONCRETE IS CAST BELOW THE REINFORCEMENT IN THAT MEMBER.
- 4. STANDARD 90° HOOKS:
 - A. RADIUS = 4 BAR DIAMETERS FOR #3 THRU #8
 - B. LENGTH = 12 BAR DIAMETERS
- 5. HOOK LENGTH MAY BE REDUCED IN ACCORDANCE WITH ACI 318-11 CHAPTER 12.5



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