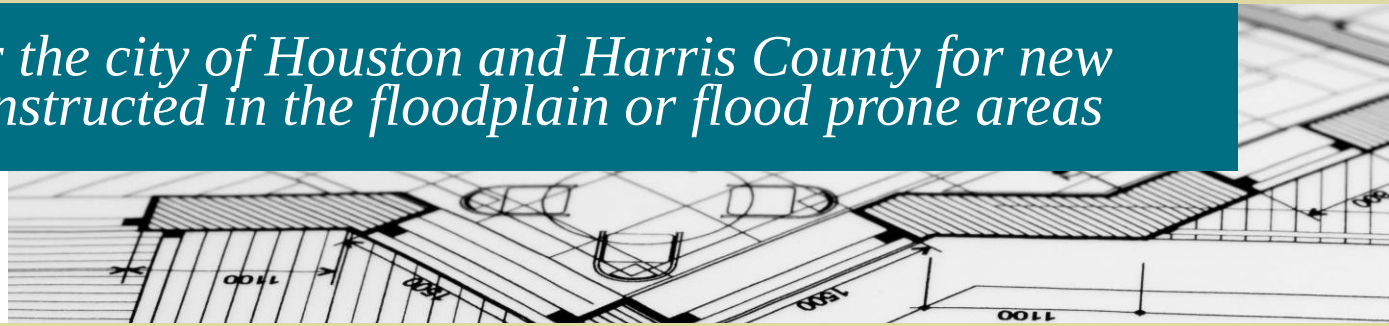
PRE-ENGINEERED RESIDENTIAL FOUNDATION DETAILS

Joint standards for the city of Houston and Harris County for new elevated homes constructed in the floodplain or flood prone areas



Presented by:

John Blount, PE *County Engineer*

Michael Scanlon, PE *Norex Engineering Inc*

Agenda

Introductions

Purpose & Scope

Participants

Design

Details

Questions & Contact

Purpose & Scope

In an effort to mitigate risk and damage due to increasing flood frequency, Norex Engineering has been asked to provide engineering consultation regarding the development of residential foundation standards for elevated homes.

These standards were created in a joint effort with Harris County and the city of Houston and will be made available for public use within Houston and Harris County jurisdictions.

Using presumptive soil capacities listed in the IRC/IBC, Norex Engineering developed engineered details and material specifications that maintain ease of construction and mitigate construction cost, while maximizing effectiveness to achieve a valuable standard.

The details provided are to be used for one and two story homes meeting the following criteria:

- 2,000 square feet or less of floorplan area
- Bottom of floor joists no higher than 4 feet above grade
- Plate heights not to exceed 9 feet
- Roof pitch not to exceed 6:12

Participants

Norex Engineering *INC*

RAMJACK

Olshan Since 1933 Foundation Solutions

CANTSINK SUPPORTING INNOVATION

Harris County

John Blount, PE

Nick Russo

Shawn Sturham

Travis Meeks

City of Houston

Maher Khansa, PE

Michael Howard

Norex Engineering

Michael Scanlon, PE

Rick Brandon, PE

Zachary Nelson, PE

Fidel Garza

Pile Manufacturers

Ram Jack

Olshan Foundation Solutions

Cantsink

Designs

Concrete Block and Footer

Reinforced stacked concrete block columns, 8x16 and 16x16 with 30x30 cast footers

Encased Wood Piles

Pressure treated piles encased in concrete, 10 feet and 12 feet depths

Helical Piles

$2^{7}/_{8}$”⦰ helical piles in lieu of encased piles,

Quicker installation with no wait time after installation.

Pre Approved installers:

- RamJack
- Olshan
- Cantsink

Design Methodology

Code Standards

Standards include:

- IRC 2015
- ASCE 7-10
- ACI 318-14

Soil Strength

Presumptive values:

- Table R401.4.1

  Clays – 1500 PSF

- Reduced to 1200 PSF in design

  Skin friction taken as 250 psf (1/6th bearing of 1500 psf) per section 1810.3.3.1.4 IBC 2015

- R401.4 Soil tests:

Where quantifiable data created by accepted soil science methodologies indicate expansive, compressible, shifting or other questionable soil characteristics are likely to be present, the building official shall determine whether to require a soil test to determine the soil's characteristics at a particular location. This test shall be done by an approved agency using an approved method.

Foundation Design

Methodology

- Prescriptive standards to accommodate any floor plan configuration
- Helical pile layouts reviewed by 3 manufacturers for reduced lead times when helical piles have been selected.
- Conventional framing standards and details, such as 16 inch spacing, to reduce complexity during construction.
- Elevation survey is required for base flood elevation criteria.

Table R401.4.1

PRESUMPTIVE LOAD-BEARING VALUES OF FOUNDATION MATERIALS[a]

CLASS OF MATERIAL	LOAD-BEARINGPRESSURE (PSF)
Crystalline bedrock	12,000
Sedimentary and foliated rock	4,000
Sandy gravel and/or gravel	3,000
Sand, silty sand, clayey sand, silty gravel and clayey gravel	2,000
Clay, sandy, silty clay, clayey silt, silt and sandy silt clay	1,500[b]

a. *Where soil tests are required by Section R401.4, the allowable bearing capacities of the soil shall be part of the recommendations.*

b. *Where the building official determines that in-place soils with an allowable bearing capacity of less than 1,500 psf are likely to be present at the site, the allowable bearing capacity shall be determined by a soils investigation.*

Table 1806.2

CLASS OF MATERIALS	VERTICAL FOUNDATION PRESSURE (psf)	LATERAL BEARING PRESSURE(psf/ft below natural grade)	LATERAL SLIDING RESISTANCE	
			Coefficient of friction[a]	Cohesion (psf)[b]
1. Crystalline bedrock	12,000	1,200	0.70	—
2. Sedimentary and foliated rock	4,000	400	0.35	—
3. Sandy gravel and/or gravel (GWand GP)	3,000	200	0.35	—
4. Sand, silty sand, clayey sand,silty gravel and clayey gravel(SW, SP, SM, SC, GM and GC)	2,000	150	0.25	—
5. Clay, sandy clay, silty clay,clayey silt, silt and sandy silt(CL, ML, MH and CH)	1,500	100	—	130

a. Coefficient to be multiplied by the dead load.

b. Cohesion value to be multiplied by the contact area, as limited by Section 1806.3.2.

Skin Friction

1810.3.3.1.4 Allowable frictional resistance.

The assumed frictional resistance developed by any uncased cast-in-place deep foundation element shall not exceed one-sixth of the bearing value of the soil material at minimum depth as set forth in Table 1806.2, up to a maximum of 500 psf (24 kPa), unless a greater value is allowed by the *building official* on the basis of a geotechnical investigation as specified in Section 1803 or a greater value is substantiated by a load test in accordance with Section 1810.3.3.1.2. Frictional resistance and bearing resistance shall not be assumed to act simultaneously unless determined by a geotechnical investigation in accordance with Section 1803.

SHEET INDEX

Standard Details for Joint City/County Low Cost and Innovative Residential Foundation Systems for Elevated Homes

Harris County and City of Houston
Prepared by Norex Engineering
NOVEMBER 2019

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HARRIS COUNTY, CO. HOUSTON
HARRIS COUNTY, TEXAS
HARRIS COUNTY, TEXAS
FOUNDATION DETAILS

COVER
NOV 2019

Standards

1 Story Loading
Per Pile

Gravity

Perimeter	
Live Load	2565 LB
Roof Live Load	1350 LB
Dead Load	2400 LB

Interior	
Live Load	3730 LB
Roof Live Load	1110 LB
Dead Load	2325 LB

PERIMETER TOTAL[3] = 5340 LB
INTERIOR TOTAL[2] = 6055 LB

Wind Loading (139 MPH Exposure B)
1100 LB at corner

1 Story Loading
Per Square Footer

Gravity

Perimeter	
Live Load	2020 LB
Roof Live Load	1065 LB
Dead Load	1890 LB

Interior	
Live Load	2935 LB
Roof Live Load	875 LB
Dead Load	1830 LB

PERIMETER TOTAL[3] = 4205 LB
INTERIOR TOTAL[3] = 4690 LB

Wind Loading (139 MPH Exposure B)
1100 LB at corner

2 Story Loading
Per Pile

Gravity

Perimeter	
Live Load	3455 LB
Roof Live Load	770 LB
Dead Load	2785 LB

Interior	
Live Load	5415 LB
Roof Live Load	1200 LB
Dead Load	3705 LB

PERIMETER TOTAL[2] = 6240 LB
INTERIOR TOTAL[2] = 9120 LB

Wind Loading (139 MPH Exposure B)
1830 LB at corner

2 Story Loading
Per Square Footer

Gravity

Perimeter	
Live Load	2800 LB
Roof Live Load	400 LB
Dead Load	1540 LB

Interior	
Live Load	3355 LB
Roof Live Load	630 LB
Dead Load	1950 LB

PERIMETER TOTAL[2] = 4340 LB
INTERIOR TOTAL[2] = 5305 LB

Wind Loading (139 MPH Exposure B)
1830 LB at corner

LIVE LOAD NOTES

1. UNINHABITABLE ATTICS WITHOUT STORAGE ARE THOSE WHERE THE CLEAR HEIGHT BETWEEN JOISTS AND RAFTERS IS NOT MORE THAN 42 INCHES, OR WHERE THERE ARE NOT TWO OR MORE ADJACENT TRUSSES WITH WEB CONFIGURATIONS CAPABLE OF ACCOMMODATING AN ASSUMED RECTANGLE 42 INCHES IN HEIGHT BY 24 INCHES IN WIDTH, OR GREATER, WITHIN THE PLANE OF THE TRUSSES. THIS LIVE LOAD NEED NOT BE ASSUMED TO ACT CONCURRENTLY WITH ANY OTHER LIVE LOAD REQUIREMENTS.
2. INDIVIDUAL STAIR TREADS SHALL BE DESIGNED FOR THE UNIFORMLY DISTRIBUTED LIVE LOAD OR A 300-POUND CONCENTRATED LOAD ACTING OVER AN AREA OF 4 SQUARE INCHES, WHICHEVER PRODUCES THE GREATER STRESSES.
3. SEE SECTION R507.1 FOR DECKS ATTACHED TO EXTERIOR WALLS.
4. GUARD IN-FILL COMPONENTS (ALL THOSE EXCEPT THE HANDRAIL), BALUSTERS AND PANEL FILLERS SHALL BE DESIGNED TO WITHSTAND A HORIZONTALLY APPLIED NORMAL LOAD OF 50 POUNDS ON AN AREA EQUAL TO 1 SQUARE FOOT. THIS LOAD NEED NOT BE ASSUMED TO ACT CONCURRENTLY WITH ANY OTHER LIVE LOAD REQUIREMENT.
5. UNINHABITABLE ATTICS WITH LIMITED STORAGE ARE THOSE WHERE THE CLEAR HEIGHT BETWEEN JOISTS AND RAFTERS IS 42 INCHES OR GREATER, OR WHERE THERE ARE TWO OR MORE ADJACENT TRUSSES WITH WEB CONFIGURATIONS CAPABLE OF ACCOMMODATING AN ASSUMED RECTANGLE 42 INCHES IN HEIGHT BY 24 INCHES IN WIDTH, OR GREATER, WITHIN THE PLANE OF THE TRUSSES.
6. THE LIVE LOAD NEED ONLY BE APPLIED TO THOSE PORTIONS OF THE JOISTS OR TRUSS BOTTOM CHORDS WHERE ALL OF THE FOLLOWING CONDITIONS ARE MET:
   - 6.1. THE ATTIC AREA IS ACCESSED FROM AN OPENING NOT LESS THAN 20 INCHES IN WIDTH BY 30 INCHES IN LENGTH THAT IS LOCATED WHERE THE CLEAR HEIGHT IN THE ATTIC IS NOT LESS THAN 30 INCHES.
   - 6.2. THE SLOPES OF THE JOISTS OR TRUSS BOTTOM CHORDS ARE NOT GREATER THAN 2 INCHES VERTICAL TO 12 UNITS HORIZONTAL.
   - 6.3. REQUIRED INSULATION DEPTH IS LESS THAN THE JOIST OR TRUSS BOTTOM CHORD MEMBER DEPTH.
7. THE REMAINING PORTIONS OF THE JOISTS OR TRUSS BOTTOM CHORDS SHALL BE DESIGNED FOR A UNIFORMLY DISTRIBUTED CONCURRENT LIVE LOAD OF NOT LESS THAN 10 POUNDS PER SQUARE FOOT.

IRC TABLE R301.5
MINIMUM UNIFORMLY DISTRIBUTED LIVE LOADS
(POUNDS PER SQUARE FOOT)

USE	LIVE LOAD
ATTICS WITHOUT STORAGE	10
ATTICS WITH LIMITED STORAGE	20
HABITABLE ATTICS AND ATTICS SERVED WITH FIXED STAIRS	30
BALCONIES (EXTERIOR) AND DECKS	40
FIRE ESCAPES	40
GUARDRAILS AND HANDRAILS	200
GUARDRAIL IN-FILL COMPONENTS	50
PASSENGER VEHICLE GARAGES	50
ROOMS OTHER THAN SLEEPING ROOM	40
SLEEPING ROOMS	30
STAIRS	40

FOR SI: 1 POUND PER SQUARE FOOT=0.0479 kPo,
1 SQUARE INCH=645 MM2, 1 POUND=4.45 N.

Footing Capacities (Unfactored)

Soil Bearing 1200 PSF
Skin friction 250 PSF

10' Length, 16" diameter, straight shaft
Fiction 9.4 Kips

12' Length, 16" diameter, straight shaft
Friction 10.5 Kips

Square footer 30"X30"
Bearing 7.5 Kips
Uplift 1.0 Kips (No Suction Capacity)

[1]Factored capacity with 0.6 Dead Load
[2]Load case #2 L+D
[3]Load case #3 (L+Lr)*0.75+D

Load Capacity Summary (Factored)

SINGLE STORY

Pile Loading	
Pile Load	6.1 Kips
Pile Capacity 10'	9.4 Kips*

Footer Loading	
Interior Load	4.7 Kips
Footer Capacity	10.8 Kips

Wind	
Maximum Uplift	1.1 Kips
Pile Capacity	10.5 Kips
Square Footer	2.1 Kips

2 STORY

Pile Loading	
Pile Load	9.2 Kips
Pile Capacity	10.5 Kips*

Footer Loading	
Interior Load	5.3 Kips
Footer Capacity	10.8 Kips

Wind	
Maximum Uplift	1.9 Kips
Pile Capacity	10.5 Kips
Square Footer	2.1 Kips

*Per section 18.10.3.3.1.4 frictional resistance and bearing resistance shall not be assumed to act simultaneously. Per this requirement bearing has been excluded from these capacities

11/07/2019 - FOR REVIEW
Revision/Issue

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HARRIS COUNTY, CO. HOUSTON
HARRIS COUNTY, TEXAS
HARRIS COUNTY, TEXAS
FOUNDATION DETAILS

CALCULATIONS
NOV 2019
C-1.0

Design Loads

GENERAL NOTES– SITE WORK

1. SITE PREPARATION SHALL BE IN ACCORDANCE WITH THE SOILS REPORT RECOMMENDATIONS (IF AVAILABLE) AND SHALL MEET THE FOLLOWING MINIMUM REQUIREMENTS:
   - 1.A. STRIP ALL VEGETATION DOWN TO NATURAL SOIL. REMOVE ALL TREES WITHIN 10 FEET OF THE PERIMETER OF THE STRUCTURE WHEN MEASURED TO THE FACE OF THE TRUNK.
   - 1.B. PROOF–ROLL EXPOSED SUBGRADE. BACK FILL AND COMPACT TREE–HOLES OR SOFT POCKETS WITH MATERIAL SIMILAR TO THE EXISTING SITE MATERIALS.
   - 1.C. BRING SUB GRADE TO REQUIRED ELEVATION WITH SELECT FILL MATERIAL. SELECT FILL SHALL BE SANDY CLAY OR SAND, FREE OF ORGANIC MATERIAL, HAVING A PLASTICITY INDEX GREATER THAN 7 BUT LESS THAN 20
   - 1.D. INITIAL SITE GRADING SHALL BE COMPLETED PRIOR TO SETTING FORMS. FINAL GRADE SHALL SLOPE AWAY FROM THE FOUNDATION 1 INCH/FOOT FOR THE FIRST 5 FEET SUCH THAT POSITIVE DRAINAGE AWAY FROM THE SLAB IS ASSURED.
2. DURING CONSTRUCTION A DRAINAGE TRENCH SHALL BE FORMED SUCH THAT ANY WATER WHICH INTRUDES INTO THE FOUNDATION WILL IMMEDIATELY DRAIN OUT OF THE BOTTOM OF CAST FOOTERS.

GENERAL NOTES– CONCRETE

1. CONCRETE SHALL BE SUPPLIED AND CONSTRUCTED IN ACCORDANCE WITH ACI–318 LATEST EDITION AND SHALL HAVE A MINIMUM 28–DAY COMPRESSIVE STRENGTH OF 3000 PSI.
2. WATER SHALL NOT BE ADDED TO CONCRETE AT THE JOB SITE.
3. CONCRETE SHALL NOT BE PLACED AT TEMPERATURES BELOW 40 DEGREES F, IN RAINY WEATHER OR IN OTHER ADVERSE WEATHER CONDITIONS.
4. CURE ALL SLABS WITH CHEMICAL CURING COMPOUND OR KEEP MOIST FOR 7 DAYS AFTER PLACEMENT.
5. BUILDER SHALL VERIFY ALL DIMENSIONS, DROPS, OFFSETS, BRICK LEDGES, INSERTS AND OPENINGS WITH ARCHITECTURAL DRAWINGS.

GENERAL NOTES – REINFORCED STEEL

1. REINFORCING STEEL SHALL BE PER ASTM A615 GRADE 60 WITH DEFORMATION PER ASTM A 305 AND SHALL BE DETAILED AND INSTALLED PER ACI–318 LATEST EDITION

ANCHOR BOLTS

1. ANCHOR BOLTS (ANCHOR RODS) SHALL CONFORM TO ASTM A307 OR F1554 GRADE 36, UNLESS NOTED OTHERWISE.
2. ALL EPOXY ANCHORS SHALL BE HIT RE 500 SD EPOXY ADHESIVE OR HIT HY 150 MAX SD AS MANUFACTURED BY HILTI INC. OR APPROVED EQUIVALENT. ALL ANCHORS SHALL BE SET IN CONCRETE, 100% GROUT FILLED MASONRY OR SOLID MASONRY WITH MINIMUM 2 1/4" EMBEDMENT LENGTH.

SUBFOOR

1. ALL LUMBER SHALL BE #2 SOUTHER YELLOW PINE
2. ALL EXPOSED LUMBER TO BE PRESSURE TREATED
3. DRIVEN PILES SHALL BE TREATED WITH A RATING OF UC4C (0.8 CCA) PER THE AMERICAN WOOD PRESERVATION ASSOCIATION.

GENERAL NOTES – HELICAL PILES

1. PILE SYSTEM SHALL BE ICC CERTIFIED AND CERTIFICATION DOCUMENTS SHALL BE SUPPLIED TO OWNER PRIOR TO INSTALLATION.
2. PILE SHALL BE COATED OR TREATED TO RESIST DEGRADATION FROM MOISTURE.
3. MANUFACTURER TO HAVE IN EFFECT INDUSTRY RECOGNIZED WRITTEN QUALITY CONTROL AND ASSURANCE FOR ALL MATERIALS AND MANUFACTURING PROCESSES.
4. MANUFACTURER SHALL BE ISO CERTIFIED.
5. ALL WELDING IS TO BE DONE BY WELDERS CERTIFIED UNDER SECTION 5 OF THE AWS CODE D1.1.
6. THE CAPACITY OF THE PILING SYSTEM IS A FUNCTION OF MANY INDIVIDUAL ELEMENTS, INCLUDING THE CAPACITY OF THE FOUNDATION, BRACKET, PIER SHAFT, HELICAL PLATE, AND BEARING STRATA, AS WELL AS THE STRENGTH OF THE FOUNDATION BRACKET CONNECTION AND THE QUALITY OF THE INSTALLATION OF THE PILE.
7. TEST PILES SHALL BE INSTALLED TO DETERMINE SOIL CAPACITY PRIOR TO SELECTION OF PILES.

GENERAL NOTES– MISCELLANEOUS & LIMITATIONS

1. THIS FOUNDATION IS DESIGNED IN ACCORDANCE WITH CURRENT NOREX ENGINEERING PRACTICES AND ADVISES THE BUILDER AND ALL CLIENTS THAT INSPECTION SERVICES ARE AVAILABLE PRIOR TO CONCRETE POUR AND DURING THE POUR. IF THESE INSPECTIONS ARE NOT PERFORMED BY NOREX, THEN NOREX ACCEPTS NO RESPONSIBILITY WHATSOEVER FOR THE PROPER IMPLEMENTATION OF ITS PLANS AND SPECIFICATIONS.
2. SCREEN OR SKIRT DESIGN FOR THE CRAWLSPACE IS NOT PROVIDED/INCLUDED IN THESE DOCUMENTS
3. WARNINGS:
   - 3.A. THE OWNER MUST ENSURE THAT THE MOISTURE CONTENT OF THE SOIL IS MAINTAINED AT A CONSISTENT LEVEL. DRAINAGE SHOULD BE MAINTAINED SUCH THAT THE PONDING OF WATER DOES NOT DEVELOP. IF WATER IS PONDING, THE BUILDER SHOULD BE CONTACTED TO IMPROVE DRAINAGE.
   - 3.B. THE OWNER SHOULD NOT PLANT TREES WITHIN 20 FEET OF THE PERIMETER OF THE STRUCTURE WHEN MEASURE TO THE FACE OF THE TRUNK.

GENERAL NOTES– DESIGN

1. THIS FOUNDATION IS DESIGNED IN ACCORDANCE WITH CURRENT ACCEPTABLE ENGINEERING PRACTICES AND SHALL NOT BE USED FOR PROJECTS OUTSIDE OF THE STATED LIMITATIONS IN THESE DOCUMENTS.
2. THE DESIGN IS BASED ON THE FOLLOWING ASSUMPTIONS:
   - 2.A. FINAL GRADING IS COMPLETED AS OUTLINED IN THE GENERAL NOTES–SITEWORK.
   - 2.B. THE FOUNDATION IS NOT INSTALLED DURING A DRY OR WET PERIOD WHICH IS CONSIDERED EXTREME OR ABNORMAL FOR THE AREA. IF SUCH IS THE CASE, BUILDER SHALL NOTIFY THE ENGINEER FOR A POSSIBLE RE–DESIGN.
   - 2.C. NO SITE SPECIFIC SOIL REPORT PROVIDED FOR THIS PROJECT. SOIL BEARING CAPACITY BASED ON THE 2015 INTERNATIONAL RESIDENTIAL/BUILDING CODE, TABLE 401.4.1 AND TABLE 1806.2 RESPECTIVELY. THE SOIL BEARING PRESSURE SHALL BE 1200 PSF MINIMUM.
3. BOTTOM OF FLOOR JOISTS SHALL BE AS SPECIFIED BY REGULATORY FLOODPLAIN ELEVATION REQUIREMENTS AND A MAXIMUM OF 4 FEET ABOVE EXISTING GRADE.
4. PILES/COLUMNS SHALL BE SPACED AT A MAXIMUM OF 7'–6" FROM CENTER TO CENTER UNLESS NOTED OTHERWISE PER FRAMING PLAN.
5. DESIGN WINDSPEED SHALL BE 139 MPH, EXPOSURE B AS PER ASCE 7–10,
6. ROOF PITCH SHALL NOT EXCEED 6:12.
7. WALL PLATE HEIGHT/CEILING HEIGHT SHALL NOT EXCEED 9 FEET.
8. SEISMIC DESIGN LOADS DO NOT GOVERN.
9. STRUCTURE SHALL NOT EXCEED TWO STORIES.
10. STRUCTURES SHALL BE LESS THAN OR EQUAL TO 2000 SQ.FT.
11. DESIGN SHALL ALSO COMPLY WITH CITY OF HOUSTON AND/OR HARRIS COUNTY CODES, ORDINANCES, AND REGULATIONS
12. MEAN ROOF HEIGHT FOR 1–STORY SHALL NOT EXCEED 15 FEET.
13. MEAN ROOF HEIGHT FOR 2–STORY SHALL NOT EXCEED 25 FEET.
14. STRUCTURE SHALL NOT BE CONSTRUCTED IN V–ZONE FLOODWAY AREAS.
15. THE LIVE LOAD CRITERIA IS AS FOLLOWS:

LIVE LOAD NOTES

1. UNINHABITABLE ATTICS WITHOUT STORAGE ARE THOSE WHERE THE CLEAR HEIGHT BETWEEN JOISTS AND RAFTERS IS NOT MORE THAN 42 INCHES, OR WHERE THERE ARE NOT TWO OR MORE ADJACENT TRUSSES WITH WEB CONFIGURATIONS CAPABLE OF ACCOMMODATING AN ASSUMED RECTANGLE 42 INCHES IN HEIGHT BY 24 INCHES IN WIDTH, OR GREATER, WITHIN THE PLANE OF THE TRUSSES. THIS LIVE LOAD NEED NOT BE ASSUMED TO ACT CONCURRENTLY WITH ANY OTHER LIVE LOAD REQUIREMENTS.
2. INDIVIDUAL STAIR TREADS SHALL BE DESIGNED FOR THE UNIFORMLY DISTRIBUTED LIVE LOAD OR A 300–POUND CONCENTRATED LOAD ACTING OVER AN AREA OF 4 SQUARE INCHES, WHICHEVER PRODUCES THE GREATER STRESSES.
3. SEE SECTION R507.1 FOR DECKS ATTACHED TO EXTERIOR WALLS.
4. GUARD IN–FILL COMPONENTS (ALL THOSE EXCEPT THE HANDRAIL), BALUSTERS AND PANEL FILLERS SHALL BE DESIGNED TO WITHSTAND A HORIZONTALLY APPLIED NORMAL LOAD OF 50 POUNDS ON AN AREA EQUAL TO 1 SQUARE FOOT. THIS LOAD NEED NOT BE ASSUMED TO ACT CONCURRENTLY WITH ANY OTHER LIVE LOAD REQUIREMENT.
5. UNINHABITABLE ATTICS WITH LIMITED STORAGE ARE THOSE WHERE THE CLEAR HEIGHT BETWEEN JOISTS AND RAFTERS IS 42 INCHES OR GREATER, OR WHERE THERE ARE TWO OR MORE ADJACENT TRUSSES WITH WEB CONFIGURATIONS CAPABLE OF ACCOMMODATING AN ASSUMED RECTANGLE 42 INCHES IN HEIGHT BY 24 INCHES IN WIDTH, OR GREATER, WITHIN THE PLANE OF THE TRUSSES.
6. THE LIVE LOAD NEED ONLY BE APPLIED TO THOSE PORTIONS OF THE JOISTS OR TRUSS BOTTOM CHORDS WHERE ALL OF THE FOLLOWING CONDITIONS ARE MET:
   - 6.1. THE ATTIC AREA IS ACCESSED FROM AN OPENING NOT LESS THAN 20 INCHES IN WIDTH BY 30 INCHES IN LENGTH THAT IS LOCATED WHERE THE CLEAR HEIGHT IN THE ATTIC IS NOT LESS THAN 30 INCHES.
   - 6.2. THE SLOPES OF THE JOISTS OR TRUSS BOTTOM CHORDS ARE NOT GREATER THAN 2 INCHES VERTICAL TO 12 UNITS HORIZONTAL.
   - 6.3. REQUIRED INSULATION DEPTH IS LESS THAN THE JOIST OR TRUSS BOTTOM CHORD MEMBER DEPTH.
7. THE REMAINING PORTIONS OF THE JOISTS OR TRUSS BOTTOM CHORDS SHALL BE DESIGNED FOR A UNIFORMLY DISTRIBUTED CONCURRENT LIVE LOAD OF NOT LESS THAN 10 POUNDS PER SQUARE FOOT.

IRC TABLE R301.5
MINIMUM UNIFORMLY DISTRIBUTED LIVE LOADS
(POUNDS PER SQUARE FOOT)

USE	LIVE LOAD
ATTICS WITHOUT STORAGE	10
ATTICS WITH LIMITED STORAGE	20
HABITABLE ATTICS AND ATTICS SERVED WITH FIXED STAIRS	30
BALCONIES (EXTERIOR) AND DECKS	40
FIRE ESCAPES	40
GUARDRAILS AND HANDRAILS	200
GUARDRAIL IN–FILL COMPONENTS	50
PASSENGER VEHICLE GARAGES	50
ROOMS OTHER THAN SLEEPING ROOM	40
SLEEPING ROOMS	30
STAIRS	40

FOR SI: 1 POUND PER SQUARE FOOT=0.0479 kPa,
1 SQUARE INCH=645 MM2, 1 POUND=4.45 N.

11/07/2019 - FOR REVIEW

Revision/Issue

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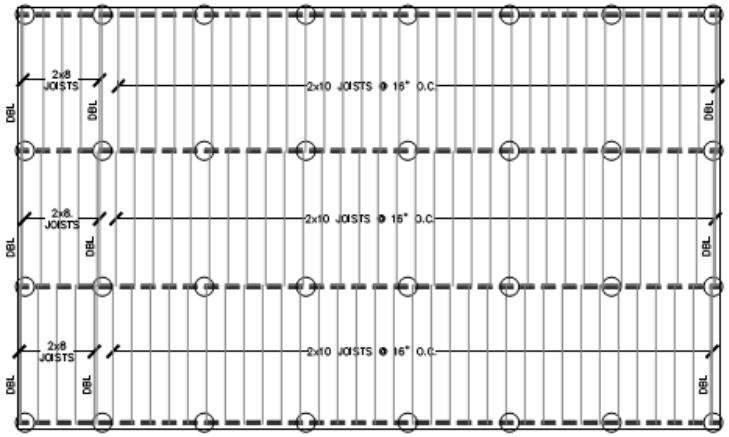
Client Name: HARRIS COUNTY, CO. HOUSTON
City, State, Zip: HARRIS COUNTY, TEXAS
City, State, Zip: HARRIS COUNTY, TEXAS
Project Name: FOUNDATION DETAILS

Title: GENERAL NOTES
Date: NOV 2019
Scale: As Shown
Sheet: F–0.0

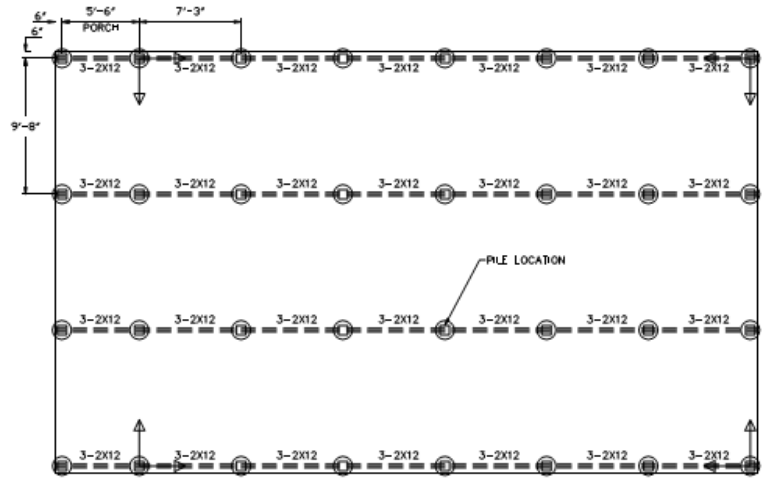
General Notes



REPRESENTATIVE PILE LAYOUT PLAN (1 STORY)

NOTES:

1. L STRINGERS TO BE 3-2x12 #2 SP PRESSURE TREATED. FASTENED TOGETHER PER DETAIL C/F-3.2
2. FLOOR JOISTS TO BE 2x10 #2 SP AT 16" O.C.
3. DBL JOISTS UNDER ALL WALLS ABOVE.
4. STRINGERS MAY BE FASTENED TO PILES WITH DET A1 OR A2 ON F3.2 FOR 8X8 SQUARE PILES



REPRESENTATIVE PILE LAYOUT PLAN (1 STORY)

HELICAL PILES (SEE SHEET F3.3) MAY BE INSTALLED IN LIEU OF WOOD PILINGS AT IDENTICAL LOCATIONS.

BRACED PILE
ARROW INDICATES DIRECTION OF BATTERED PILES
RAMJACK AND CANTSINK

11/07/2019 - FOR REVIEW

Revision/Issue

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FOUNDATION DETAILS

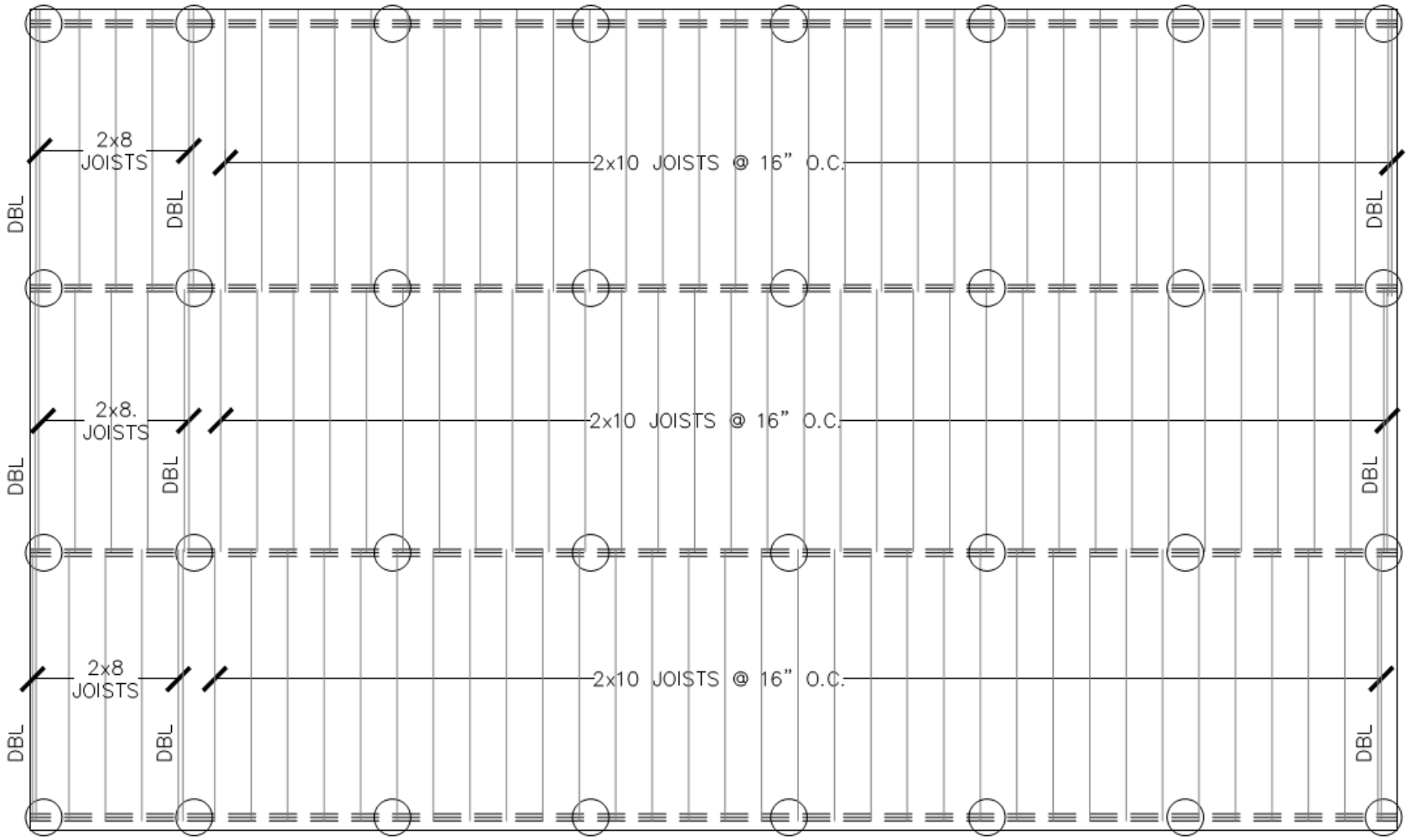
1 STORY PILE LAYOUT

NOV 2019

F-1.1

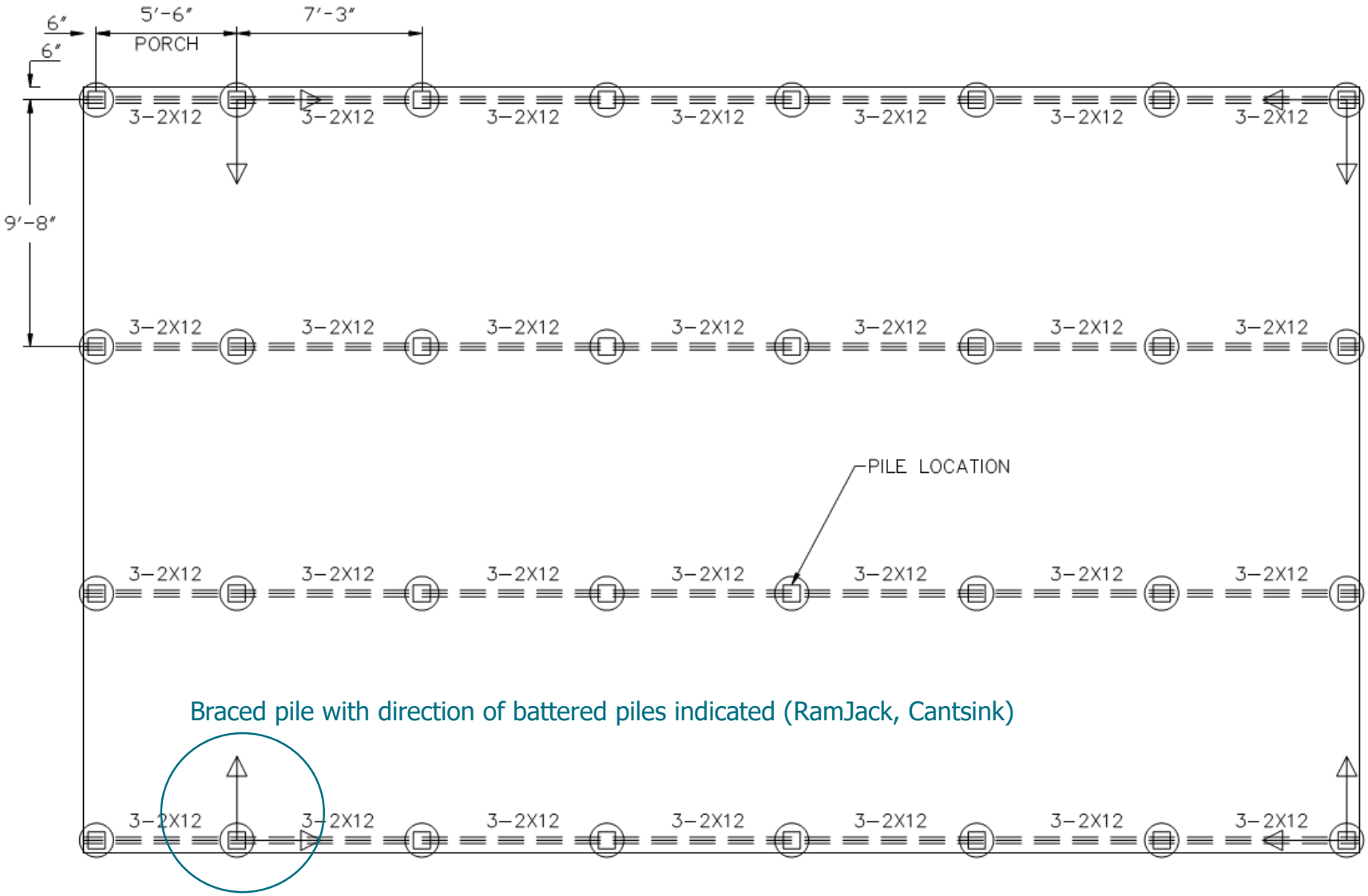
Sample Layout – 1 Story

PILES



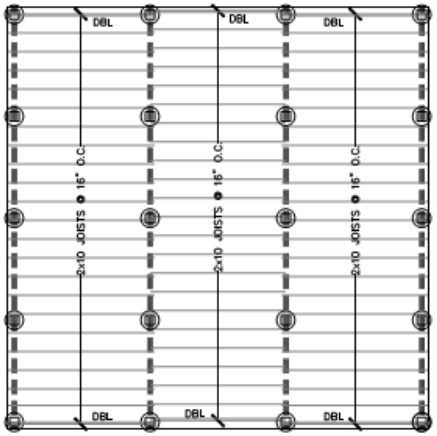
REPRESENTATIVE PILE LAYOUT PLAN (1 STORY)

FLOOR JOIST PLAN



REPRESENTATIVE PILE LAYOUT PLAN (1 STORY)

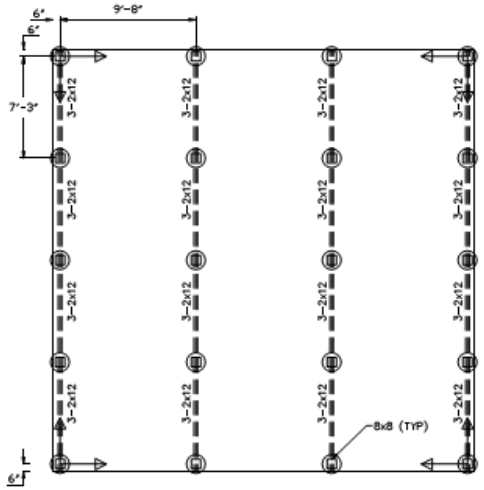
STRINGER PLAN



REPRESENTATIVE PILE LAYOUT PLAN (2 STORY)

NOTES:

1. 1. STRINGERS TO BE 3-2x12 #2 SP PRESSURE TREATED. FASTENED TOGETHER PER DETAIL C/F-3.2
2. FLOOR JOISTS TO BE 2x10 #2 SP AT 16" O.C.
3. DBL JOISTS UNDER ALL WALLS ABOVE.
4. STRINGERS MAY BE FASTENED TO PILES WITH DET A.1 OR A.2 ON F3.2 FOR 8X8 SQUARE PILES



REPRESENTATIVE PILE LAYOUT PLAN (2 STORY)

HELICAL PILES (SEE SHEET F3.3) MAY BE INSTALLED IN LIEU OF WOOD PILINGS AT IDENTICAL LOCATIONS.

BRACED PILE
ARROW INDICATES DIRECTION OF BATTERED PILES
RAMJACK AND CANTSINK

THIS DOCUMENT AND THE DESIGNS INCORPORATED HEREIN ARE NOT TO BE USED OR COPIED IN WHOLE OR IN PART FOR ANY OTHER PROJECTS OR PURPOSES WITHOUT THE EXPRESS WRITTEN AUTHORIZATION OF NOREX ENGINEERING.
NOREX ENGINEERING DISCLAIMS ANY RESPONSIBILITY FOR THE ACCURACY OF THE DESIGN REVISED IN THIS DRAWING UNTIL IT HAS SUCCESSFULLY COMPLETED ALL NECESSARY CONSTRUCTION INSPECTIONS AND RECEIVED THE ENGINEER'S VERIFICATION.

11/07/2019 - FOR REVIEW
Revision/Issue

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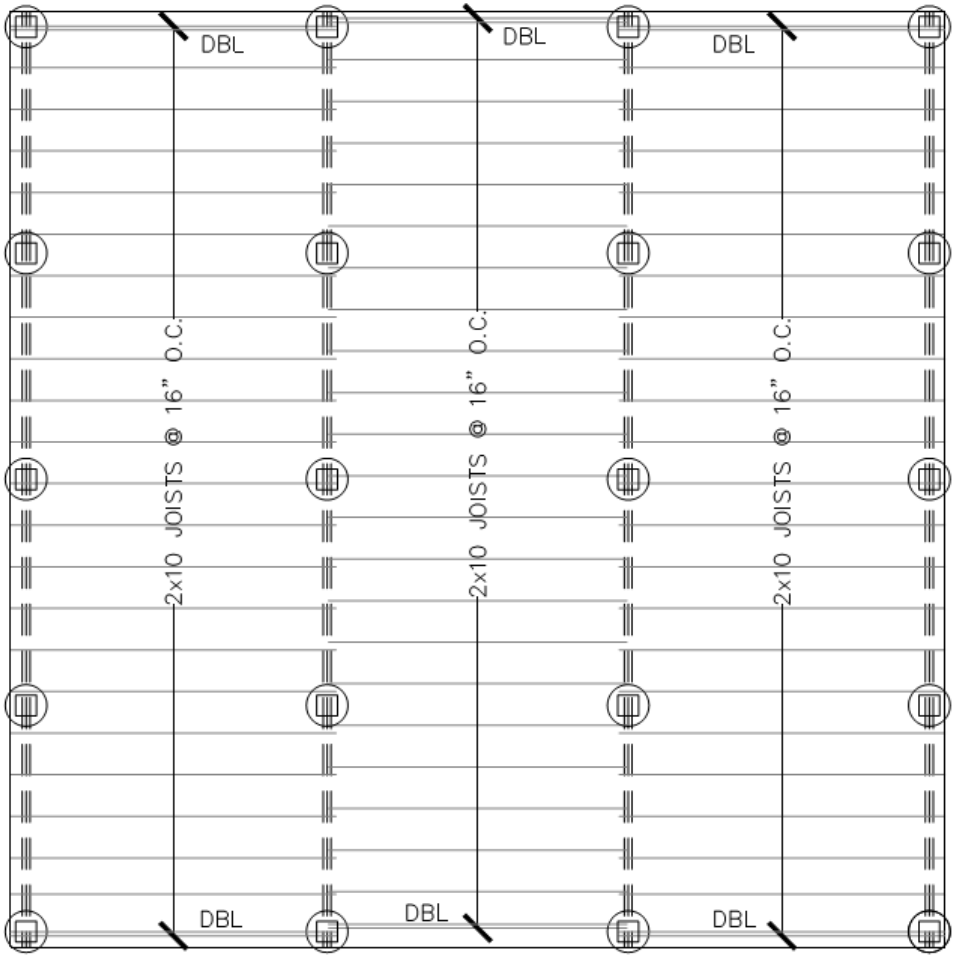
HARRIS COUNTY, CO. HOUSTON
HARRIS COUNTY, TEXAS
HARRIS COUNTY, TEXAS
FOUNDATION DETAILS

2 STORY PILE LAYOUT
NOV 2019
F-1.2

Sample Layout – 2 Story

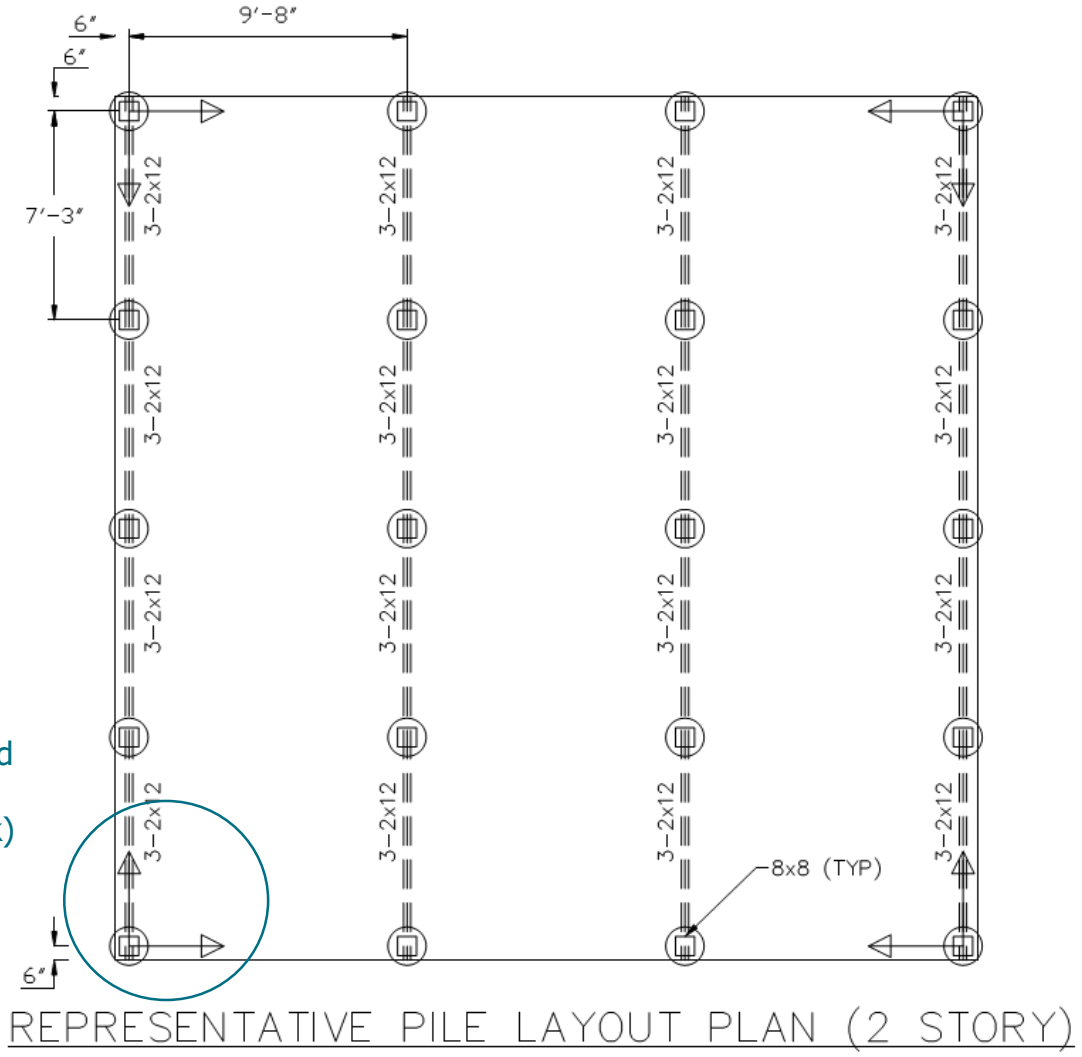
PILES



REPRESENTATIVE PILE LAYOUT PLAN (2 STORY)

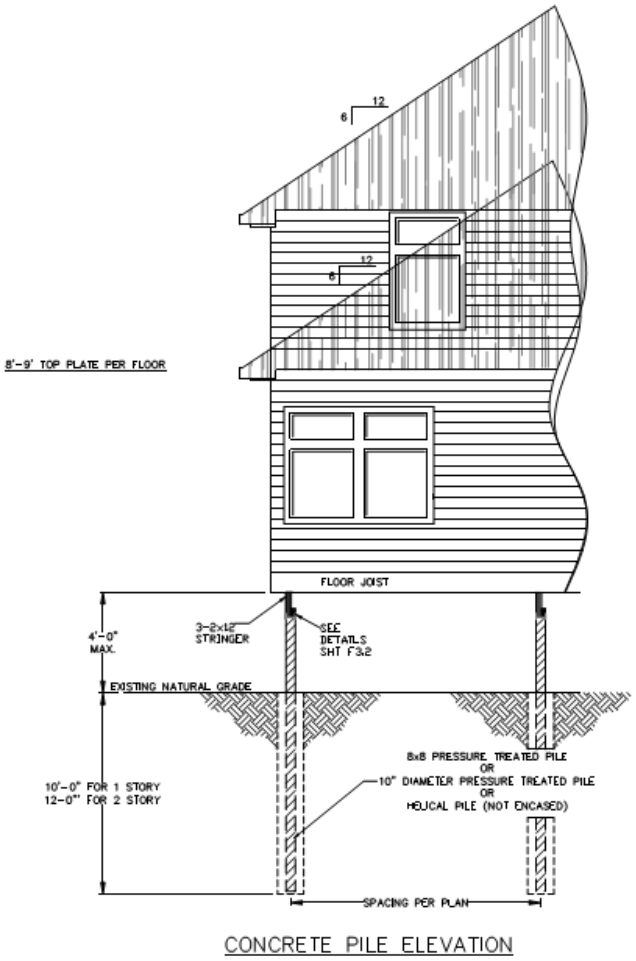
FLOOR JOIST PLAN

Braced pile with direction of battered piles indicated (RamJack, Cantsink)

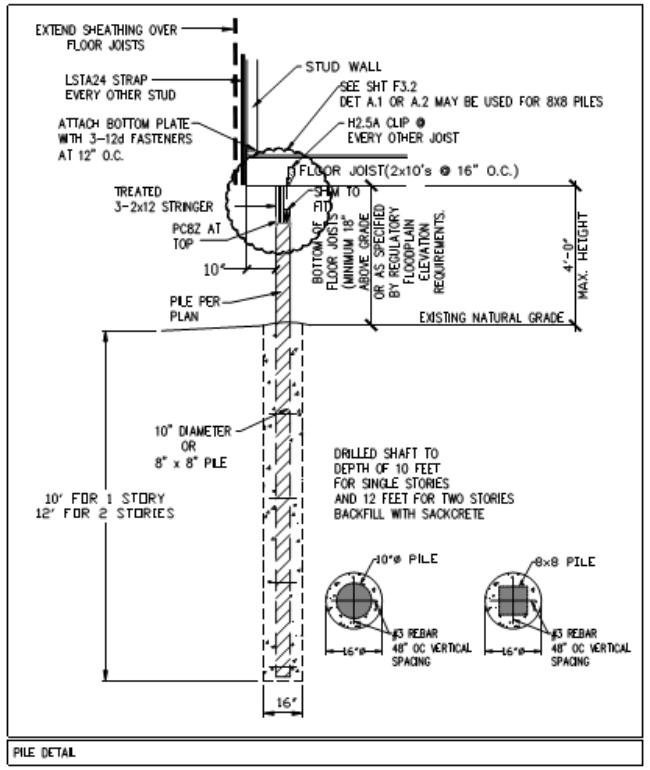


REPRESENTATIVE PILE LAYOUT PLAN (2 STORY)

STRINGER PLAN



CONCRETE PILE ELEVATION



PILE DETAIL

11/07/2019 - FOR REVIEW

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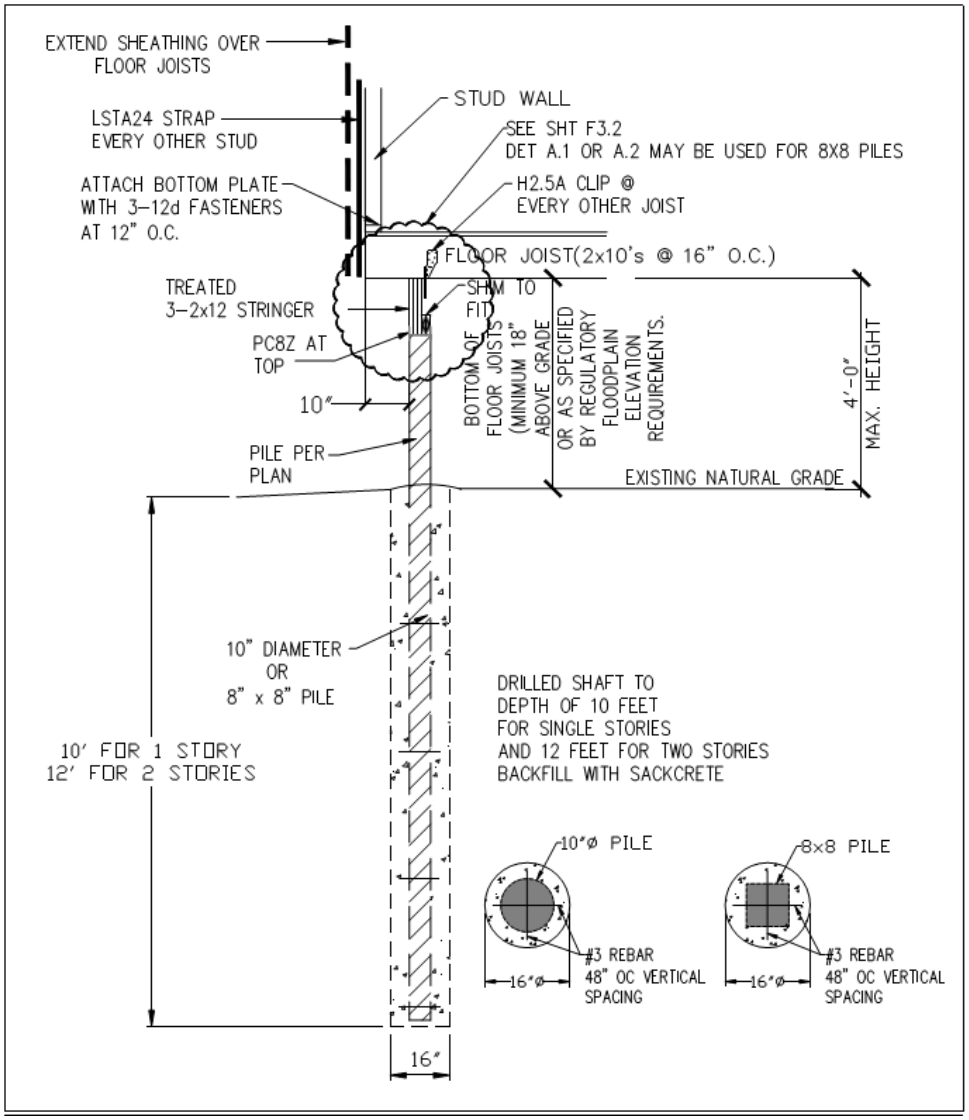
HARRIS COUNTY, TEXAS
FOUNDATION DETAILS

PILE DETAIL
NOV 2019
F-1.3

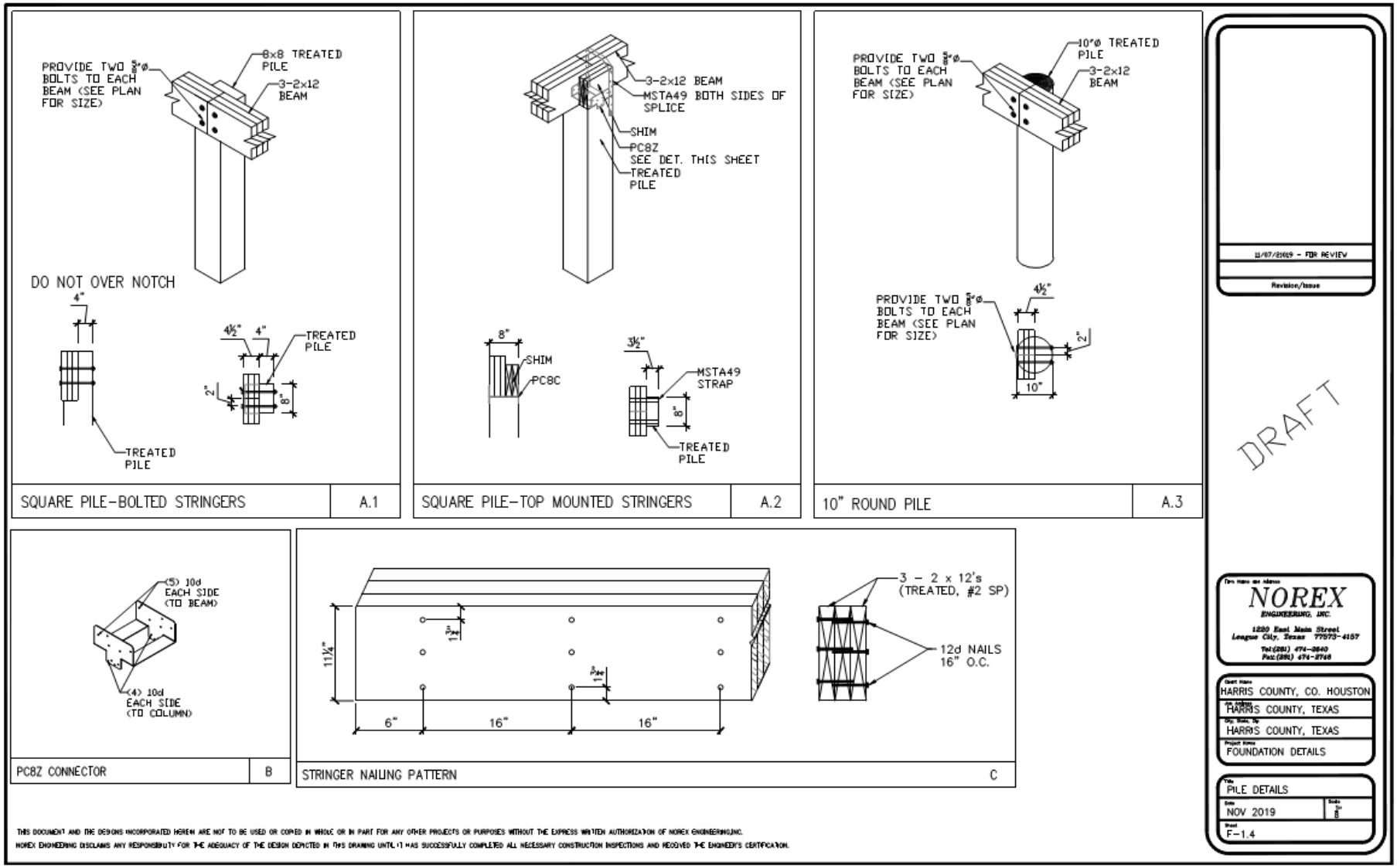
Wood Pile Details

Overview



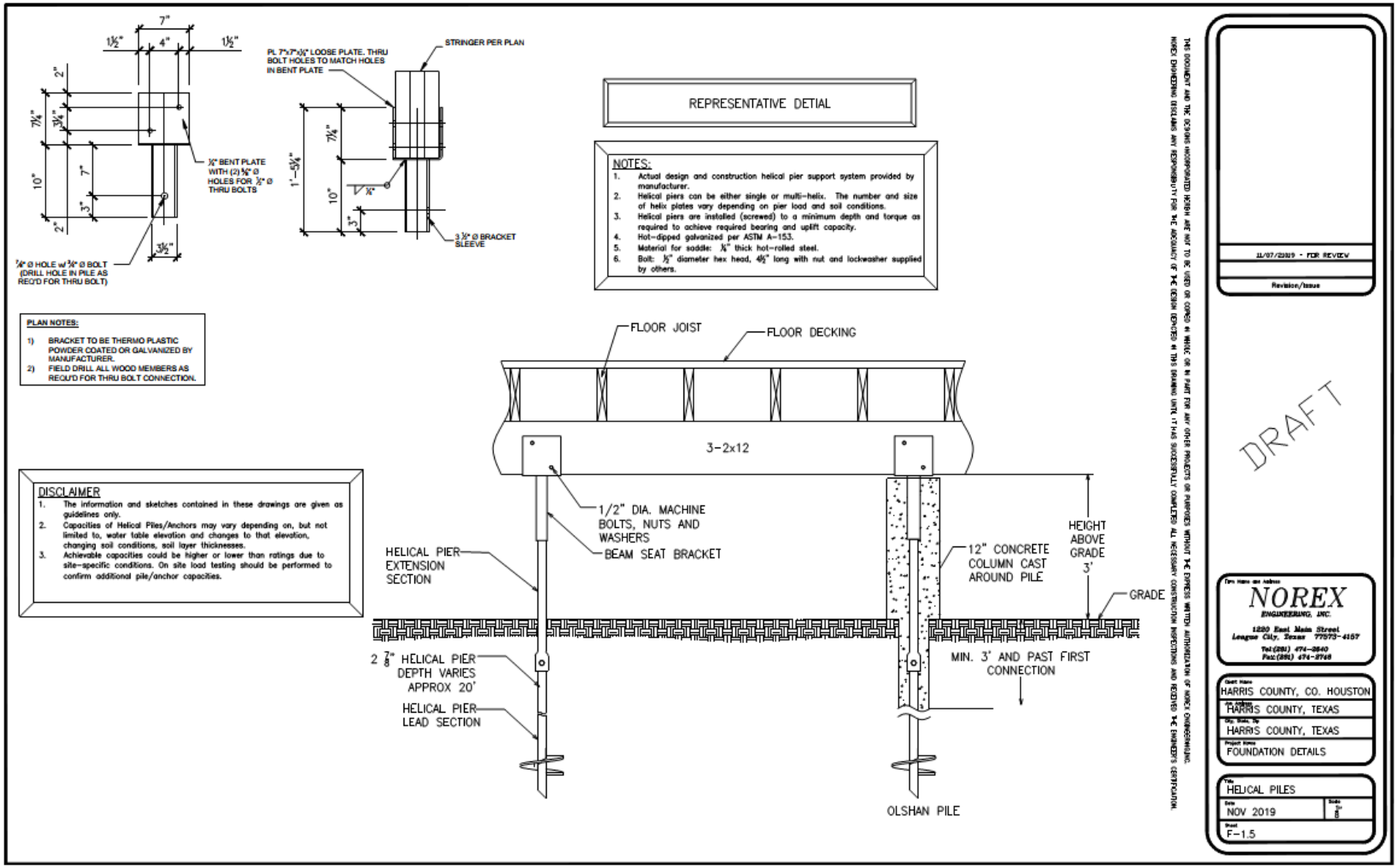
Wood Pile Details

Pile Cross Section and Connection to Stringers



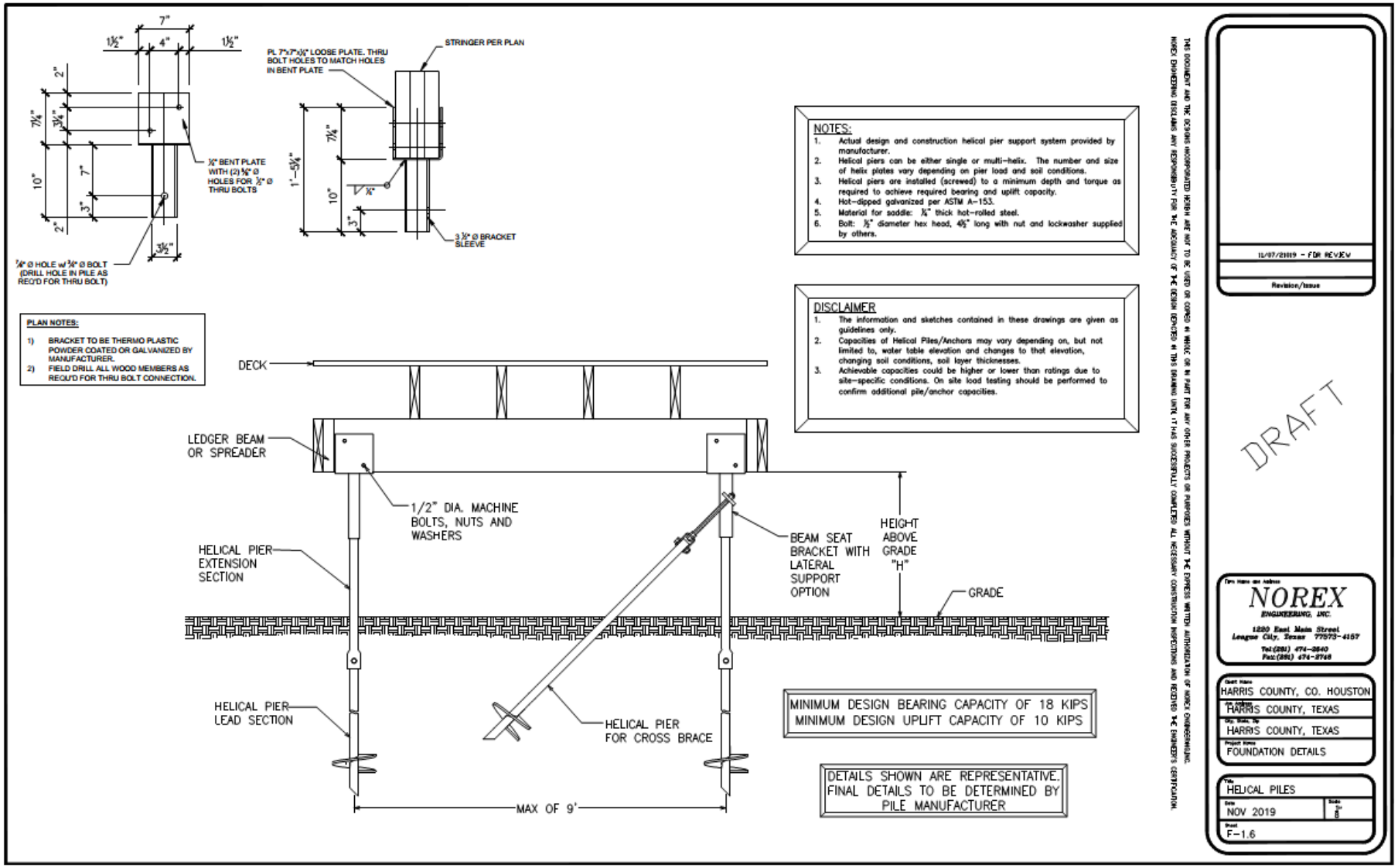
Wood Pile Details

Connections



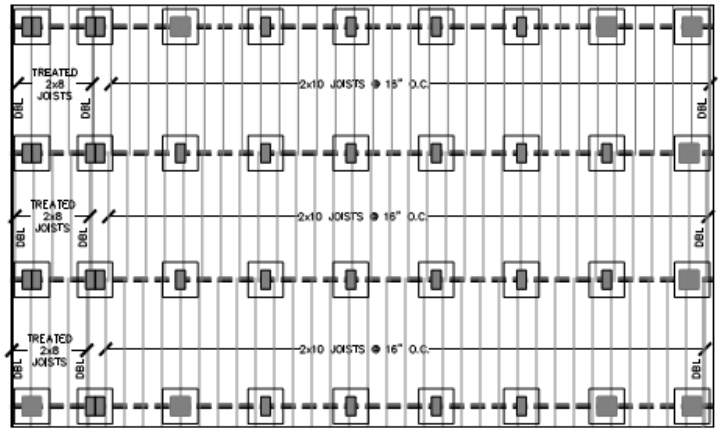
Helical Pile Details

SLEEVED - OLSHAN

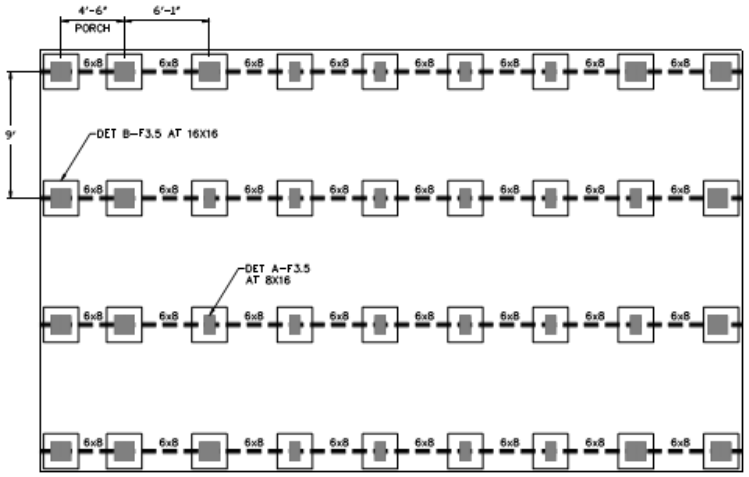


Helical Pile Details

BATTERED PILES – RAMJACK, CANTSINK



REPRESENTATIVE FOOTER LAYOUT PLAN (1 STORY)



REPRESENTATIVE FOOTER PLAN (1 STORY)

NOTES:

1. STRINGERS TO BE 6x8 #2 SP PRESSURE TREATED.
2. FLOOR JOISTS TO BE 2x10 #2 SP AT 16" O.C. U.N.O. DBL JOISTS UNDER ALL WALLS ABOVE.

21/07/2020 - FOR REVIEW

Revision/Issue

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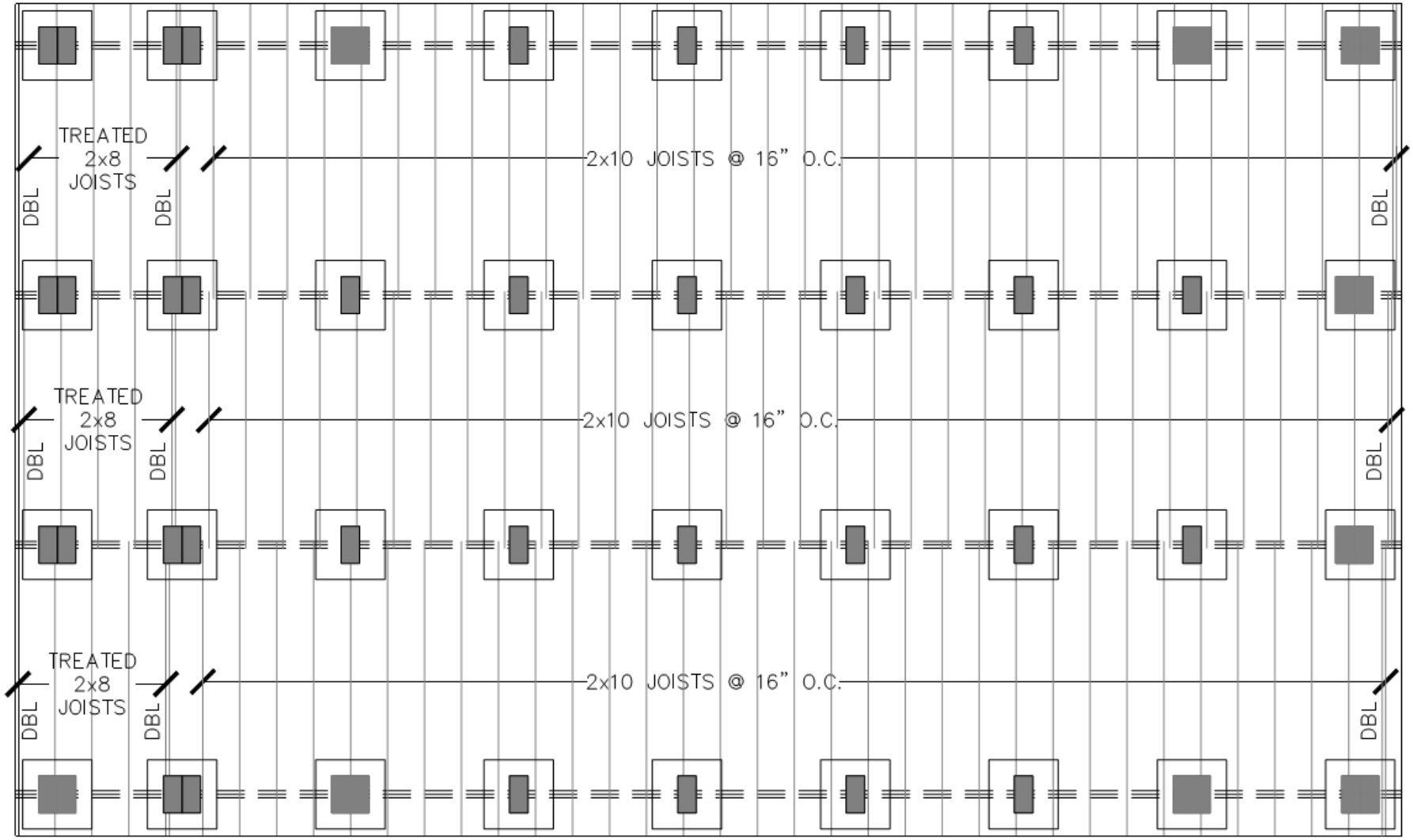
Project Name: FOUNDATION DETAILS

Title: 1 STORY FOOTER LAYOUT
Date: NOV 2019
Sheet: F-2.1

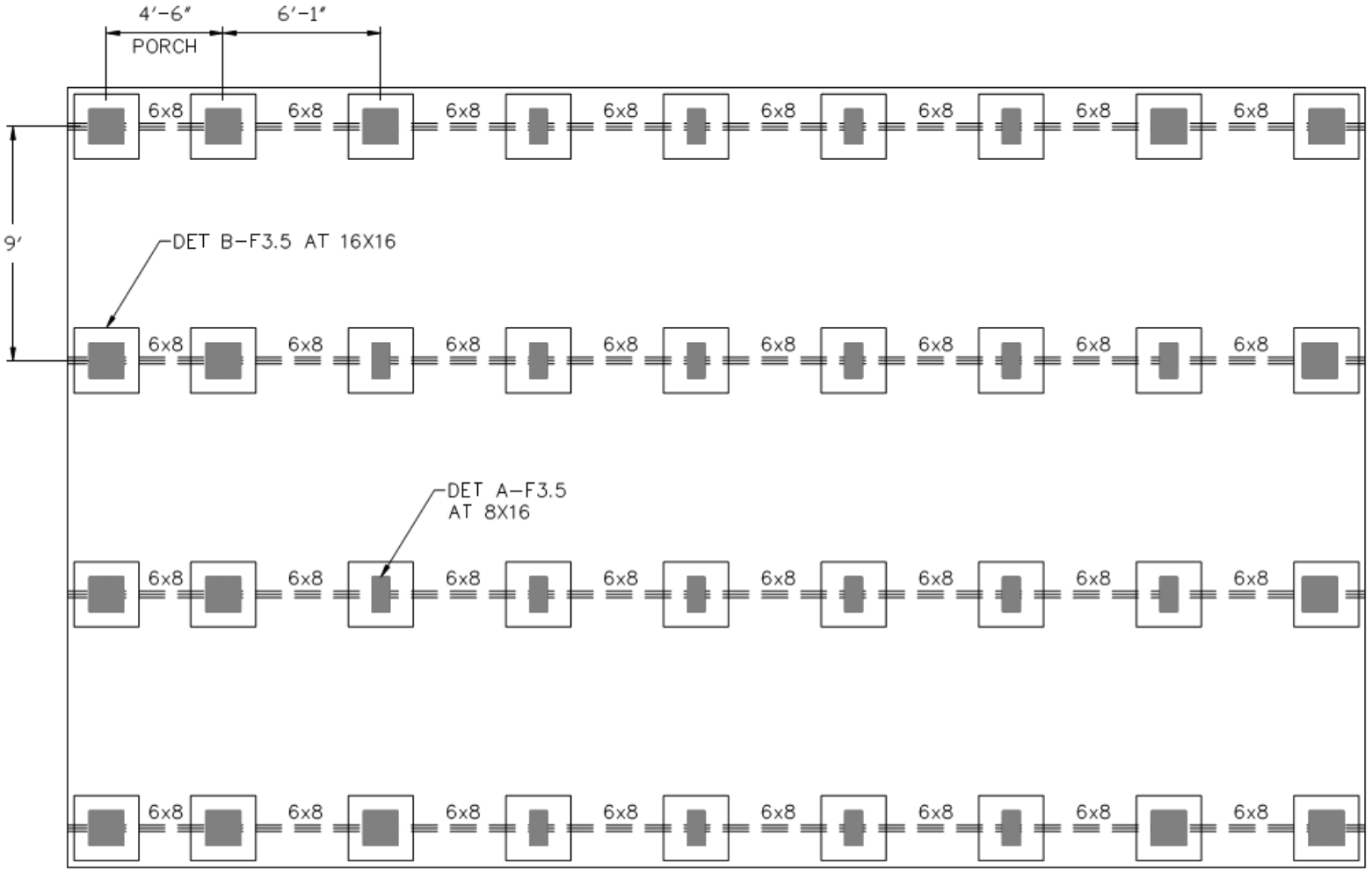
Sample Layout – 1 Story

FOOTERS



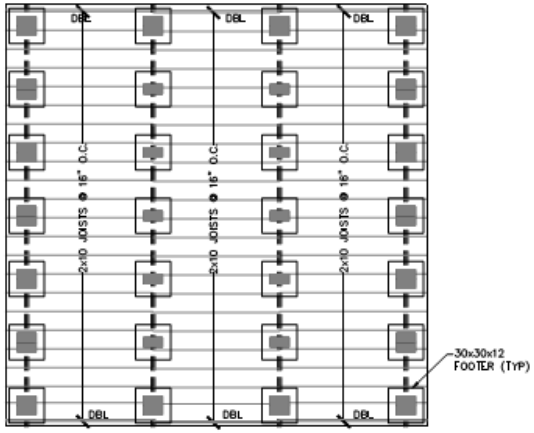
REPRESENTATIVE FOOTER LAYOUT PLAN (1 STORY)

FLOOR JOIST PLAN



REPRESENTATIVE FOOTER PLAN (1 STORY)

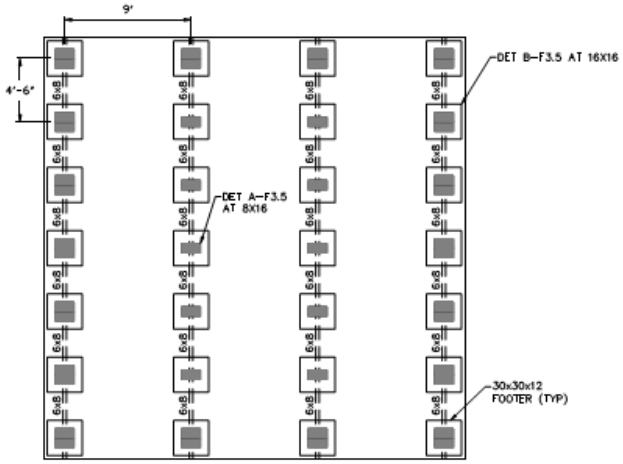
STRINGER PLAN



REPRESENTATIVE FOOTER LAYOUT PLAN (2 STORY)

NOTES:

1. STRINGERS TO BE 6x8 #2 SP PRESSURE TREATED.
2. FLOOR JOISTS TO BE 2x10 #2 SP AT 16" O.C. U.N.O. DBL JOISTS UNDER ALL WALLS ABOVE.



REPRESENTATIVE FOOTER LAYOUT PLAN (2 STORY)

11/07/2019 - FOR REVIEW

Revision/Issue

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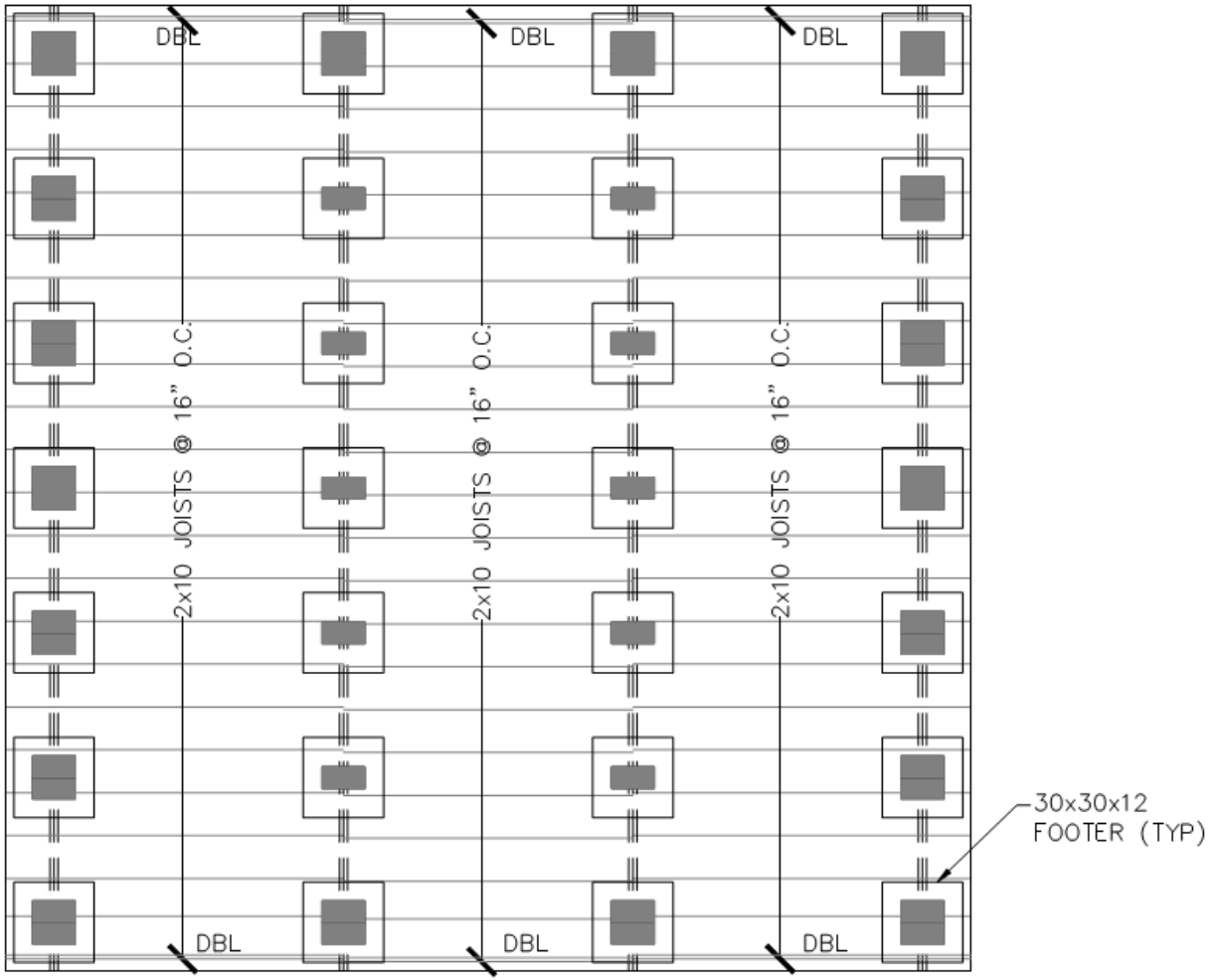
Job Address: HARRIS COUNTY, TEXAS
City, State, Zip: HARRIS COUNTY, TEXAS
Project Name: FOUNDATION DETAILS

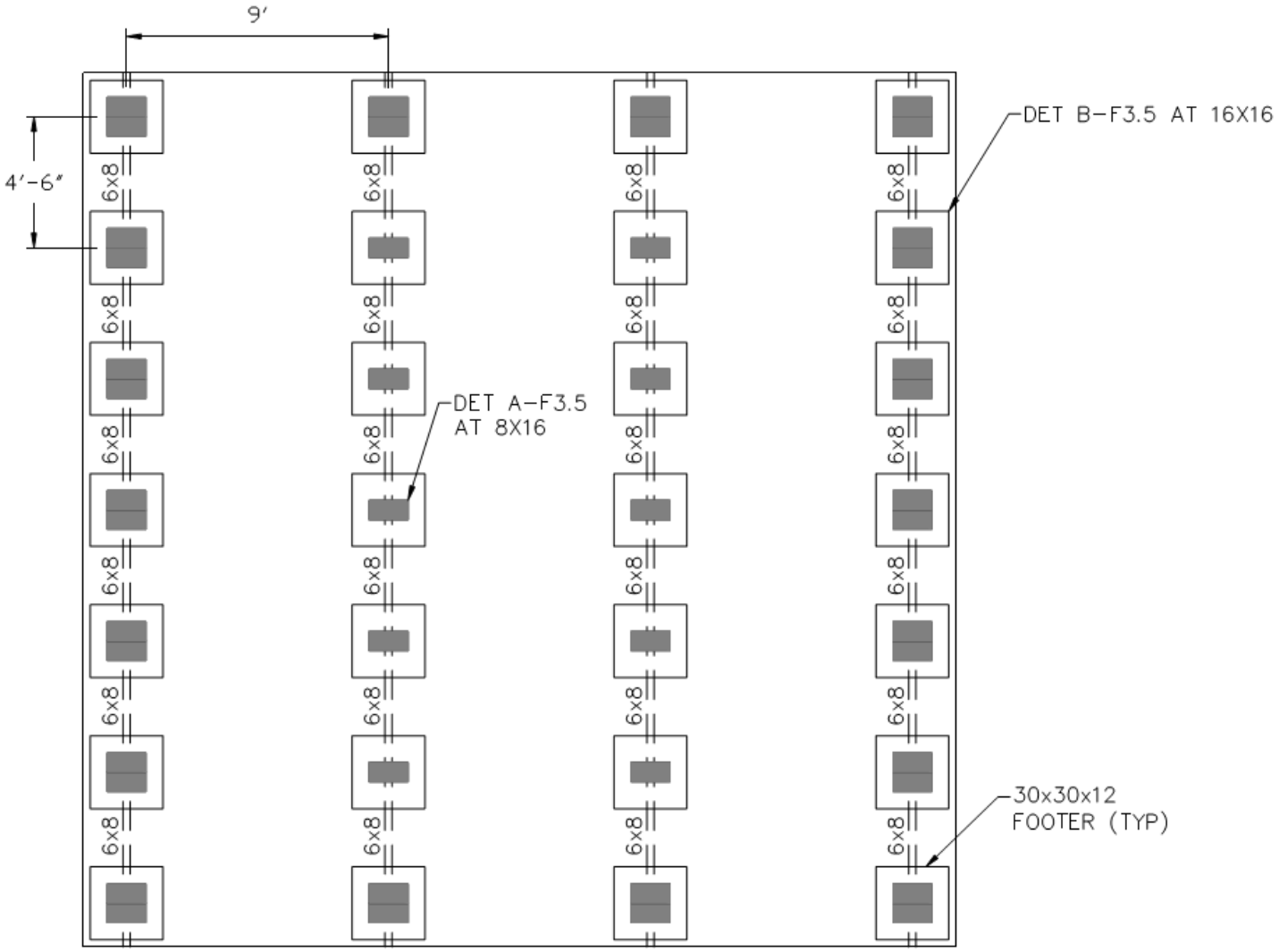
Title: 2 STORY FOOTER LAYOUT
Date: NOV 2019
Scale: 3/4" = 1'-0"
Sheet: F-2.2

Sample Layout – 2 Story
FOOTERS



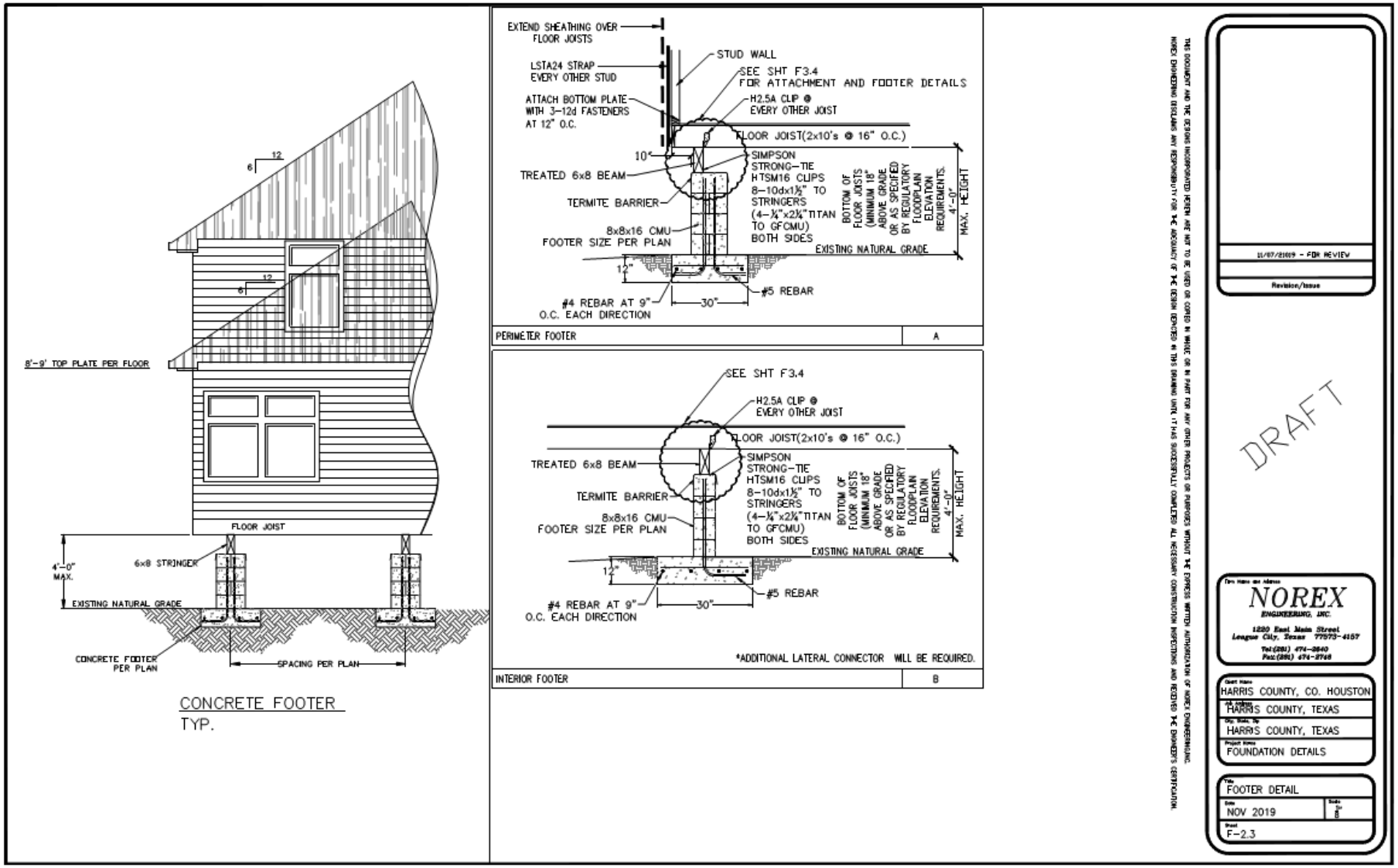
REPRESENTATIVE FOOTER LAYOUT PLAN (2 STORY)

FLOOR JOIST PLAN



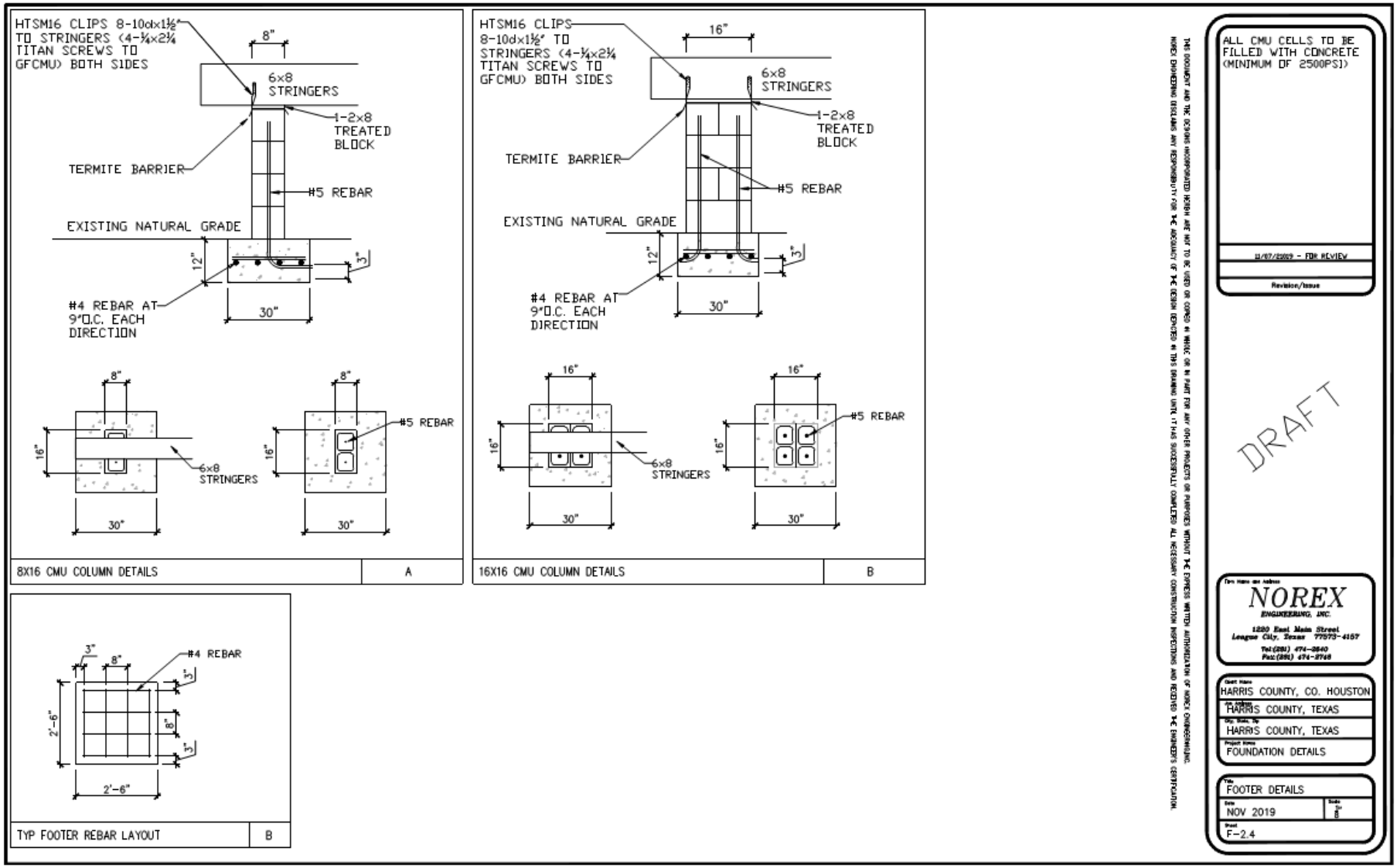
REPRESENTATIVE FOOTER LAYOUT PLAN (2 STORY)

STRINGER PLAN



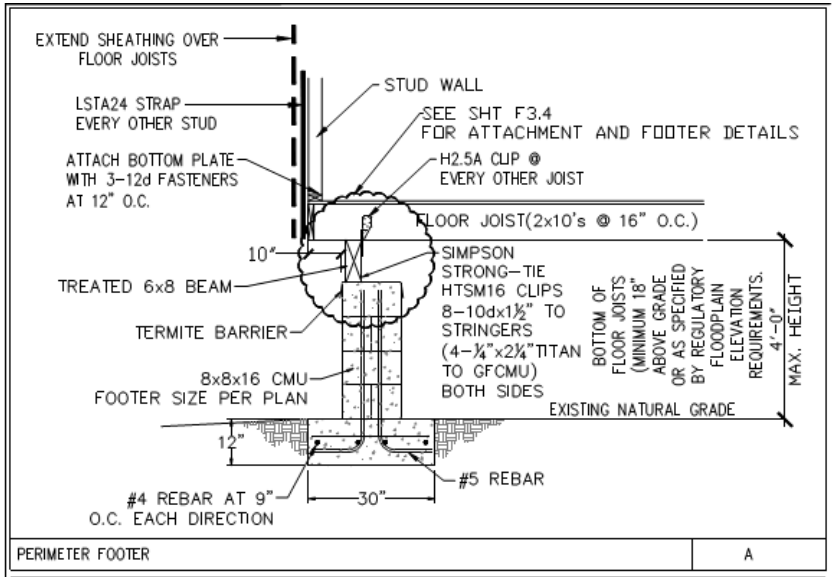
Concrete Footer Details

Overview



Concrete Footer Details

Steel Reinforcement



Concrete Footer Details

Connection to Stringers

Questions & Contact

We look forward to receiving your questions, comments, and concerns.

Please submit by December 1, 2019 to:

JointStandards@NorexEngineering.net

Digital copies of this presentation and draft copies of details are available for download through the Foundation Performance Association website:

foundationperformance.org

DRAFT - NOT FOR CONSTRUCTION

SHEET INDEX

Standard Details for

Joint City/County Low Cost and Innovative Residential Foundation Systems for Elevated Homes

Harris County and City of Houston

Prepared by Norex Engineering

NOVEMBER 2019

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Job Address: HARRIS COUNTY, TEXAS

City, State, Zip: HARRIS COUNTY, TEXAS

Project Name: FOUNDATION DETAILS

Title: COVER

Date: NOV 2019

Scale:

Sheet:

1 Story Loading
Per Pile

Gravity

Perimeter
Live Load 2565 LB
Roof Live Load 1350 LB
Dead Load 2400 LB

Interior
Live Load 3730 LB
Roof Live Load 1110 LB
Dead Load 2325 LB

PERIMETER TOTAL[3] = 5340 LB
INTERIOR TOTAL[2] = 6055 LB

Wind Loading (139 MPH Exposure B)
1100 LB at corner

1 Story Loading
Per Square Footer

Gravity

Perimeter
Live Load 2020 LB
Roof Live Load 1065 LB
Dead Load 1890 LB

Interior
Live Load 2935 LB
Roof Live Load 875 LB
Dead Load 1830 LB

PERIMETER TOTAL[3] = 4205 LB
INTERIOR TOTAL[3] = 4690 LB

Wind Loading (139 MPH Exposure B)
1100 LB at corner

2 Story Loading
Per Pile

Gravity

Perimeter
Live Load 3455 LB
Roof Live Load 770 LB
Dead Load 2785 LB

Interior
Live Load 5415 LB
Roof Live Load 1200 LB
Dead Load 3705 LB

PERIMETER TOTAL[2] = 6240 LB
INTERIOR TOTAL[2] = 9120 LB

Wind Loading (139 MPH Exposure B)
1830 LB at corner

2 Story Loading
Per Square Footer

Gravity

Perimeter
Live Load 2800 LB
Roof Live Load 400 LB
Dead Load 1540 LB

Interior
Live Load 3355 LB
Roof Live Load 630 LB
Dead Load 1950 LB

PERIMETER TOTAL[2] = 4340 LB
INTERIOR TOTAL[2] = 5305 LB

Wind Loading (139 MPH Exposure B)
1830 LB at corner

Footing Capacities (Unfactored)

Soil Bearing 1200 PSF
Skin friction 250 PSF

10' Length, 16" diameter, straight shaft
Fiction 9.4 Kips

12' Length, 16" diameter, straight shaft
Friction 10.5 Kips

Square footer 30"X30"
Bearing 7.5 Kips
Uplift 1.0 Kips (No Suction Capacity)

[1]Factored capacity with 0.6 Dead Load
[2]Load case #2 L+D
[3]Load case #3 (L+Lr)*0.75+D

Load Capacity Summary (Factored)

SINGLE STORY

Pile Loading		Footer Loading	
Pile Load	6.1 Kips	Interior Load	4.7 Kips
Pile Capacity 10'	9.4 Kips*	Footer Capacity	10.8 Kips

Wind
Maximum Uplift 1.1 Kips
Pile Capacity 10.5 Kips
Square Footer 2.1 Kips

2 STORY

Pile Loading		Footer Loading	
Pile Load	9.2 Kips	Interior Load	5.3 Kips
Pile Capacity	10.5 Kips*	Footer Capacity	10.8 Kips

Wind
Maximum Uplift 1.9 Kips
Pile Capacity 10.5 Kips
Square Footer 2.1 Kips

*Per section 18.10.3.3.1.4 frictional resistance and bearing resistance shall not be assumed to act simultaneously. Per this requirement bearing has been excluded from these capacities

LIVE LOAD NOTES:

1. UNINHABITABLE ATTICS WITHOUT STORAGE ARE THOSE WHERE THE CLEAR HEIGHT BETWEEN JOISTS AND RAFTERS IS NOT MORE THAN 42 INCHES, OR WHERE THERE ARE NOT TWO OR MORE ADJACENT TRUSSES WITH WEB CONFIGURATIONS CAPABLE OF ACCOMMODATING AN ASSUMED RECTANGLE 42 INCHES IN HEIGHT BY 24 INCHES IN WIDTH, OR GREATER, WITHIN THE PLANE OF THE TRUSSES. THIS LIVE LOAD NEED NOT BE ASSUMED TO ACT CONCURRENTLY WITH ANY OTHER LIVE LOAD REQUIREMENTS.
2. INDIVIDUAL STAIR TREADS SHALL BE DESIGNED FOR THE UNIFORMLY DISTRIBUTED LIVE LOAD OR A 300–POUND CONCENTRATED LOAD ACTING OVER AN AREA OF 4 SQUARE INCHES, WHICHEVER PRODUCES THE GREATER STRESSES.
3. SEE SECTION R507.1 FOR DECKS ATTACHED TO EXTERIOR WALLS.
4. GUARD IN–FILL COMPONENTS (ALL THOSE EXCEPT THE HANDRAIL), BALUSTERS AND PANEL FILLERS SHALL BE DESIGNED TO WITHSTAND A HORIZONTALLY APPLIED NORMAL LOAD OF 50 POUNDS ON AN AREA EQUAL TO 1 SQUARE FOOT. THIS LOAD NEED NOT BE ASSUMED TO ACT CONCURRENTLY WITH ANY OTHER LIVE LOAD REQUIREMENT.
5. UNINHABITABLE ATTICS WITH LIMITED STORAGE ARE THOSE WHERE THE CLEAR HEIGHT BETWEEN JOISTS AND RAFTERS IS 42 INCHES OR GREATER, OR WHERE THERE ARE TWO OR MORE ADJACENT TRUSSES WITH WEB CONFIGURATIONS CAPABLE OF ACCOMMODATING AN ASSUMED RECTANGLE 42 INCHES IN HEIGHT BY 24 INCHES IN WIDTH, OR GREATER, WITHIN THE PLANE OF THE TRUSSES.
6. THE LIVE LOAD NEED ONLY BE APPLIED TO THOSE PORTIONS OF THE JOISTS OR TRUSS BOTTOM CHORDS WHERE ALL OF THE FOLLOWING CONDITIONS ARE MET:
   - 6.1. THE ATTIC AREA IS ACCESSED FROM AN OPENING NOT LESS THAN 20 INCHES IN WIDTH BY 30 INCHES IN LENGTH THAT IS LOCATED WHERE THE CLEAR HEIGHT IN THE ATTIC IS NOT LESS THAN 30 INCHES.
   - 6.2. THE SLOPES OF THE JOISTS OR TRUSS BOTTOM CHORDS ARE NOT GREATER THAN 2 INCHES VERTICAL TO 12 UNITS HORIZONTAL.
   - 6.3. REQUIRED INSULATION DEPTH IS LESS THAN THE JOIST OR TRUSS BOTTOM CHORD MEMBER DEPTH.
7. THE REMAINING PORTIONS OF THE JOISTS OR TRUSS BOTTOM CHORDS SHALL BE DESIGNED FOR A UNIFORMLY DISTRIBUTED CONCURRENT LIVE LOAD OF NOT LESS THAN 10 POUNDS PER SQUARE FOOT.

IRC TABLE R301.5
MINIMUM UNIFORMLY DISTRIBUTED LIVE LOADS
(POUNDS PER SQUARE FOOT)

USE	LIVE LOAD
ATTICS WITHOUT STORAGE	10
ATTICS WITH LIMITED STORAGE	20
HABITABLE ATTICS AND ATTICS SERVED WITH FIXED STAIRS	30
BALCONIES (EXTERIOR) AND DECKS	40
FIRE ESCAPES	40
GUARDRAILS AND HANDRAILS	200
GUARDRAIL IN–FILL COMPONENTS	50
PASSENGER VEHICLE GARAGES	50
ROOMS OTHER THAN SLEEPING ROOM	40
SLEEPING ROOMS	30
STAIRS	40

FOR SI: 1 POUND PER SQUARE FOOT=0.0479 kPa,
1 SQUARE INCH=645 MM2, 1 POUND=4.45 N.

11/07/21019 - FOR REVIEW

Revision/Issue

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City, State, Zip
HARRIS COUNTY, TEXAS

Project Name
FOUNDATION DETAILS

Title
CALCULATIONS

Date
NOV 2019

Scale
1"
0

Sheet
C–1.0

GENERAL NOTES– SITE WORK

1. SITE PREPARATION SHALL BE IN ACCORDANCE WITH THE SOILS REPORT RECOMMENDATIONS (IF AVAILABLE) AND SHALL MEET THE FOLLOWING MINIMUM REQUIREMENTS:
   - 1.A. STRIP ALL VEGETATION DOWN TO NATURAL SOIL. REMOVE ALL TREES WITHIN 10 FEET OF THE PERIMETER OF THE STRUCTURE WHEN MEASURED TO THE FACE OF THE TRUNK.
   - 1.B. PROOF–ROLL EXPOSED SUBGRADE. BACK FILL AND COMPACT TREE–HOLES OR SOFT POCKETS WITH MATERIAL SIMILAR TO THE EXISTING SITE MATERIALS.
   - 1.C. BRING SUB GRADE TO REQUIRED ELEVATION WITH SELECT FILL MATERIAL. SELECT FILL SHALL BE SANDY CLAY OR SAND, FREE OF ORGANIC MATERIAL, HAVING A PLASTICITY INDEX GREATER THAN 7 BUT LESS THAN 20
   - 1.D. INITIAL SITE GRADING SHALL BE COMPLETED PRIOR TO SETTING FORMS. FINAL GRADE SHALL SLOPE AWAY FROM THE FOUNDATION 1 INCH/FOOT FOR THE FIRST 5 FEET SUCH THAT POSITIVE DRAINAGE AWAY FROM THE SLAB IS ASSURED.
2. DURING CONSTRUCTION A DRAINAGE TRENCH SHALL BE FORMED SUCH THAT ANY WATER WHICH INTRUDES INTO THE FOUNDATION WILL IMMEDIATELY DRAIN OUT OF THE BOTTOM OF CAST FOOTERS.

GENERAL NOTES– CONCRETE

1. CONCRETE SHALL BE SUPPLIED AND CONSTRUCTED IN ACCORDANCE WITH AC1–318 LATEST EDITION AND SHALL HAVE A MINIMUM 28–DAY COMPRESSIVE STRENGTH OF 3000 PSI.
2. WATER SHALL NOT BE ADDED TO CONCRETE AT THE JOB SITE.
3. CONCRETE SHALL NOT BE PLACED AT TEMPERATURES BELOW 40 DEGREES F, IN RAINY WEATHER OR IN OTHER ADVERSE WEATHER CONDITIONS.
4. CURE ALL SLABS WITH CHEMICAL CURING COMPOUND OR KEEP MOIST FOR 7 DAYS AFTER PLACEMENT.
5. BUILDER SHALL VERIFY ALL DIMENSIONS, DROPS, OFFSETS, BRICK LEDGES, INSERTS AND OPENINGS WITH ARCHITECTURAL DRAWINGS.

GENERAL NOTES – REINFORCED STEEL

1. REINFORCING STEEL SHALL BE PER ASTM A615 GRADE 60 WITH DEFORMATION PER ASTM A 305 AND SHALL BE DETAILED AND INSTALLED PER ACI–318 LATEST EDITION

ANCHOR BOLTS

1. ANCHOR BOLTS (ANCHOR RODS) SHALL CONFORM TO ASTM A307 OR F1554 GRADE 36, UNLESS NOTED OTHERWISE.
2. ALL EPOXY ANCHORS SHALL BE HIT RE 500 SD EPOXY ADHESIVE OR HIT HY 150 MAX SD AS MANUFACTURED BY HILTI INC. OR APPROVED EQUIVALENT. ALL ANCHORS SHALL BE SET IN CONCRETE, 100% GROUT FILLED MASONRY OR SOLID MASONRY WITH MINIMUM 2 1/4" EMBEDMENT LENGTH.

SUBFOOR

1. ALL LUMBER SHALL BE #2 SOUTHER YELLOW PINE
2. ALL EXPOSED LUMBER TO BE PRESSURE TREATED
3. DRIVEN PILES SHALL BE TREATED WITH A RATING OF UC4C (0.8 CCA) PER THE AMERICAN WOOD PRESERVATION ASSOCIATION.

GENERAL NOTES – HELICAL PILES

1. PILE SYSTEM SHALL BE ICC CERTIFIED AND CERTIFICATION DOCUMENTS SHALL BE SUPPLIED TO OWNER PRIOR TO INSTALLATION.
2. PILE SHALL BE COATED OR TREATED TO RESIST DEGRADATION FROM MOISTURE.
3. MANUFACTURER TO HAVE IN EFFECT INDUSTRY RECOGNIZED WRITTEN QUALITY CONTROL AND ASSURANCE FOR ALL MATERIALS AND MANUFACTURING PROCESSES.
4. MANUFACTURER SHALL BE ISO CERTIFIED.
5. ALL WELDING IS TO BE DONE BY WELDERS CERTIFIED UNDER SECTION 5 OF THE AWS CODE D1.1.
6. THE CAPACITY OF THE PILING SYSTEM IS A FUNCTION OF MANY INDIVIDUAL ELEMENTS, INCLUDING THE CAPACITY OF THE FOUNDATION, BRACKET, PIER SHAFT, HELICAL PLATE, AND BEARING STRATA, AS WELL AS THE STRENGTH OF THE FOUNDATION BRACKET CONNECTION AND THE QUALITY OF THE INSTALLATION OF THE PILE.
7. TEST PILES SHALL BE INSTALLED TO DETERMINE SOIL CAPACITY PRIOR TO SELECTION OF PILES.

GENERAL NOTES– MISCELLANEOUS & LIMITATIONS

1. THIS FOUNDATION IS DESIGNED IN ACCORDANCE WITH CURRENT NOREX ENGINEERING PRACTICES AND ADVISES THE BUILDER AND ALL CLIENTS THAT INSPECTION SERVICES ARE AVAILABLE PRIOR TO CONCRETE POUR AND DURING THE POUR. IF THESE INSPECTIONS ARE NOT PERFORMED BY NOREX, THEN NOREX ACCEPTS NO RESPONSIBILITY WHATSOEVER FOR THE PROPER IMPLEMENTATION OF ITS PLANS AND SPECIFICATIONS.
2. SCREEN OR SKIRT DESIGN FOR THE CRAWLSPACE IS NOT PROVIDED/INCLUDED IN THESE DOCUMENTS
3. WARNINGS:
   - 3.A. THE OWNER MUST ENSURE THAT THE MOISTURE CONTENT OF THE SOIL IS MAINTAINED AT A CONSISTENT LEVEL. DRAINAGE SHOULD BE MAINTAINED SUCH THAT THE PONDING OF WATER DOES NOT DEVELOP. IF WATER IS PONDING, THE BUILDER SHOULD BE CONTACTED TO IMPROVE DRAINAGE.
   - 3.B. THE OWNER SHOULD NOT PLANT TREES WITHIN 20 FEET OF THE PERIMETER OF THE STRUCTURE WHEN MEASURE TO THE FACE OF THE TRUNK.

GENERAL NOTES– DESIGN

1. THIS FOUNDATION IS DESIGNED IN ACCORDANCE WITH CURRENT ACCEPTABLE ENGINEERING PRACTICES AND SHALL NOT BE USED FOR PROJECTS OUTSIDE OF THE STATED LIMITATIONS IN THESE DOCUMENTS.
2. THE DESIGN IS BASED ON THE FOLLOWING ASSUMPTIONS:
   - 2.A. FINAL GRADING IS COMPLETED AS OUTLINED IN THE GENERAL NOTES–SITEWORK.
   - 2.B. THE FOUNDATION IS NOT INSTALLED DURING A DRY OR WET PERIOD WHICH IS CONSIDERED EXTREME OR ABNORMAL FOR THE AREA. IF SUCH IS THE CASE, BUILDER SHALL NOTIFY THE ENGINEER FOR A POSSIBLE RE–DESIGN.
   - 2.C. NO SITE SPECIFIC SOIL REPORT PROVIDED FOR THIS PROJECT. SOIL BEARING CAPACITY BASED ON THE 2015 INTERNATIONAL RESIDENTIAL/BUILDING CODE, TABLE 401.4.1 AND TABLE 1806.2 RESPECTIVELY. THE SOIL BEARING PRESSURE SHALL BE 1200 PSF MINIMUM.
3. BOTTOM OF FLOOR JOISTS SHALL BE AS SPECIFIED BY REGULATORY FLOODPLAIN ELEVATION REQUIREMENTS AND A MAXIMUM OF 4 FEET ABOVE EXISTING GRADE.
4. PILES/COLUMNS SHALL BE SPACED AT A MAXIMUM OF 7'–6" FROM CENTER TO CENTER UNLESS NOTED OTHERWISE PER FRAMING PLAN.
5. DESIGN WINDSPEED SHALL BE 139 MPH, EXPOSURE B AS PER ASCE 7–10,
6. ROOF PITCH SHALL NOT EXCEED 6:12.
7. WALL PLATE HEIGHT/CEILING HEIGHT SHALL NOT EXCEED 9 FEET.
8. SEISMIC DESIGN LOADS DO NOT GOVERN.
9. STRUCTURE SHALL NOT EXCEED TWO STORIES.
10. STRUCTURES SHALL BE LESS THAN OR EQUAL TO 2000 SQ.FT.
11. DESIGN SHALL ALSO COMPLY WITH CITY OF HOUSTON AND/OR HARRIS COUNTY CODES, ORDINANCES, AND REGULATIONS
12. MEAN ROOF HEIGHT FOR 1–STORY SHALL NOT EXCEED 15 FEET.
13. MEAN ROOF HEIGHT FOR 2–STORY SHALL NOT EXCEED 25 FEET.
14. STRUCTURE SHALL NOT BE CONSTRUCTED IN V–ZONE FLOODWAY AREAS.
15. THE LIVE LOAD CRITERIA IS AS FOLLOWS:

LIVE LOAD NOTES

1. UNINHABITABLE ATTICS WITHOUT STORAGE ARE THOSE WHERE THE CLEAR HEIGHT BETWEEN JOISTS AND RAFTERS IS NOT MORE THAN 42 INCHES, OR WHERE THERE ARE NOT TWO OR MORE ADJACENT TRUSSES WITH WEB CONFIGURATIONS CAPABLE OF ACCOMMODATING AN ASSUMED RECTANGLE 42 INCHES IN HEIGHT BY 24 INCHES IN WIDTH, OR GREATER, WITHIN THE PLANE OF THE TRUSSES. THIS LIVE LOAD NEED NOT BE ASSUMED TO ACT CONCURRENTLY WITH ANY OTHER LIVE LOAD REQUIREMENTS.
2. INDIVIDUAL STAIR TREADS SHALL BE DESIGNED FOR THE UNIFORMLY DISTRIBUTED LIVE LOAD OR A 300–POUND CONCENTRATED LOAD ACTING OVER AN AREA OF 4 SQUARE INCHES, WHICHEVER PRODUCES THE GREATER STRESSES.
3. SEE SECTION R507.1 FOR DECKS ATTACHED TO EXTERIOR WALLS.
4. GUARD IN–FILL COMPONENTS (ALL THOSE EXCEPT THE HANDRAIL), BALUSTERS AND PANEL FILLERS SHALL BE DESIGNED TO WITHSTAND A HORIZONTALLY APPLIED NORMAL LOAD OF 50 POUNDS ON AN AREA EQUAL TO 1 SQUARE FOOT. THIS LOAD NEED NOT BE ASSUMED TO ACT CONCURRENTLY WITH ANY OTHER LIVE LOAD REQUIREMENT.
5. UNINHABITABLE ATTICS WITH LIMITED STORAGE ARE THOSE WHERE THE CLEAR HEIGHT BETWEEN JOISTS AND RAFTERS IS 42 INCHES OR GREATER, OR WHERE THERE ARE TWO OR MORE ADJACENT TRUSSES WITH WEB CONFIGURATIONS CAPABLE OF ACCOMMODATING AN ASSUMED RECTANGLE 42 INCHES IN HEIGHT BY 24 INCHES IN WIDTH, OR GREATER, WITHIN THE PLANE OF THE TRUSSES.
6. THE LIVE LOAD NEED ONLY BE APPLIED TO THOSE PORTIONS OF THE JOISTS OR TRUSS BOTTOM CHORDS WHERE ALL OF THE FOLLOWING CONDITIONS ARE MET:
   - 6.1. THE ATTIC AREA IS ACCESSED FROM AN OPENING NOT LESS THAN 20 INCHES IN WIDTH BY 30 INCHES IN LENGTH THAT IS LOCATED WHERE THE CLEAR HEIGHT IN THE ATTIC IS NOT LESS THAN 30 INCHES.
   - 6.2. THE SLOPES OF THE JOISTS OR TRUSS BOTTOM CHORDS ARE NOT GREATER THAN 2 INCHES VERTICAL TO 12 UNITS HORIZONTAL.
   - 6.3. REQUIRED INSULATION DEPTH IS LESS THAN THE JOIST OR TRUSS BOTTOM CHORD MEMBER DEPTH.
7. THE REMAINING PORTIONS OF THE JOISTS OR TRUSS BOTTOM CHORDS SHALL BE DESIGNED FOR A UNIFORMLY DISTRIBUTED CONCURRENT LIVE LOAD OF NOT LESS THAN 10 POUNDS PER SQUARE FOOT.

IRC TABLE R301.5
MINIMUM UNIFORMLY DISTRIBUTED LIVE LOADS
(POUNDS PER SQUARE FOOT)

USE	LIVE LOAD
ATTICS WITHOUT STORAGE	10
ATTICS WITH LIMITED STORAGE	20
HABITABLE ATTICS AND ATTICS SERVED WITH FIXED STAIRS	30
BALCONIES (EXTERIOR) AND DECKS	40
FIRE ESCAPES	40
GUARDRAILS AND HANDRAILS	200
GUARDRAIL IN–FILL COMPONENTS	50
PASSENGER VEHICLE GARAGES	50
ROOMS OTHER THAN SLEEPING ROOM	40
SLEEPING ROOMS	30
STAIRS	40

FOR SI: 1 POUND PER SQUARE FOOT=0.0479 kPa,
1 SQUARE INCH=645 MM2, 1 POUND=4.45 N.

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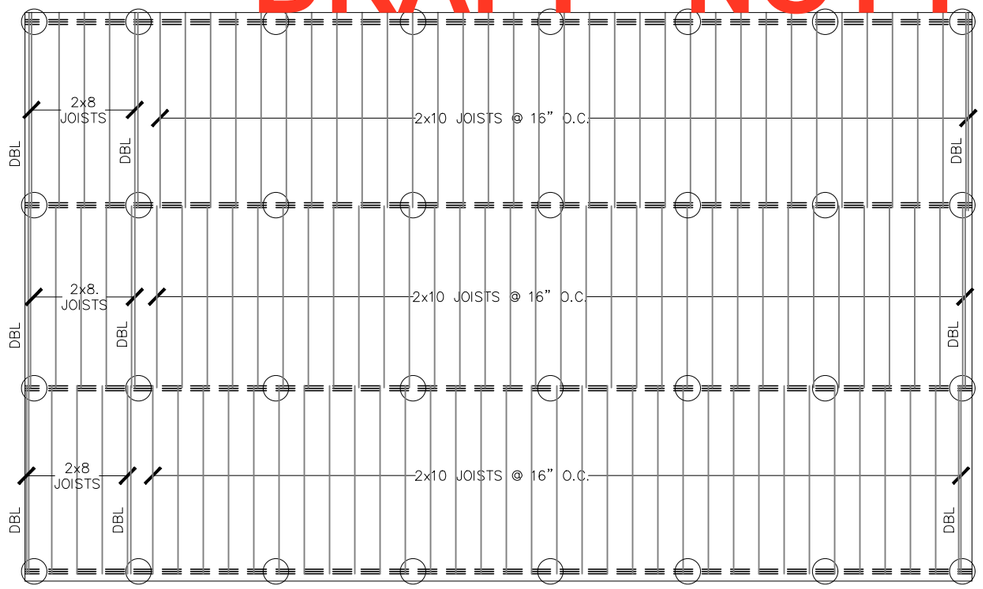
Client Name: HARRIS COUNTY, CO. HOUSTON
Job Address: HARRIS COUNTY, TEXAS
City, State, Zip: HARRIS COUNTY, TEXAS
Project Name: FOUNDATION DETAILS

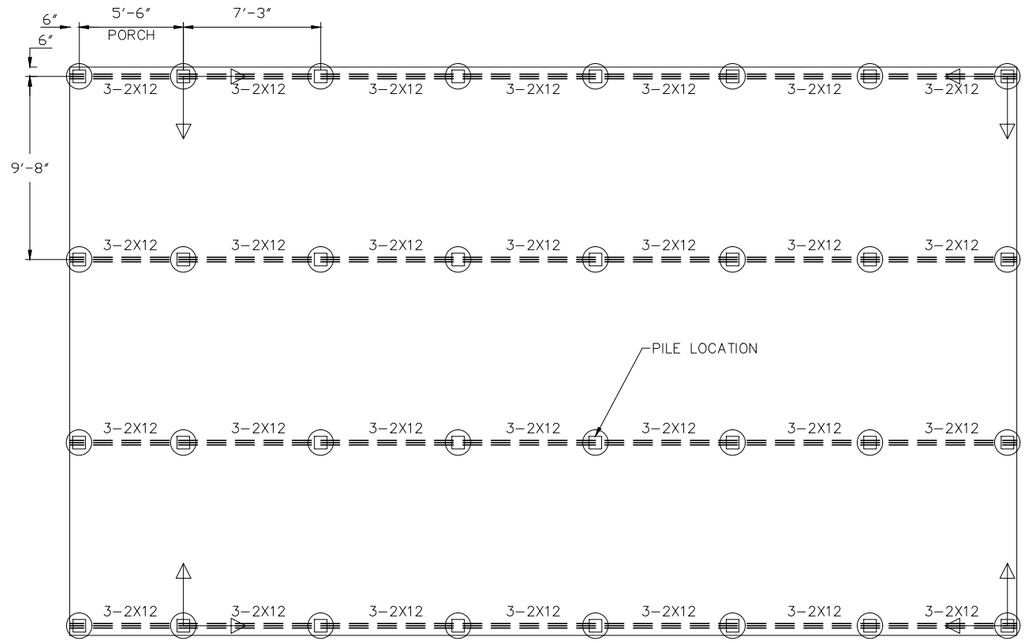
Title: GENERAL NOTES
Date: NOV 2019
Scale: 1" 8
Sheet: F–0.0



REPRESENTATIVE PILE LAYOUT PLAN (1 STORY)

NOTES:

1. 1. STRINGERS TO BE 3-2x12 #2 SP PRESSURE TREATED. FASTENED TOGETHER PER DETAIL C/F-3.2
2. FLOOR JOISTS TO BE 2x10 #2 SP AT 16" O.C.
3. DBL JOISTS UNDER ALL WALLS ABOVE.
4. STRINGERS MAY BE FASTENED TO PLIES WITH DET A.1 OR A.2 ON F3.2 FOR 8X8 SQUARE PILES



REPRESENTATIVE PILE LAYOUT PLAN (1 STORY)

HELICAL PILES (SEE SHEET F3.3) MAY BE INSTALLED IN LIEU OF WOOD PILINGS AT IDENTICAL LOCATIONS.

BRACED PILE
ARROW INDICATES DIRECTION OF BATTERED PILES
RAMJACK AND CANTSINK

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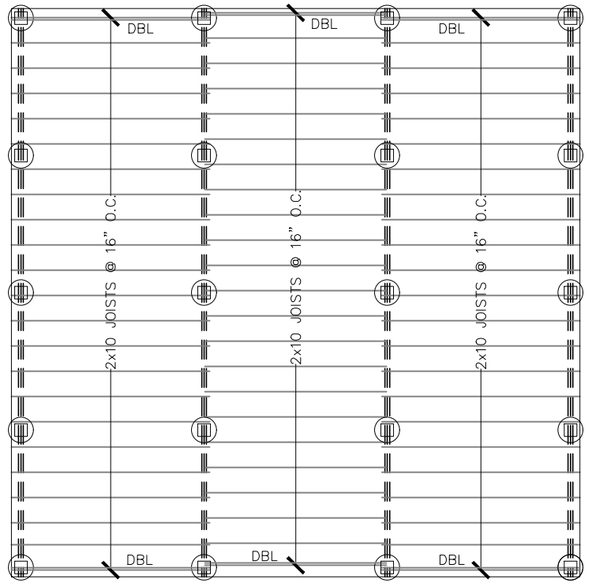
Project Name
FOUNDATION DETAILS

Title
1 STORY PILE LAYOUT

Date
NOV 2019

Scale
1" / 8

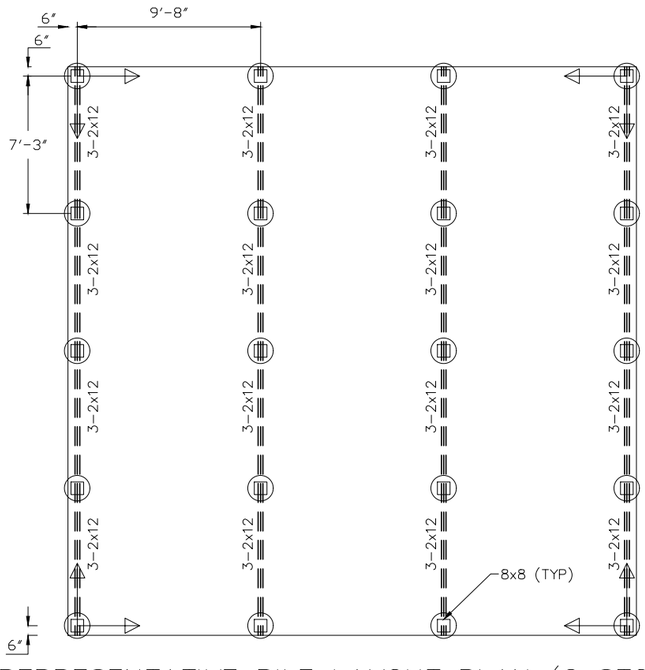
Sheet
F-1.1



REPRESENTATIVE PILE LAYOUT PLAN (2 STORY)

NOTES:

1. 1. STRINGERS TO BE 3-2x12 #2 SP PRESSURE TREATED. FASTENED TOGETHER PER DETAIL C/F-3.2
2. FLOOR JOISTS TO BE 2x10 #2 SP AT 16" O.C.
3. DBL JOISTS UNDER ALL WALLS ABOVE.
4. STRINGERS MAY BE FASTENED TO PLIES WITH DET A.1 OR A.2 ON F3.2 FOR 8X8 SQUARE PILES



REPRESENTATIVE PILE LAYOUT PLAN (2 STORY)

HELICAL PILES (SEE SHEET F3.3) MAY BE INSTALLED IN LIEU OF WOOD PILINGS AT IDENTICAL LOCATIONS.

BRACED PILE
ARROW INDICATES DIRECTION OF BATTERED PILES
RAMJACK AND CANTSINK

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Title: 2 STORY PILE LAYOUT
Date: NOV 2019
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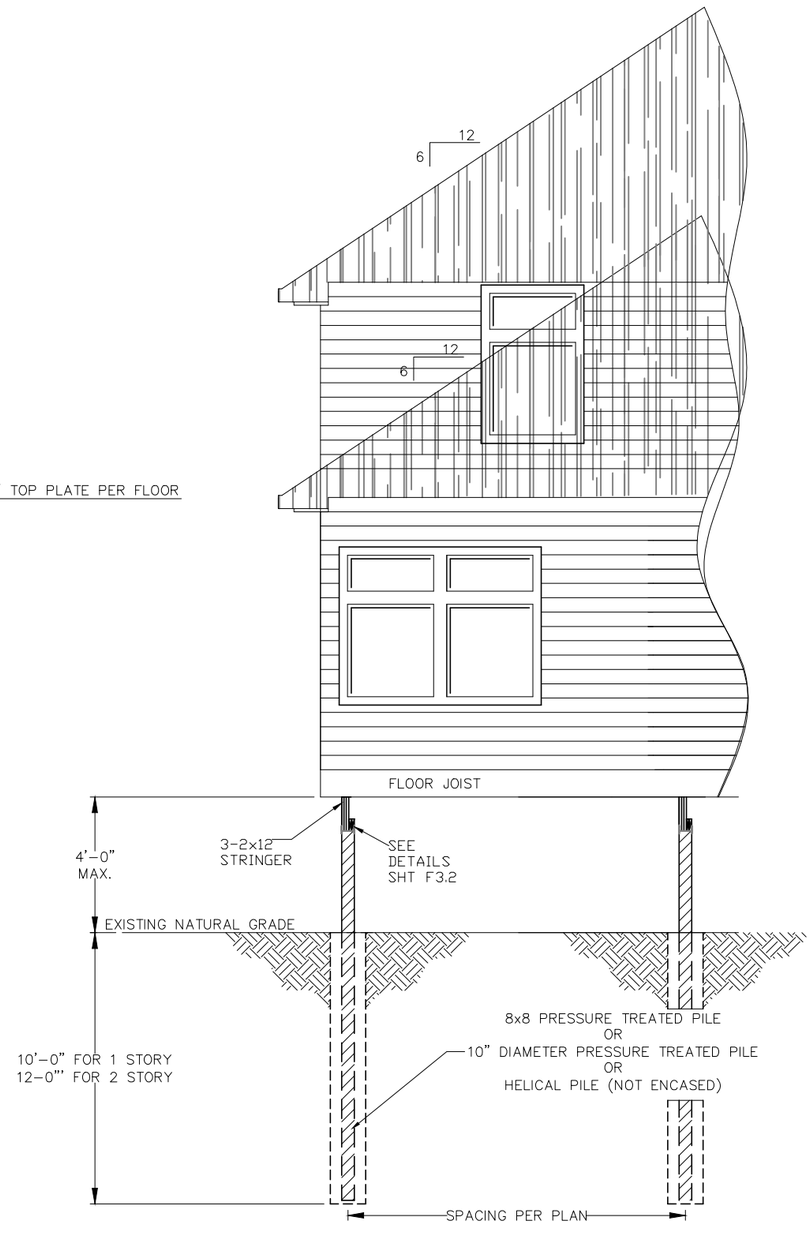
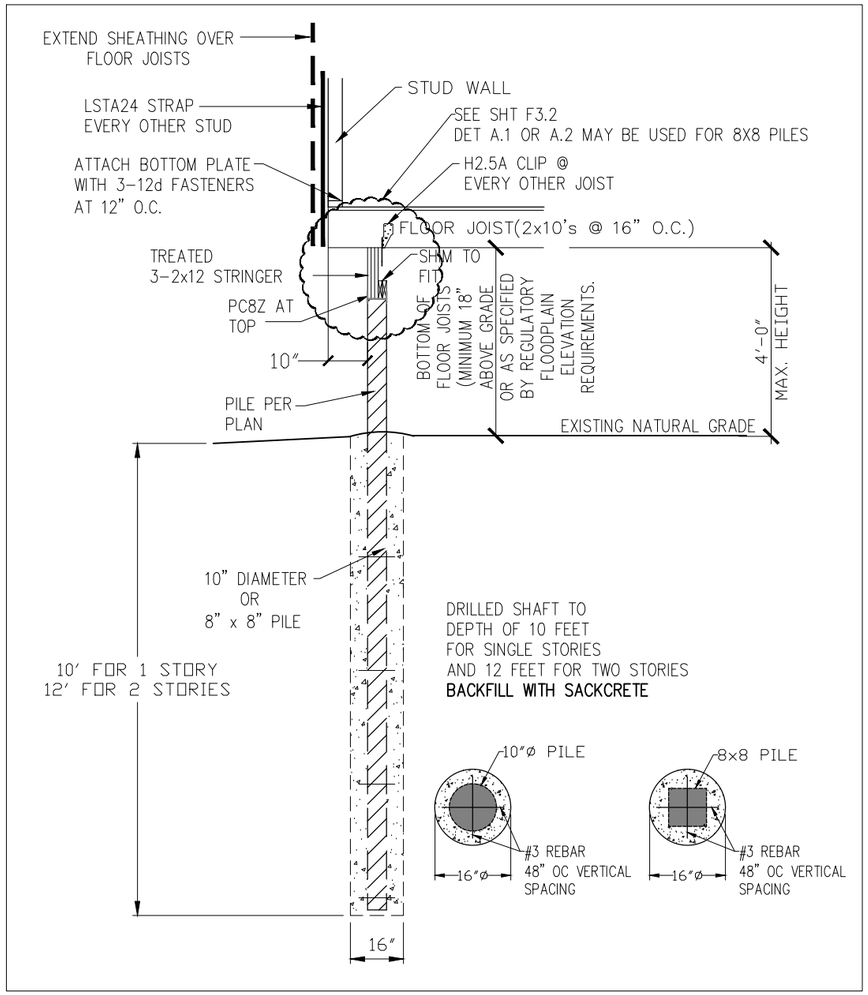
8'–9' TOP PLATE PER FLOOR



CONCRETE PILE ELEVATION



PILE DETAIL

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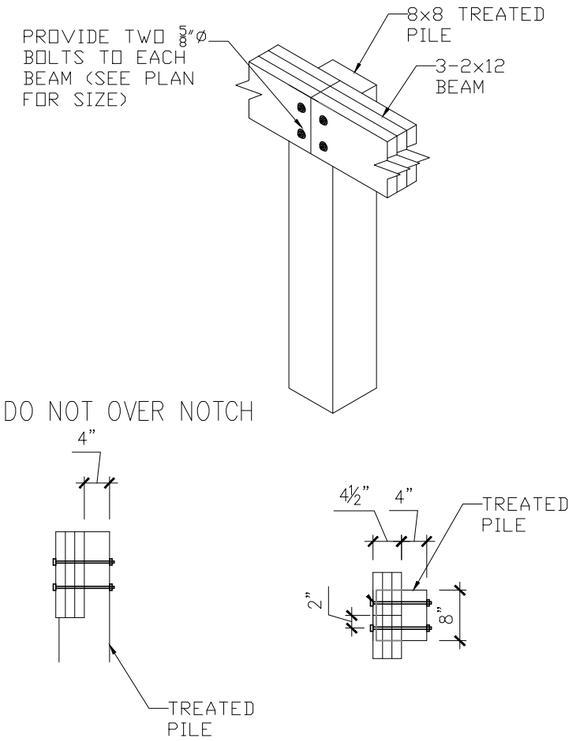
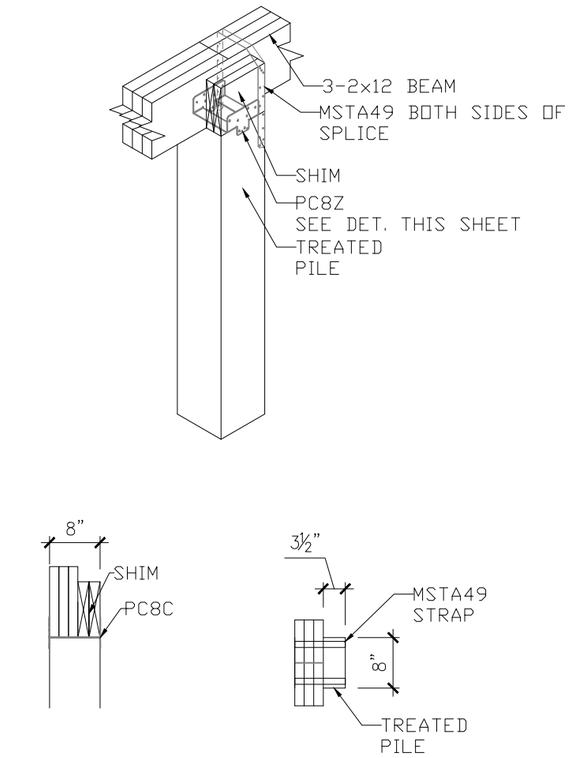
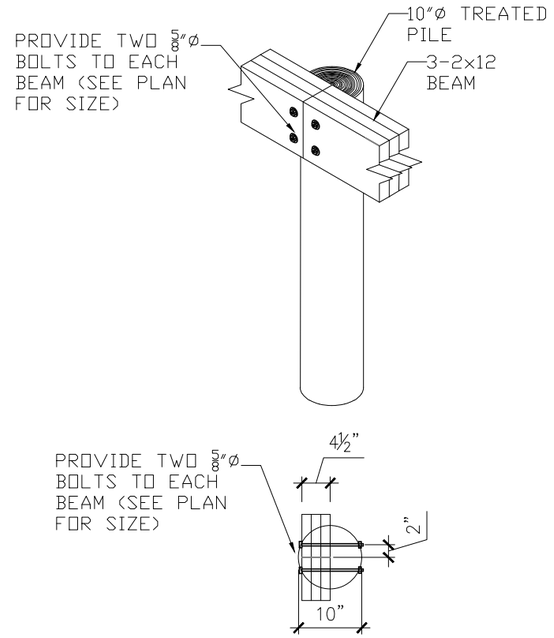


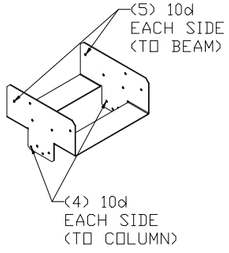
SQUARE PILE–BOLTED STRINGERS | A.1



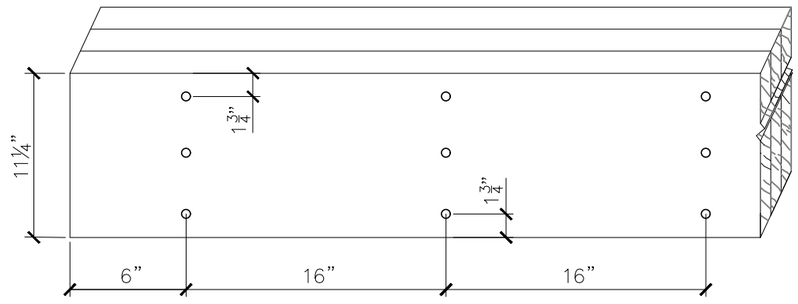
SQUARE PILE–TOP MOUNTED STRINGERS | A.2

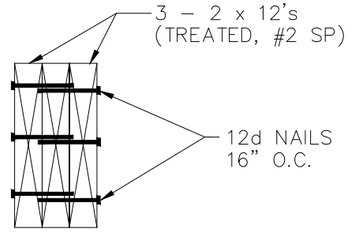


10" ROUND PILE | A.3



PC8Z CONNECTOR | B





STRINGER NAILING PATTERN | C

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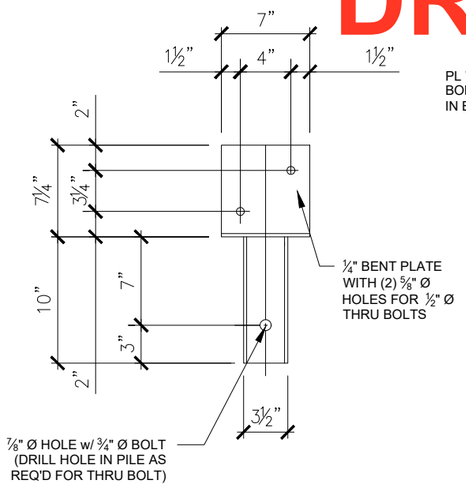
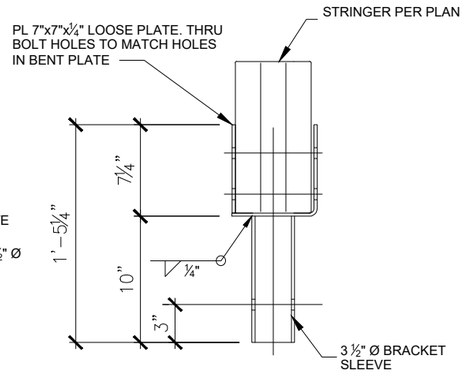




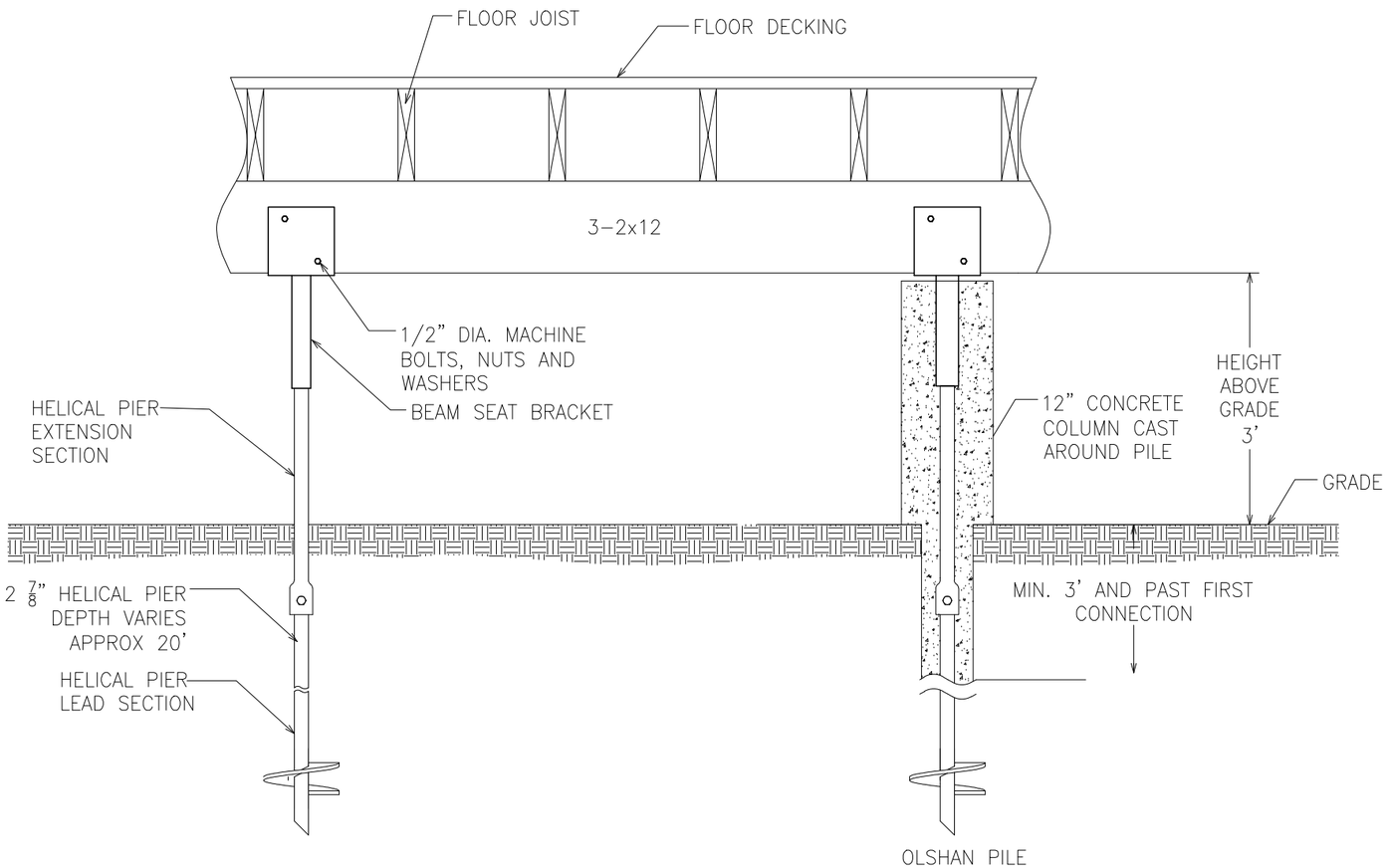
PLAN NOTES:

1) BRACKET TO BE THERMO PLASTIC POWDER COATED OR GALVANIZED BY MANUFACTURER.
2) FIELD DRILL ALL WOOD MEMBERS AS REQU'D FOR THRU BOLT CONNECTION.

REPRESENTATIVE DETIAL

NOTES:

1. Actual design and construction helical pier support system provided by manufacturer.
2. Helical piers can be either single or multi-helix. The number and size of helix plates vary depending on pier load and soil conditions.
3. Helical piers are installed (screwed) to a minimum depth and torque as required to achieve required bearing and uplift capacity.
4. Hot-dipped galvanized per ASTM A-153.
5. Material for saddle: ¼" thick hot-rolled steel.
6. Bolt: ½" diameter hex head, 4½" long with nut and lockwasher supplied by others.



DISCLAIMER

1. The information and sketches contained in these drawings are given as guidelines only.
2. Capacities of Helical Piles/Anchors may vary depending on, but not limited to, water table elevation and changes to that elevation, changing soil conditions, soil layer thicknesses.
3. Achievable capacities could be higher or lower than ratings due to site-specific conditions. On site load testing should be performed to confirm additional pile/anchor capacities.

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Title: HELICAL PILES
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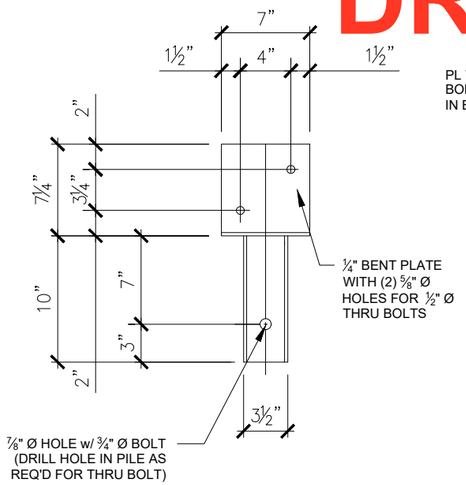

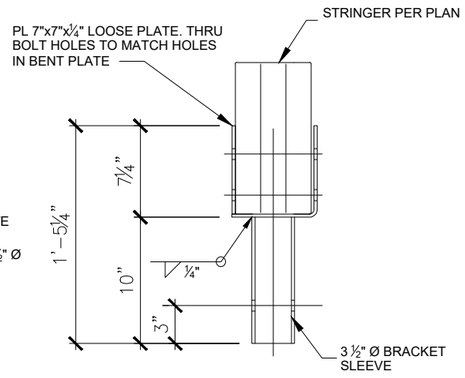

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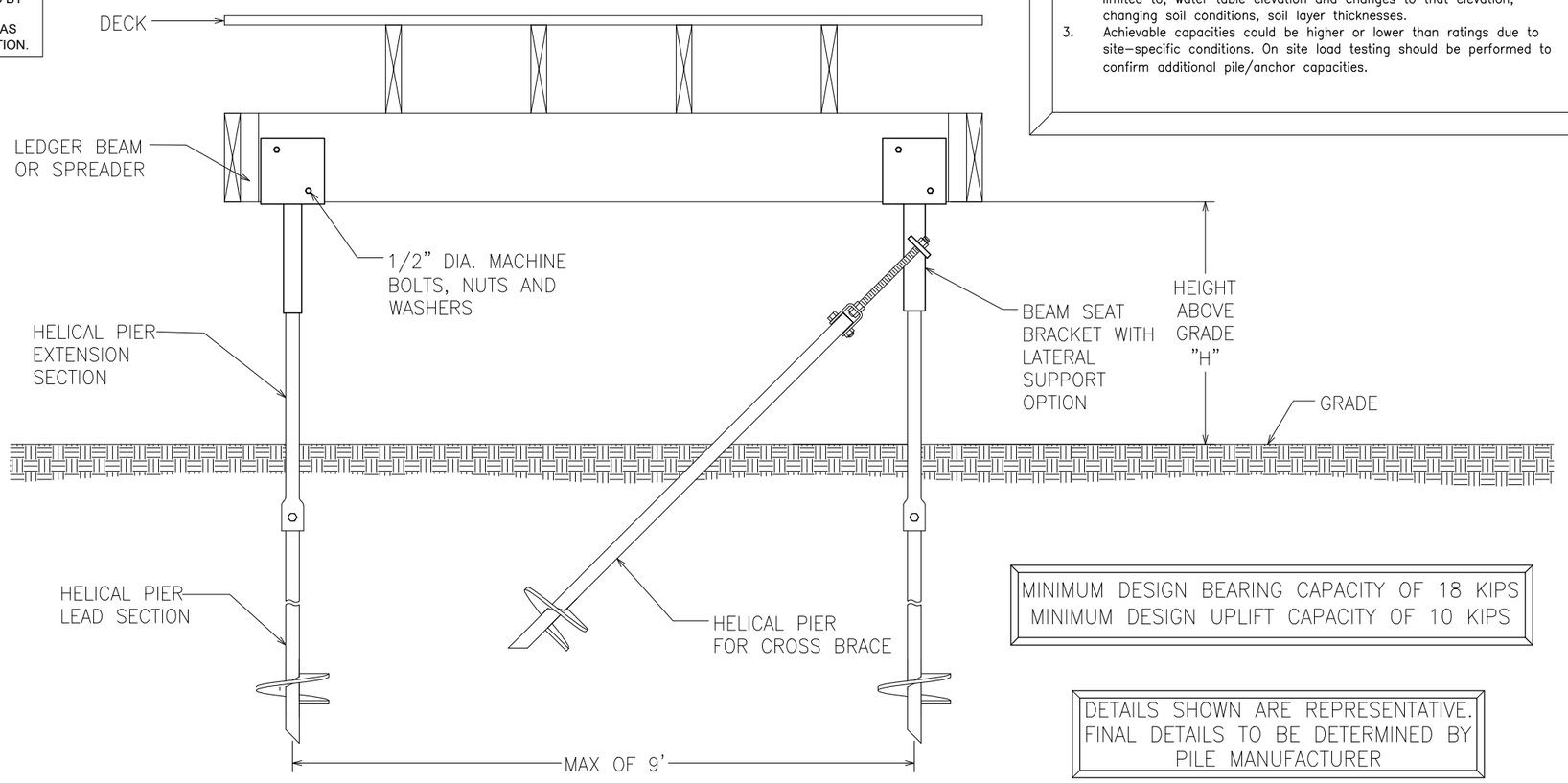

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MINIMUM DESIGN BEARING CAPACITY OF 18 KIPS
MINIMUM DESIGN UPLIFT CAPACITY OF 10 KIPS

DETAILS SHOWN ARE REPRESENTATIVE. FINAL DETAILS TO BE DETERMINED BY PILE MANUFACTURER

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Title: HELICAL PILES
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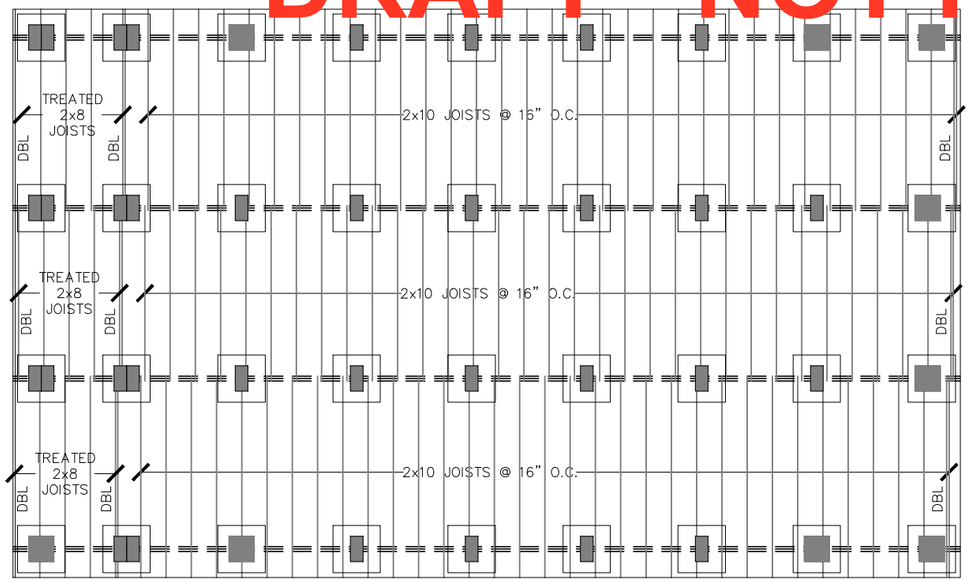
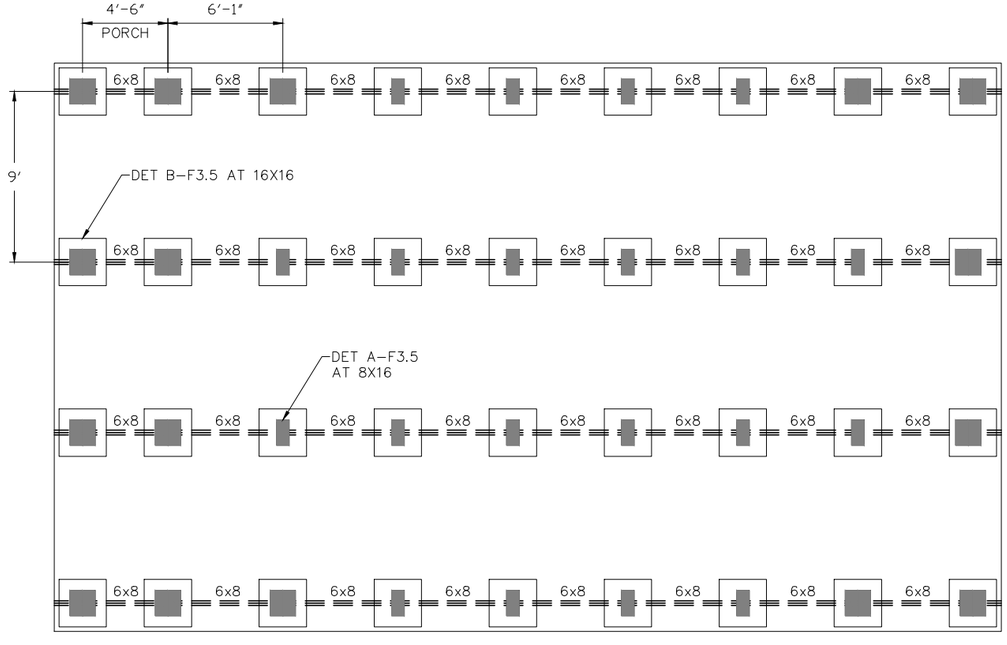
Scale: 1" / 8
Sheet: F-1.6



REPRESENTATIVE FOOTER LAYOUT PLAN (1 STORY)

NOTES:

1. STRINGERS TO BE 6x8 #2 SP PRESSURE TREATED.
2. FLOOR JOISTS TO BE 2x10 #2 SP AT 16" O.C. U.N.O. DBL JOISTS UNDER ALL WALLS ABOVE.



REPRESENTATIVE FOOTER PLAN (1 STORY)

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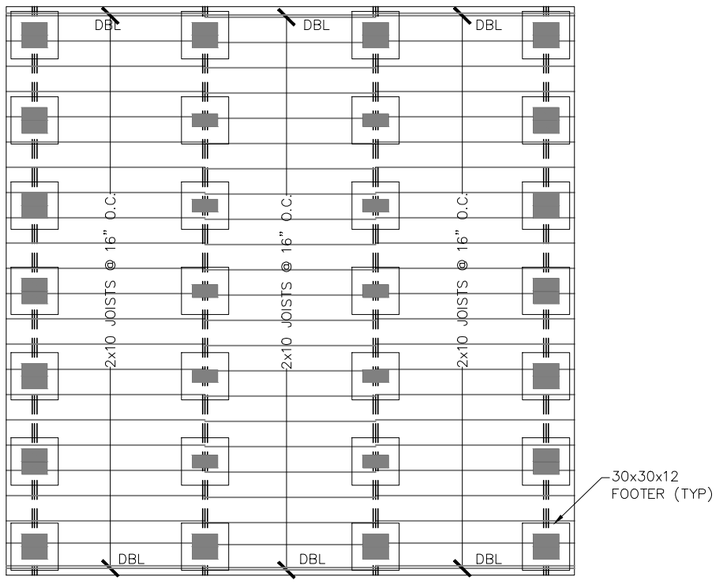
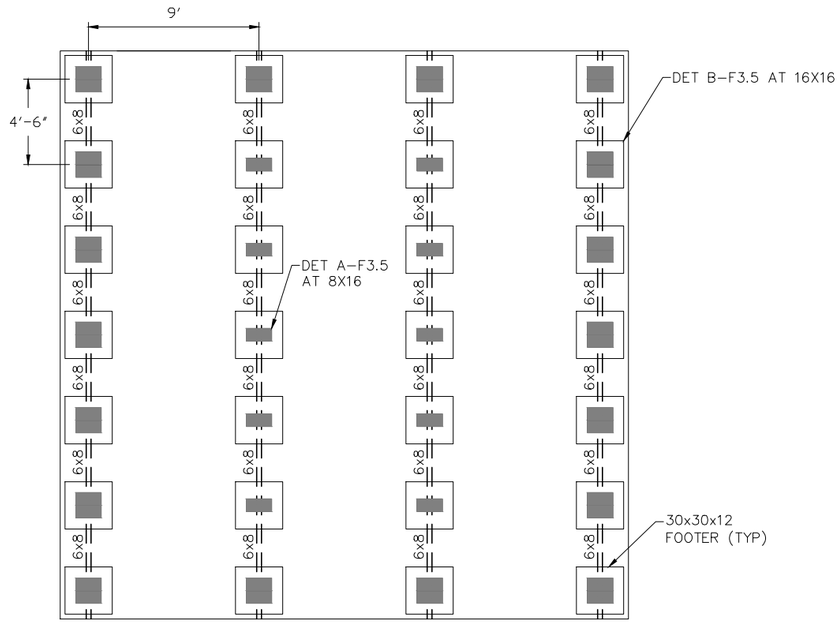
Title	1 STORY FOOTER LAYOUT
Date	NOV 2019
Scale	1" / 8
Sheet	F-2.1



REPRESENTATIVE FOOTER LAYOUT PLAN (2 STORY)

NOTES:

1. STRINGERS TO BE 6x8 #2 SP PRESSURE TREATED.
2. FLOOR JOISTS TO BE 2x10 #2 SP AT 16" O.C. U.N.O. DBL JOISTS UNDER ALL WALLS ABOVE.



REPRESENTATIVE FOOTER LAYOUT PLAN (2 STORY)

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Title: 2 STORY FOOTER LAYOUT
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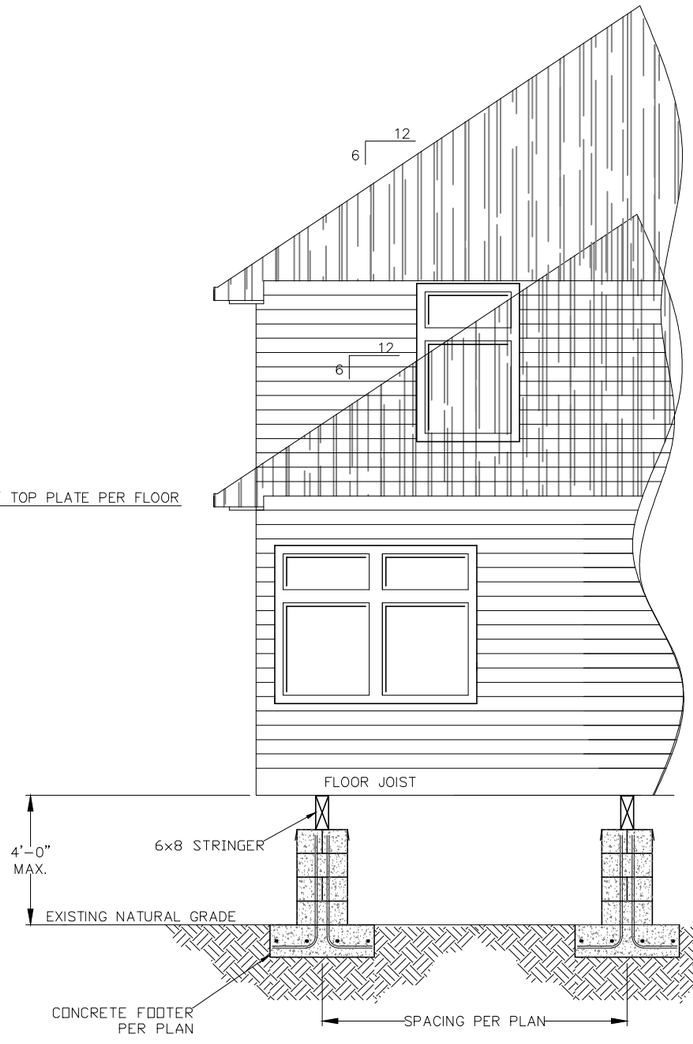
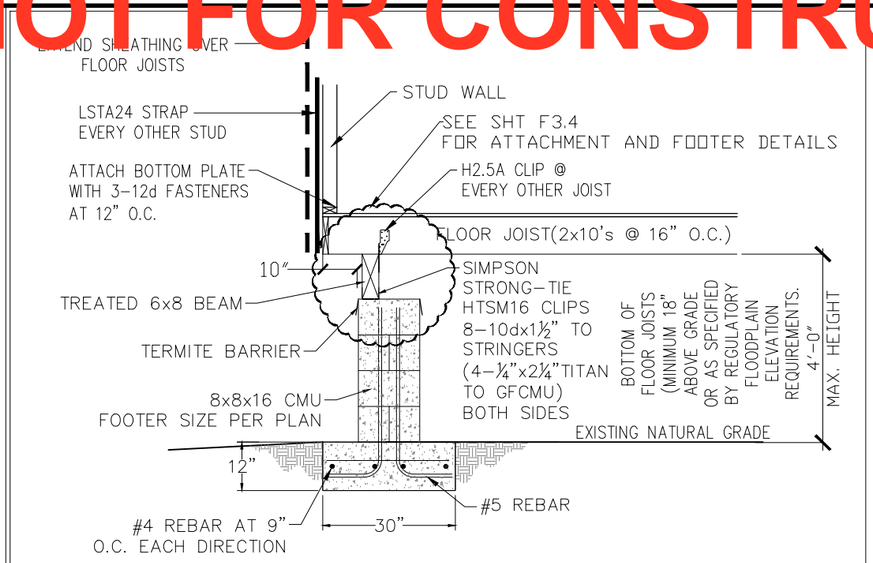
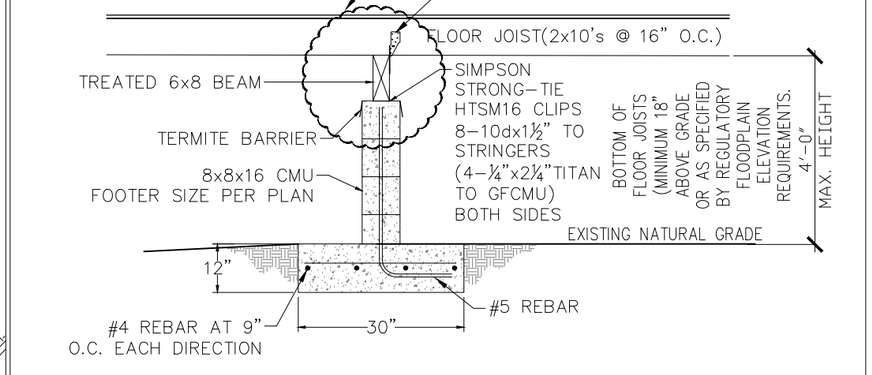


CONCRETE FOOTER
TYP.



PERIMETER FOOTER | A



*ADDITIONAL LATERAL CONNECTOR WILL BE REQUIRED.

INTERIOR FOOTER | B

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Date: NOV 2019
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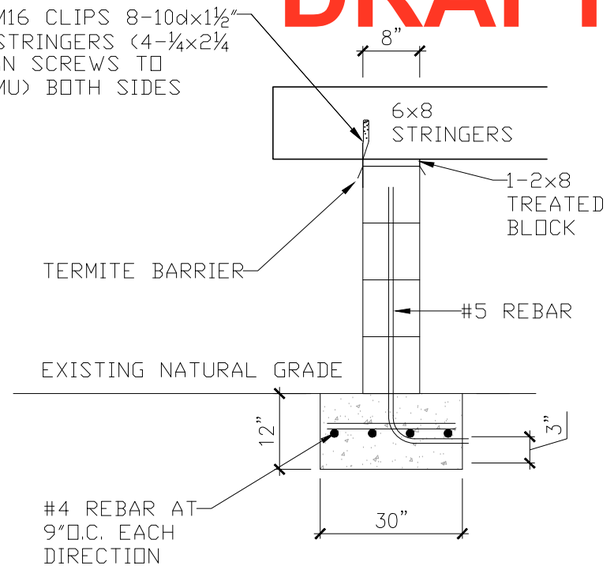
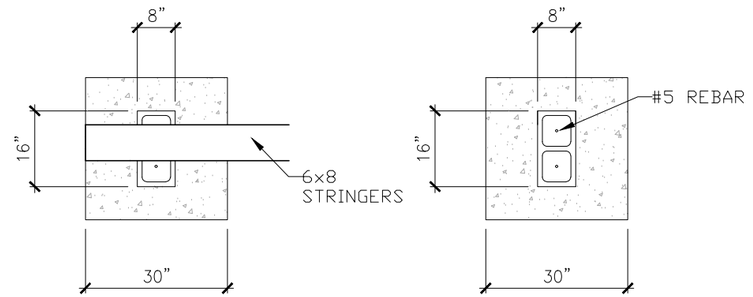
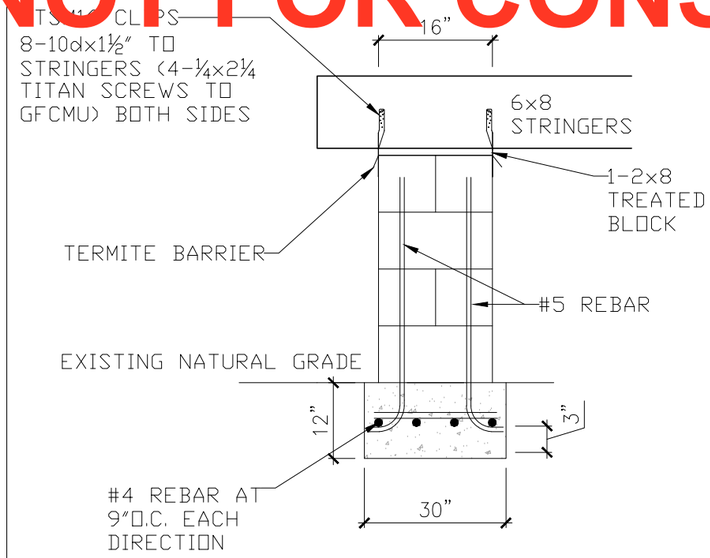
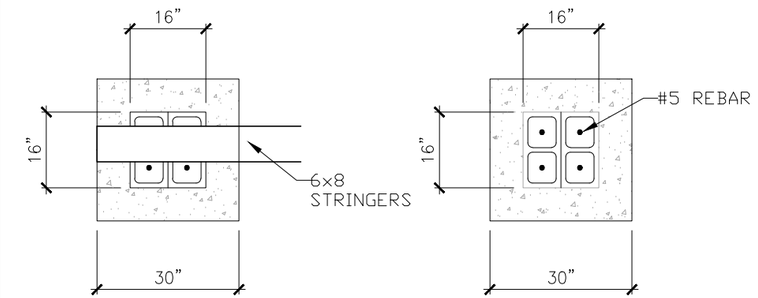


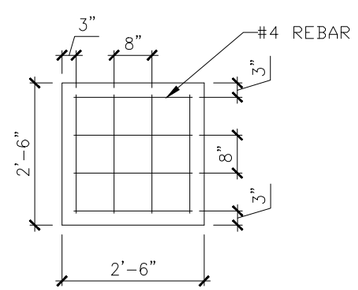


8X16 CMU COLUMN DETAILS | A





16X16 CMU COLUMN DETAILS | B



TYP FOOTER REBAR LAYOUT | B

ALL CMU CELLS TO BE FILLED WITH CONCRETE (MINIMUM OF 2500PSI)

Revision/Issue
11/07/21019 - FOR REVIEW

Firm Name and Address
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Client Name: HARRIS COUNTY, CO. HOUSTON
Job Address: HARRIS COUNTY, TEXAS
City, State, Zip: HARRIS COUNTY, TEXAS
Project Name: FOUNDATION DETAILS

Title: FOOTER DETAILS
Date: NOV 2019
Scale: 1" / 8
Sheet: F-2.4