

- 1.0 CODES AND STANDARDS:
- 1.1 "2018 North Carolina State Building Code" and "International Building Code", 2015.
- 1.2 "Minimum Design Loads for Buildings and other Structures" SEI/ASCE 7-10.
- 1.3 "Building Code Requirements for Structural Concrete (ACI 318-14)" American Concrete Institute 2014.
- 1.4 "Manual of Standard Practice", Concrete Reinforcing Steel Institute, latest edition.
- 1.5 "Specification for Structural Steel Buildings (ASCE 360-10)" American Institute of Steel Construction, 2011 – 14th Edition
- 1.6 "Structural Welding Code – Steel (AWS D1.1)" and "Structural Welding Code – Reinforcing Steel (AWS D1.4)", American Welding Society.
- 1.7 "Building Code Requirements for Masonry Structures", ACI 530-13, ASCE 5-13, TMS 402-13.
- 1.8 "Design Manual For Floor Decks and Roof Decks", Steel Deck Institute, latest edition.

2.0 DESIGN LOCATIONS:
Project Located in: Town of Shallotte, County of Brunswick, State of North Carolina.

2.1 Gravity Loads: (Reduced where allowed)

GRAVITY LOADS		
Location	Uniform (psf)	Concentrated (lbs) (over 2.5'x2.5')
Roof Loads:		
Dead Load	20	
Live Load	20	300
Floor Loads:		
Dead Load	50	
Live Load	100	

2.2 Drifting Snow Loads per N.C. Building Code.

P_g = 10 psf
I = 1.1
C_e = 0.9
C_t = 1.0

2.3 Risk Category = III

2.4 Wind Loads per N.C. State Building Codes, 2018 edition (IBC 2015) & ASCE 7-10 (3-second gust)

Main Wind Force Resisting System:
V= 156 mph
Exposure Category "B"

Building is enclosed & Internal Pressure coefficient (GCp) = +0.18 & -0.18
Topographic Factor K_{zt} = 1.0
Wind Directionality Factor, K_d = 0.85

Calculated Wind Base Shear (For MWFRS)
V_x = 6K V_y = 20K

Components and Cladding:
V = 156 mph
Exposure Category "B"

Components and Cladding Wind Pressure (psf)						
Walls	Area < 10ft ²	< 20ft ²	Area < 50ft ²	Area < 100ft ²	Area < 500ft ²	
Zone 4	43.9	-47.5	41.9	-45.6	39.2	-43.0
Zone 5	43.9	-58.7	41.9	-54.7	39.2	-49.5
					37.3	-45.6
					32.7	-36.4
Roof	Area < 10ft ²	Area < 20ft ²	Area < 50ft ²	Area < 100ft ²	Area < 500ft ²	
Zone 1	17.8	-43.9	16.7	-42.7	15.3	-41.3
Zone 2	17.8	-73.6	16.7	-65.7	15.3	-55.3
Zone 3	17.8	-110.7	16.7	-91.7	15.3	-66.6
					14.1	-47.5
					14.1	-47.5

- Notes:
- Areas noted are effective wind areas as per ASCE 7-10, 26.2 definitions.
 - See figures below for Zone locations.
 - Plus and minus signs signify pressures acting toward and away from surfaces, respectively.
 - Design pressures shown in table are strength design wind pressures. Allowable stress design wind pressures may be calculated by factoring the pressures by 0.6.
 - Design pressures for effective wind areas between those noted in schedule may be interpolated.
 - Tributary area = greater of LxW or LxL/3.
 - Deflections may be calculated based on 42% of these loads.

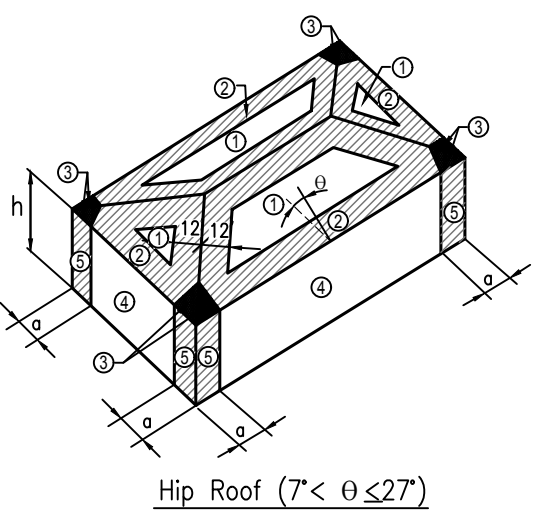
2.5 Seismic Loads per 2018 North Carolina State Building Code (IBC 2015) & ASCE 7-10

Risk Category = III
Site class = "F" (Per Geotechnical Report – spectral response based on site class 'D' per IBC 2015 exception.)
Spectral Response Coefficients:
SDS = 0.311g
SD1 = 0.162g

C_s = 0.097
Seismic Design Category = C
Seismic Importance Factor = 1.25
Basic Seismic – Force – Resisting System
Light frame (cold formed steel) wall systems using flat strap bracing
R_x=R_y=4.0, D_y=2.0, C_D=3.5
Design Base Shear V_x = V_y =2K
Building Height Limit = NL
Analysis Procedure = 12.8.1 ASCE 7-10
Equivalent Lateral Force Procedure

2.6 Guardrail designed per North Carolina State Building Code, Section 1607.8
Guardrail:
Uniform load = 50 pif, any direction – per 1607.8.1
Concentrated load = 200 lbs, any direction – per 1607.8.1.1
Intermediate Rail: (all those except handrail) per 1607.8.1.2

2.7 Flood Loads:
Project is located in an area with minimal flood hazard (Flood Zone X).



3.0 FOUNDATIONS:

3.1 Foundation design is based on geotechnical report #1306-19-016 by SMA& Inc, Wilmington, NC dated August 21, 2019. This report is available in the project specifications book. The recommendations contained in this report are herein made part of the requirements of these contract documents.

3.2 Based on the Geotechnical Report by SM&E Inc, this site has a low to moderate risk of liquefaction during the maximum considered earthquake (MCE). The MCE has a 2% probability of exceedance in 50 years or once every 2,500 years. Based on the estimated total and differential settlements of less than 4 inches and less than 3 inches, respectively, the structure should not collapse. During the design seismic event, the structure should not collapse, however extensive unreparable damage should be expected unless liquefaction mitigation (i.e. earthquake drains) are implemented. The owner should be made aware of the risk associated and determine if liquefaction mitigation should be implemented.

3.3 New footings shall bear on strata capable of sustaining a minimum bearing pressure of 2,500 psf. The bearing capacity shall be verified by a qualified Geotechnical Engineer.

3.4 Top of footing (1/FTG) elevations are shown on the drawings or are to be determined by the Contractor in the field in accordance with the guidelines set forth in the drawings.

3.5 Bottom of exterior footings, grade beams and walls shall bear at a minimum depth of 1'-6" below final grade for frost protection.

3.6 Testing and Inspection:

- All areas to have slabs on grade shall be proof rolled in accordance with and under observation for the Geotechnical Engineer and approved prior to preparation for concrete placement.
- All foundation bearing strata shall be inspected and approved by the Geotechnical Engineer prior to any concrete placement.
- Geotechnical Engineer shall be the sole judge as to suitability of all foundation and/or slab bearing strata.
- Footing bearing elevations shall be adjusted in the field as required to meet the design bearing pressures by additional excavation or compaction and/or backfilling or by other means acceptable to the Geotechnical Engineer.

3.7 Undercutting to remove existing fill beneath footings and slab shall be performed at the direction of the Geotechnical Engineer.

3.8 Engineered Fill: All fill material shall be selected in accordance with the Geotechnical Report Material shall be clean, low plastic soil with a plasticity index less than 30 (less than 15 is preferred), liquid limit less than 50, and unit weight of 120 pcf (+ 5 pcf)

3.9 Compaction: All fill shall be placed in loose lifts not exceeding 8 inches in thickness and compacted to a minimum of 96 percent Standard Proctor (ASTM D-698) except that the top 12 inches shall be compacted to a minimum of 98 percent Standard Proctor. Moisture shall be controlled to within 3 percent above or below optimum content.

3.10 Remove all topsoil and organic materials. The stripping should extend at least 10' beyond the proposed construction limits.

3.11 Subsurface Water: Due to the relatively shallow groundwater encountered, (2'-3" noted during boring) temporary construction dewatering may be necessary to facilitate efficient below-grade construction. Dewatering operations for the majority of the site can be handled by the use of conventional submersible pumps directly in the excavation or temporary trenches or French drains.

3.12 Protection of Foundation Excavations: Exposure to the environment may weaken the soils at the footing bearing level if the foundation excavations remain open for too long a time. Therefore, foundation concrete should be placed the same day that excavations are made. If the bearing soils are softened by the surface water intrusion or exposure, the softened soils must be removed from the foundation excavation bottom immediately prior to placement of concrete. If the excavation must remain open overnight, or if rainfall becomes imminent while the bearing soils are exposed, a 2 to 3-inch "mud mat" of "lean" concrete should be placed on the bearing soils before the placement of reinforcing steel.

4.0 CONCRETE:

4.1 Concrete Strength:

All concrete shall be in accordance with the American Concrete Institute (ACI) 301 and 318.

4.2 Concrete shall have a 28 day compressive strength and density as follows:

- Footings.....3,000psi, Density = ±145pcf
- Interior Slab on Grade.....3,000psi, Density = ±145pcf
- CMU Grout Fill.....3,000psi, Density = ±145pcf, Slump 8"-11" or per structural masonry note 6.5
- Exterior Slab on Grade.....4,000psi, Density = ±145pcf

4.3 Concrete Mix Designs:

- Submittals: Submit written reports of each proposed concrete mix not less than 15 days prior to the start of work.
- Mix designs, including water, cement ratios and slumps, shall be prepared in accordance with ACI 301-05, Section 4, Cement shall conform to ASTM C 150 Type 1 or at contractor's option, ASTM C 595 Type IP where fly ash is permitted. Normal weight aggregate shall conform to ASTM C 33 and light weight aggregate shall conform to ASTM C 330. No admixtures containing calcium chloride shall be permitted in any concrete.
- Aggregate size shall be #67 stone for supported slabs or other formed concrete elements; #57 stone for slabs on grade and footings or other concrete elements formed from and poured against earth; #59 stone for masonry grout.
- Water reducing admixture shall be used in all concrete.
- Air entraining admixture in accordance with ACI 301 shall be used in all concrete exposed freezing and thawing during construction or service conditions.
- Concrete subjected to freezing/thawing shall have a maximum water/cement ratio of 0.45 and shall contain the amount of air entraining agent specified in ACI 301-05 Section 4.

4.4 Curing:

See specifications for curing method options and apply within two (2) hours after completion of finishing to all concrete flatwork and walls, U.N.O., other than footings and grade beams.

4.5 Use a non-corrosive, non-chloride accelerating admixture in concrete exposed to temperatures below 40 degrees. Uniformly heat the water and aggregates to a temperature of not less than 50 degrees. Place and cure concrete in accordance with ACI 306.

4.6 When hot weather conditions exist, place and cure concrete in accordance with ACI 301. Cool ingredients before mixing to maintain concrete temp. at time of placement below 90 degrees.

4.7 Reinforcing in all abutting concrete, including footings shall be continuous through or around all corners or intersections. Dowels or splices shall be equal in size and spacing to the reinforcing in the abutting members.

4.8 Refer to architectural drawings for door and window openings, drips, reglets, washes, masonry anchors, brick ledge elevations, slab depressions and miscellaneous embedded plates, bolts, anchors, angles, etc.

4.9 Refer to plumbing, mechanical and electrical drawings for underfloor, perimeter and other drains and for sleeves, outlet boxes, conduit, anchors, etc. The various trades are responsible for their items.

4.10 Base plates, anchor rods, support angles and other steel exposed to earth or granular fill shall be covered with a minimum of 3" of concrete.

4.11 Finish surfaces to the following tolerances, according to ASTM E 1155, for a randomly trafficked floor surface:
a. Specified overall values of flatness, F(*F*); 25; and of levelness, F(*L*); 20; with minimum local values equal to ⅓ of the overall flatness and levelness values.
b. The composite F(*F*) and F(*L*) numbers shall be measured and reported within 72 hours after completion of slab concrete finishing operations and before removal of any supporting shores.

4.12 Non-shrink grout shall be pre-mixed, non-corrosive, non-metallic, non-staining containing silica sands, Portland cement, shrinkage compensating and water reducing agents. Product shall only require the addition of water. Minimum compressive strength shall be 2500 psi after one day and 7000 psi after 28 days. Grout shall be free of gas producing or air releasing and oxidizing agents and contain no corrosive iron, aluminum or gypsum.

4.13 Provide concrete grout – not mortar – for reinforced masonry lintel and bond beams where indicated on drawing or as scheduled.

4.14 Tolerance for anchor rods and other embedded items shall be per the AISC Code of Standard Practice Section 7.5.

4.15 Unless otherwise shown in the architectural drawings, provide 3/4-inch chamfers at all column, wall, slab or beam edges that are exposed to view in the finished structure.

4.16 Concrete cover for cast-in-place concrete reinforcement:
Concrete cast against & permanently exposed to earth.....3 inches
Concrete exposed to earth or weather:
No. 6 through No. 18 Bars.....2 inches
No. 5 Bar and smaller.....1½" inches
Concrete not exposed to weather or in contact with ground:
Slabs:
No. 11 Bar and smaller.....¾" inches

5.0 REINFORCING STEEL:

5.1 Reinforcing shall be domestic new billet steel conforming to ASTM A615, Grade 60 or 60S including stirrups and ties, except that reinforcing which is required to be welded shall conform to ASTM A706.

5.2 Field bending of concrete reinforcing steel is not permitted.

5.3 Welded wire mat and fabric shall conform to ASTM A184 and A185 respectively and shall be provided in flat sheets. Welded wire mat/fabric shall be lapped 6"-6" at all splices.

5.4 Bar Splices:

Bar Size	Ld (in)	F _c = 3,000psi		F _c = 4,000psi		F _c = 5,000psi	
		Class "B" Lap Splice (in)	Ld (in)	Class "B" Lap Splice (in)	Ld (in)	Class "B" Lap Splice (in)	Ld (in)
#3	17	22	15	19	13	17	17
#4	22	29	19	25	17	23	23
#5	28	36	24	31	22	28	28
#6	33	43	29	37	26	34	34
#7	40	53	42	54	38	49	49
#8	55	62	48	62	43	56	56

- Values are based on normal weight concrete.
- L_d = minimum embed of rebar
- Class "B" lap splice refers to minimum distance bars must be lapped for a full tension splice.

6.0 STRUCTURAL MASONRY:

6.1 All structural masonry shall conform to ACI 530 standards as appropriate to the material.

6.2 Concrete Masonry Units (CMU):

- Units shall be lightweight cellular units conforming to ASTM C 90, Grade N-2. Concrete masonry net area unit strength shall be no less than 2000 psi in accordance with ASTM C 140, with a unit weight not exceeding 95 pcf.
- Design compressive strength of CMU (f_m) = 2000 psi.

6.3 Mortar shall conform to ASTM C 270. Mortar shall be type "S" and shall conform to the ASTM C270 proportion requirements.

6.4 Neither type "N" mortar nor masonry cement shall be used as port of the lateral force resisting system.

6.5 Grouting:

- Grout shall conform to ASTM C476 as specified by proportion. Masonry grout shall conform to the ASTM proportion requirements for coarse grout with a slump of 8 to 11 inches. Contractor may substitute grout with pea gravel concrete masonry fill, see note 4.2 this sheet.
- All bond beams shall be filled with grout and reinforced as indicated on the drawings (details or schedules). Mortar fill is not permitted.
- All masonry wall cells or cavities indicated as reinforced shall be grouted for the full height of the wall, unless specifically noted otherwise on the drawings. Unreinforced walls indicated as grouted shall be grouted full height, unless specifically noted otherwise. Mortar fill is not permitted.
- All masonry cells or cavities below grade shall be grouted solid unless specifically noted otherwise on the drawings. Mortar fill is not permitted.
- Vertical grouting shall be low lift or high lift as follows:
(1) Low lift grouting shall be used for all cavity walls and may be used for all walls at the option of the Contractor. Lifts shall not exceed 4'-0" in height.
(2) High lift grouting is permissible only for filling of cellular masonry units and shall not exceed 12'-8" in height. Clean out holes shall be provided at the base of each grouted cell.
- Grouting shall be stopped 1-1/2" below the top of a course to form a key at the joint.
- Grouting of masonry beams or lintels shall be done in one continuous operation.

6.6 Masonry Reinforcing:

- Foundation dowels may slope a maximum of 1:6 to align with wall cavities or vertical CMU cores. Greater slopes will require replacement of the foundation dowels.
- Spliced reinforcing shall be lapped a length calculated per IBC 2107.5 OR 15" OR as shown on drawings, whichever is greatest. All splices shall be wired together.
- Vertical reinforcing bars shall have a minimum clearance of ¼" from masonry and shall be held in position top and bottom and at intervals not exceeding 4'-0". Accessories for such support shall be used. Provide "AK Wire Products Company" (or approved equal) Rebar Positioner AA225 or AA239 for vertical bars and AA239 for horizontal bars or approved equal products from other suppliers.
- Horizontal joint reinforcing shall be lapped no less than 6" all splices, including corners and tees where no control joint is used.
- All horizontal joint reinforcing shall stop at control joints.
- Horizontal reinforcing in bond beams shall be continuous through control joints.
- All CMU walls shall have joint reinforcing @ 16"o.c. All joint reinforcing shall have (2) 9 gauge (0.148") or W1.7 side rods and cross rods @ 16"o.c.

6.7 Masonry contractor shall provide for and coordinate with other trades for placement of all items to be embedded or built into the masonry.

MINIMUM SPLICING LENGTH (L_d) FOR MASONRY

BAR SIZE	SPLICE LENGTH
#3	16"
#4	22"
#5	26"
#6	43"
#7	60"

7.0 STEEL DECK:

7.1 Steel roof deck shall be galvanized, Type B, 1 1/2" deep, 22 gauge, U.N.O.

7.2 For steel roof deck spans, mechanically fasten side laps at mid-span using "Buildex", self-tapping TEKS No. 10 or larger machine screws or as noted on plan.
Provide additional sidelap fasteners where noted on plan.
Fasten roof deck to supporting members as noted on plan.

7.3 Do not hang pipes or ducts from steel roof deck. Fasten roof deck to supporting members as noted on plan.

8.0 LIGHT GAUGE STEEL FRAMING (DIETRICH):

8.1 All members shall be designed in accordance with the American Iron and Steel Institute (AISI) "Specifications for the Design of Cold-formed Steel Structural Members", Latest Edition.

8.2 All framing members shall be formed from corrosion-resistant steel corresponding to the requirements of ASTM A446, with a minimum yield strength of 33 ksi for joists and studs and 33 ksi for runners. All exterior tracks, studs and roof trusses to have 500 Galvanization.

8.3 All members shown are standard designations of "Dietrich Industries, Inc."

8.4 Design of members indicated in structural drawings is based on minimum properties of products produced by "Dietrich Industries." No substitution of materials is acceptable for use without prior approval of the structural engineer. Substitutions shall meet or exceed all properties produced by "Dietrich Industries, Inc."

8.5 All shop drawing submittals shall show layout, spacing, sizes, thicknesses and types of cold-formed metal framing, fabrication, and fastening and anchorage details, including mechanical fasteners. Show reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details and attachment to adjoining work.

8.6 Shop drawings, design calculations and other structural data shall be prepared and sealed by a qualified engineer. The Structural Engineer shall be legally qualified to practice in the jurisdiction where the project is located and shall be experienced in providing engineering services of the kind indicated.

8.7 All framing components shall be cut square for attachment to perpendicular members or as required for an angular fit tight against abutting members. All load bearing stud/walls shall be factory assembled into panels with studs bearing squarely and fully in top and bottom tracks.

8.8 Fastening components shall be by self-drilling screws or by welding as defined below UNO on the drawings.

8.9 Screwed connections:

- Screws shall be type S-12 or type S-4 for all framing members per manufacturer's recommendations.
- A minimum of three (3) exposed threads shall penetrate through at joined materials.
- Corrosion-resistant cadmium-plated screws shall be used for screws attaching metal lath, masonry ties, and other exterior materials.

8.10 Welded connections:

- Gas metal arc welding (GMAW) shall be used for 20 ga. or lighter members. AWS-E705-3, E-705-E, E-705-E wire electrodes 0.307-0.351" diameter shall be used with carbon dioxide, argon-oxygen or argon-carbon dioxide shielding. Welding equipment 60-100 amperes at 25 volts using 220-volt 3-phase electric service.
- Shielded metal arc welding (SMAW) shall be used for 18 ga and heavier members. AWS E-6012, E-6013, or E-7014 electrodes of 3/32" or 1/8" diameter shall be used. Welding equipment heat setting shall be varied dependent on material thickness.
- All welds shall be touched up with zinc rich paint, or paint similar to that used by the framing member manufacturer.

8.11 Alignment of studs (plumbness) and walls (straightness) shall be within 1/960 of their respective heights and lengths.

8.12 Studs shall be plumbed, aligned, and securely attached to top and bottom runners. Splices in studs are not permitted.

8.13 Where manufacturer's recommendations for erection, attachment, assembly, bracing, alignment, or other installation, or assembly requirements are more stringent than indicated in these drawings, the manufacturer's recommendations shall apply.

STEEL THICKNESS				
Gauge:	Mils	Design Thickness	Minimum Thickness	Yield Strength
		Inches	Inches	ksi
20	33	0.0346	0.0329	0.836
18	43	0.0451	0.0428	1.087
16	54	0.0566	0.0538	1.367
14	68	0.0713	0.0677	1.720
12	97	0.1017	0.0966	2.454

9.0 POST-INSTALLED ANCHORS:

9.1 Except where indicated on the drawings, post-installed anchors shall consist of the following anchor types as provided by HILTI, Inc. Contact HILTI at (800) 879-8000 for product related questions.

Anchorage to Concrete

a. Adhesive anchors for cracked and uncracked concrete use:

- HILTI HIT-HY 200 Safe Set System with HILTI HIT-Z Rod per ICC ESR-3187 (pending).
- HILTI HIT-HY 200 Safe Set System with HILTI Hollow Drill Bit System with HAS-E threaded rod per ICC ESR-3187.
- HILTI HIT-RE 500-SD Epoxy Adhesive Anchoring system with HAS-E threaded rod per ICC ESR-2322 for slow cure applications.

b. Medium duty mechanical anchors for cracked and uncracked concrete use:

- HILTI KWIK HUS EZ and KWIK HUS EZ-I Screw Anchors per ICC ESR-3027
- HILTI KWIK BOLT-TZ Expansion Anchors per ICC ESR-1917
- HILTI KWIK Bolt 3 Expansion Anchors (uncracked concrete only) per ICC ESR-2302

c. Heavy duty mechanical anchors for cracked and uncracked concrete use:

- HILTI HDA Undercut Anchors per ICC ESR 1546
- HILTI HSL-3 Expansion Anchors per ICC ESR 1545

Rebar Doweling into Concrete

a. Adhesive anchors for cracked and uncracked concrete use:

- HILTI HIT-HY 200 Safe Set System with HILTI Hollow Drill Bit System with continuously deformed rebar per ICC ESR-3187.
- HILTI HIT-RE 500-SD Epoxy Adhesive Anchoring System with continuously deformed rebar per ICC ESR-2322.

Anchorage to Solid Grouted Masonry

a. Adhesive Anchors use:

- HILTI HIT-HY 70 Masonry Adhesive Anchoring System (ICC pending).
- Steel anchor element shall be HILTI HAS-E continuously threaded rod or continuously deformed steel rebar.

b. Mechanical Anchors use:

- HILTI KWIK BOLT-3 Expansion Anchors per ICC ESR 1385.

Anchorage to Hollow/Multi-wythe Masonry

a. Adhesive Anchors use:

- HILTI HIT-HY 70 Masonry Adhesive Anchoring System per ICC ESR-3342.
- Steel anchor element shall be HILTI HAS-E continuously threaded rod or continuously deformed steel rebar.
- The appropriate size screen tube shall be used per adhesive manufacturer's recommendation.

9.2 Anchor capacity used in design shall be based on the technical data published by HILTI or such other method as approved by the Structural Engineer of record. Substitution requests for alternate products must be approved in writing by the Structural Engineer of record prior to use. Contractor shall provide calculations demonstrating that the substituted product is capable of achieving the performance values of the specified product. Substitutions will be evaluated by their having an ICC ESR showing compliance with the relevant building code for seismic uses, load resistance, installation category, and availability of comprehensive installation instructions. Adhesive anchor evaluation will also consider creep, in-service temperature and installation temperature.

9.3 Install anchors per the manufacturer instructions, as included in the anchor packaging.

9.4 Overhead adhesive anchors must be installed using the HILTI PROFI System.

9.5 The contractor shall arrange an anchor manufacturer's representative to provide onsite installation training for all of their anchoring products specified. The Structural Engineer of record must receive documented confirmation that all of the contractor's personnel who install anchors are trained prior to the commencement of installing anchors.

9.6 Anchor capacity is dependant upon spacing between adjacent anchors and proximity of anchors to edge of concrete. Install anchors in accordance with spacing and edge clearances indicated on the drawings.

9.7 Existing reinforcing bars in the concrete structure may conflict with specific anchor locations. Unless noted on the drawings that the bars can be cut, the contractor shall review the existing structural drawings and shall undertake to locate the position of the reinforcing bars at the locations of the concrete anchors, by HILTI FERROSCAN, GPR, X-ray, chipping