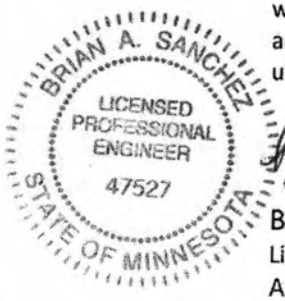
Chance® Helical Pier Certification
956 Geranium Ave. E.
St. Paul, MN 55106

Prepared by: Brian Sanchez
Atlas Foundation Co Project: 16XXX

Professional Certification:
I hereby certify that this plan, specification, or report was prepared by me or under my direct supervision and that I am a duly Licensed Professional Engineer under the laws of the State of Minnesota.



Brian Sanchez, P.E.
License Number: 47527
April 1, 2016

April 1, 2016

Harlan Worsham
Solid Rock Construction

RE: Submittal Information • Residential Underpinning • Helical Pier Anchors
956 Geranium Ave E. • Saint Paul, MN 55106

We offer our submittal information for our proposed Helical Pier Systems. These Anchors are manufactured by CHANCE® Company. We are a certified installation contractor for this product. CHANCE® Helical piers are galvanized per ASTM A153. Additional information can be obtained from our distributor's website: www.structuralanchorsupply.com.

Information Given:

• Site Visit by Atlas Foundation Co. in March, 2016. The residence shows signs of foundation settlement at all exterior walls.

Discussion:

As proposed we intend to install (35) 20 kip capacity underpinning piers at the residence at 956 Geranium Ave. E. The helical piers will have a typical spacing of 5' on center along the load bearing foundation walls. The anchor capacity will be determined by correlation with the required installation torque. This procedure will stabilize the distressed foundation and prevent any future settlement of the underpinned area. See Attached anchor drawings and details.

Submittals:

- Helical Pier numbering - 1 Page
- Pier Layout - 1 Page
- Helicap Engineering Capacity Calculations - 2 Pages
- Chance SS Product Specifications (material properties) - 2 Pages
- Chance SS5 Product Specifications (sizes and dimensions) - 2 Pages
- Standard Bracket Detail - 1 Page

Should you have any questions please contact me at your earliest convenience.

Regards,
Atlas Foundation Co.

Brian Sanchez, P.E.
Project Manager

Encl: Submittals as listed above – 9 Pages

956 Geranium Ave E. Saint Paul, MN
Helical Piers
Atlas Foundation Co.
4/1/2016

Helical Pier #	Design Load	Shaft	Lead Section	Minimum Installation Torque	Length (ft)	Inclination Angle	Termination Hardware
1 thru 35	20 Kips, FS = 2.0	Chance SS5 Ext, 5' extension (C150-0008) 10' extension (C150-0048)	Chance SS5 8"x10"x12" 5' lead section (C150-0007)	4,000 ft-lbs	Approx 20' Final Length based on installation torque	90°	Standard Bracket and T-Pipe System (C150-0121)

All Piers to be Pulldowns.

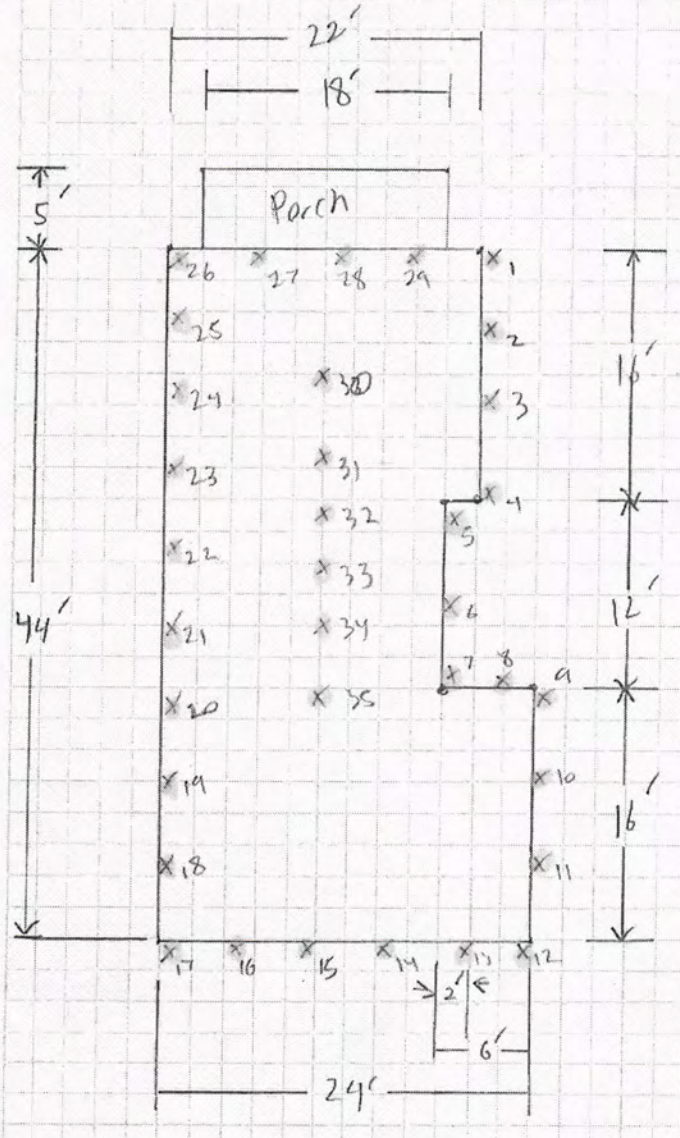
WORKSHEET

CHANCE™ Since 1912

Project / Job Name: SRC - 956 Geranium Ave E. St. Paul MN, 55106 Date: 4/1/2016

By: B. Sanchez Page: 1 of 1

Notes: Interior Piers 30-35 Locations will Vary.



X = 555 Pull down - Aprox 20'
20kip capacity
C150-0121 Under Pinning Bracket

Notes - 18-35 Interior
Install - (MT-52)
Equipment.

Piers 30-35
Position will vary
Depending on Load Bearing
walls.

BRIAN A. SANCHEZ
LICENSED PROFESSIONAL ENGINEER
STATE OF MINNESOTA

CHANCE ALLIANCE NETWORK™ HUBBELL HELICAL PILE™ ASSOCIATION

HeliCAP-v2.0 SUMMARY REPORT

Job Name: Solid Rock

Job Number:

Boring Number: B-1

Water Table Depth: 9.0 ft

Application: Compression

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P:\Pending & Bids\Brian\2016\Underpinning\956 Geranium

Capacity Summary

Pile Number	Helix Depth (ft)	Ult. Helix Bearing Capacity (kips)	Ultimate Recommended Helix Capacity (kips)	Installation Torque (ft-lbs)
Number:1				
Product: SS 5	Helix Gr:50	Thk:3/8"		
Helix Strength:	40.0 kips			
Datum Depth:6.0	Length:20.0	Angle:90.0		
Friction Analysis Method:	US Navy			
Friction Type: Concrete	Dia:4.0	Length:10.0		
12" helix	21.0	12.1t 21.8c	12.1t 21.8c	
10" helix	23.5	15.2t 30.0c	15.2t 30.0c	
8" helix	25.5	19.6t 20.6c	19.6t 20.6c	
Total Ult. Helix Tension (Qbt\Qht)		46.9t	46.9t	
Total Ult. Helix Compression (Qbc\Qhc)		72.5c	72.5c	6128
Total Ult.Friction(Qf)		3.5t/c	3.5t/c	
Total Ult.-Combined Capacity(Qc)		75.9c	75.9c	
Number:2				
Product: SS 175	Helix Gr:80	Thk:3/8"		
Helix Strength:	50.0 kips			
Datum Depth:6.0	Length:25.0	Angle:90.0		
Friction Analysis Method:	US Navy			
Friction Type: Concrete	Dia:5.0	Length:15.0		
12" helix	26.0	44.7t 48.3c	44.7t 48.3c	
10" helix	28.5	34.0t 43.9c	34.0t 43.9c	
8" helix	30.5	28.6t 40.5c	28.6t 40.5c	

HeliCAP Helical Capacity Design Software

CHANCE POWER SYSTEMS

HeliCAP-v2.0 SUMMARY REPORT

Job Name: Solid Rock

Job Number:

Boring Number: B-1

Water Table Depth: 9.0 ft

Application: Compression

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Total Ult. Helix Tension (Qbt\Qht)	107.5t	107.5t	
Total Ult. Helix Compression (Qbc\Qhc)	132.8c	132.8c	12113
Total Ult.Friction(Qf)	8.5t/c	8.5t/c	
Total Ult.-Combined Capacity(Qc)	141.3c	141.3c	

Soil Profile

Top of Layer Depth (ft)	Soil Type	Cohesion (psf)	N	Bond Value (psf)	Angle of Internal Friction (Degrees)	Nc \ Nq	In-situ Unit Weight (pcf)	Effect. Unit Weight (pcf)
0.0	2-Sand Fill	0	24	193	34.1	0 \ 22	114	114
5.0	2-Sand Fill	0	9	443	29.9	0 \ 13	100	100
9.0	2-Sand Fill	0	9	596	29.9	0 \ 13	100	37
12.5	2-Sand Fill	0	11	675	30.4	0 \ 14	101	38
15.0	Organics	750	6	720	0.0	9 \ 0	92	29
19.0	Clay	1750	14	880	0.0	9 \ 0	108	45
23.0	Sand	0	37	1333	37.7	0 \ 36	127	64
30.0	Sand	0	50	3259	41.4	0 \ 58	140	77

Bond values are for Pile # 2

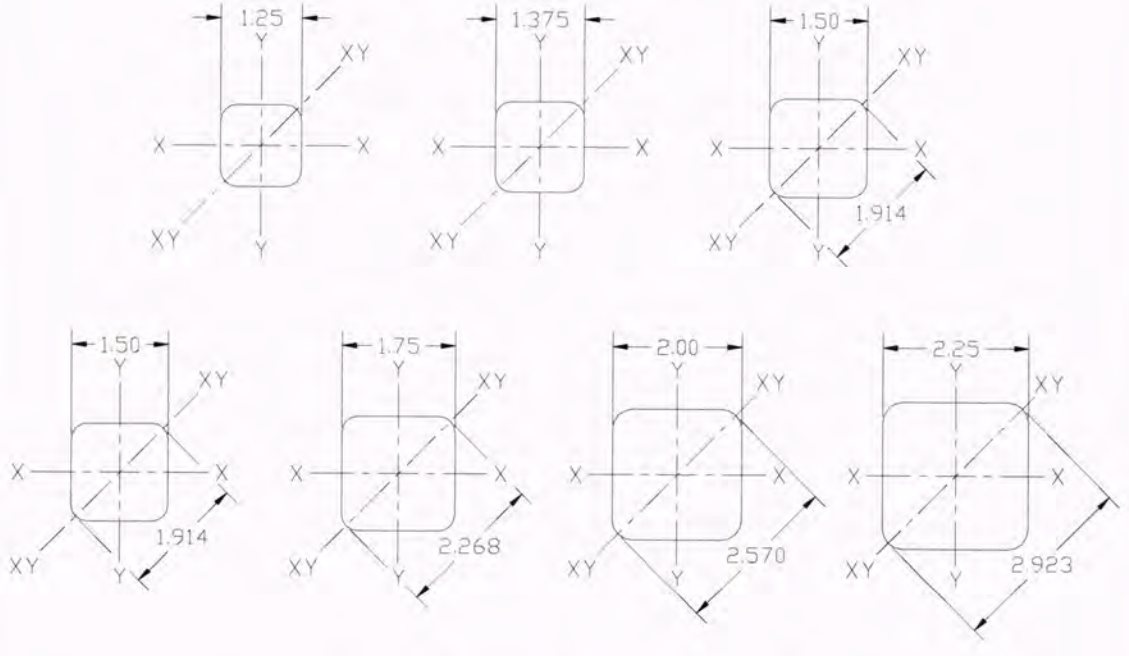
Chance® Square Shaft (SS) Helical Product Ratings
Table 7-3

PRODUCT SERIES	TORQUE RATING ft-lbs (Nm)	ULTIMATE TENSION STRENGTH* kip (kN)	UPLIFT/COMPRESSION CAPACITY LIMIT** kip (kN)
SS 125	4,000 (5400)	60 (267)	40 (178)
SS 1375	5,500 (7500)	75 (334)	55 (245)
SS 5	5,500 (7500)	70 (312)	55 (245)
SS 150	7,000 (9,500)	70 (312)	70 (312)
SS 175	11,000 (14,900)	100 (445)	110 (489)
SS 200	16,000 (21,700)	150 (668)	150# (668)
SS 225	23,000 (31,200)	200 (890)	200# (890)

* Based on Mechanical Strength of Coupling

** Based on Torque Rating – Uplift/Compression Capacity Limit = Torque Rating x K_t.
"Default" K_t for Type SS = 10 ft^{-1} (33 m^{-1})

\# Based on Mechanical Strength of Coupling Bolt
Higher Compression Capacities Available with Helical Pulldown® Micropile



Chance® Square Shaft Helical Cross Sections
Figure 7-2

Chance® Square Shaft (SS) Helical Section Properties
Table 7-4

PRODUCT SERIES	SHAFT SIZE in (mm)	WALL THICKNESS in (mm)	METAL AREA in^2 (cm^2)	PERIMETER in (cm)	MOMENT OF INERTIA in^4 (cm^4) $I_{x-x}, I_{y-y}, I_{x-y}$	SECTION MODULUS in^3 (cm^3)	
						S_{x-x} S_{y-y}	S_{x-y}
SS125	1.25 (32)	solid	1.55 (10.0)	4.79 (12.17)	0.20 (8.3)	0.32 (5.3)	0.24 (3.9)
SS1375	1.375 (35)	solid	1.88 (12.1)	5.29 (13.4)	0.29 (12.1)	0.42 (6.9)	0.32 (5.2)
SS5	1.5 (38)	solid	2.2 (14.2)	5.6 (14.2)	0.40 (16.5)	0.53 (8.7)	0.42 (6.9)
SS150	1.5 (38)	solid	2.2 (14.2)	5.6 (14.2)	0.40 (16.5)	0.53 (8.7)	0.42 (6.9)
SS175	1.75 (44)	solid	3.1 (19.4)	6.6 (16.7)	0.75 (31.1)	0.85 (13.9)	0.66 (10.8)
SS200	2 (51)	solid	3.9 (25.3)	7.5 (18.9)	1.26 (52.4)	1.26 (20.6)	0.98 (16.1)
SS225	2.25 (57)	solid	5.0 (32.1)	8.5 (21.5)	2.04 (84.9)	1.81 (29.7)	1.40 (22.9)

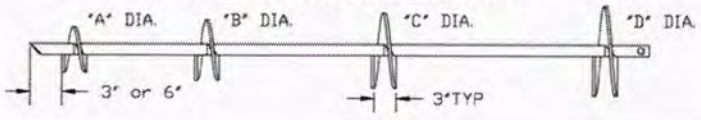
Chance® Square Shaft (SS) Helix Thickness and Mechanical Strength
Table 7-5

DEFAULT (STANDARD)				OPTIONS		
Product Series	Helix Grade ksi (mPa)	Thickness in (mm)	Mechanical Strength kip (kN)	Helix Grade ksi (mPa)	Thickness in (mm)	Mechanical Strength kip (kN)
SS125	50 (345)	3/8 (9.5)	30 (133)	50 (345)	½ (13)	35 (156)
SS1375	50 (345)	3/8 (9.5)	30 (133)	50 (345)	½ (13)	35 (156)
SS5	50 (345)	3/8 (9.5)	40 (178)	50 (345)	½ (13)	45 (200)
				80 (552)	3/8 (9.5)	40 (178)
				80 (552)	½ (13)	50 (222)
SS150	80 (552)	3/8 (9.5)	40 (178)	50 (345)	½ (13)	45 (200)
SS175	80 (552)	3/8 (9.5)	50 (222)	80 (552)	½ (13)	60 (267)
SS200	80 (552)	½ (13)	60 (267)			
SS225	80 (552)	½ (13)	60 (267)			

The mechanical strength ratings in Table 7-5 are minimum values. The helix diameter, grade, and thickness along with the shaft series to which an individual helix is connected effect the mechanical strength rating of a helix. A higher mechanical strength rating of an individual helix is possible depending on the combination of these variables.

Chance® Helical 1-1/2" Round Corner Square Shaft Products (Type SS5 Series)

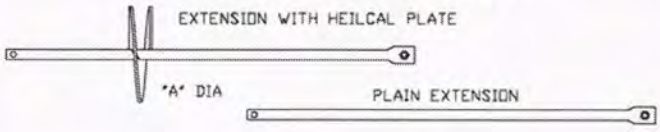
COMMON LEAD CONFIGURATIONS



Product Designation (See Notes Page 7-21)	Plate Diameter				Length	Wt (lbs)	Helix Grade	Helix Edge
	A	B	C	D				
T150-0495	6T	-	-	-	5'-0	41	80	SLE
T150-0497	6	-	-	-	5'-0	50	80	SLE
T150-0086	6	6	-	-	3'-0	50	50	
C150-0030	6	8	-	-	7'-0	64	50	
C150-0244	6	8	-	-	3'-0	50	50	
C150-0001	8	-	-	-	7'-0	56	50	
T150-0269	8	-	-	-	7'-0	58	80	SLE
T150-0304	8T	-	-	-	7'-0	59	80	SLE
C150-0002	8	-	-	-	5'-0	44	50	
T150-0268	8	-	-	-	5'-0	55	80	SLE
T150-0305	8T	-	-	-	5'-0	45	80	SLE
T150-0469	8	-	-	-	3'-0	33	80	SLE
C150-0006	8	10	-	-	7'-0	70	50	
T150-0265	8	10	-	-	7'-0	68	80	SLE
T150-0443	8	10	-	-	5'-0	52	80	SLE
T150-0444	8T	10T	-	-	5'-0	55	80	SLE
C150-0160	8	10	-	-	3'-0	39	50	
T110-0720	8	10	-	-	5'-0	55	50	
C150-0031	8	10	-	-	10'-0	81	50	
C150-0397*	8	10	12	-	7'-0	79	50	SLE
T150-0000	8	10	12	-	7'-0	80	50	
C150-0007	8	10	12	-	5'-0	67	50	
012642-AEJN	8	10	12	14	10'-0	109	50	
C150-0003	10	-	-	-	7'-0	62	50	
T150-0326	10	-	-	-	7'-0	61	80	SLE
C150-0058	10	-	-	-	5'-0	47	50	
T150-0267	10	-	-	-	5'-0	47	80	SLE
C150-0051	10	12	-	-	7'-0	77	50	
T150-0442	10	12	-	-	5'-0	60	80	SLE
C150-0161	10	12	-	-	3'-0	55	50	
C150-0489	10	12	14	-	7'-0	63	50	
C150-0398*	10	12	14	-	10'-0	119	50	SLE
012642-EJNS	10	12	14	14	10'-0	131	50	
C150-0004	12	-	-	-	7'-0	68	50	
T150-0266	12	-	-	-	7'-0	66	80	SLE
C150-0242	12	-	-	-	5'-0	52	50	
C150-0399*	12	14	16	-	10'-0	140	50	SLE
C150-0005	14	-	-	-	7'-0	72	50	
C150-0243	14	-	-	-	5'-0	55	50	
T110-0607	14	14	-	-	7'-0	95	50	

Chance® Helical 1-1/2" Round Corner Square Shaft Products (Type SS5 Series)

COMMON EXTENSION CONFIGURATIONS



Product Designation (See Notes Page 7-21)	Plate Diameter		Length	Weight (lbs)	Helix Grade	Helix Edge
	A	B				
C150-0047	-	-	3'-0	28		
C150-0008	-	-	5'-0	40		
C150-0009	-	-	7'-0	57		
C150-0048	-	-	10'-0	78		
C150-0158	10	-	5'-0	51	50	SLE
C150-0159	12	-	5'-0	54	50	SLE
C150-0166	14	-	3'-0	55	80	
T150-0440	14	-	5'-0	60	80	
C150-0167	14	-	5'-0	83	80	

Chance® Helical 1-1/2" Round Corner Square Shaft Products (Type SS5 Series) – Special Order

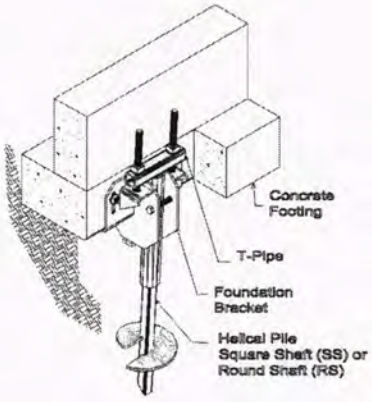
(Allow extra processing time for Special Orders)

Lead Section Special Orders -- Designation: S-SS5[*]♣[Helix Grade][*Length*]
(Example: S-SS5[G]14-14-14[GR80][10'-0])

Lead Bars - Specify Length (Insert above)	
Available Lengths	Weight (lbs)
0' – 10	7
3' – 4	26
5' – 0	39
6' – 8	52
10' – 0	78
20' – 0	157

♣ Helical Flights - Specify Diameter(s) (Insert above ♦-♦-♦)	
Flight Size Descriptions	Weight (lbs)
6" dia x 3/8" thick. = 6	3
8" dia x 3/8" thick. = 8	5
8" dia x 1/2" thick. = 8T	7
10" dia x 3/8" thick. = 10	8
10" dia x 1/2" thick. = 10T	11
12" dia x 3/8" thick. = 12	12
12" dia x 1/2" thick. = 12T	16
14" dia x 3/8" thick. = 14	16
14" dia x 1/2" thick. = 14T	21
16" dia x 1/2" thick. = 16T	28

REMEDIAL REPAIR BRACKETS for CHANCE® HELICAL PILES



Chance® Helical C150-0121 Standard Bracket and T-Pipe System

- Use for lifts up to 4" (10 cm)
- All C150-0121 Standard Systems include:
  - Foundation bracket
  - T-pipe
  - Hardware

Order separately: Two 5/8" (16 mm) diameter anchor bolts per pier as required.

Standard finish is galvanized per ASTM A153.

Ultimate mechanical strength of bracket body is 80,000 lbs (356 kN). Working mechanical strength of bracket body is 40,000 lbs (178kN).

See table below for system (bracket/pile shaft) ratings.

Chance® Helical C150-0121 Standard Bracket and T-Pipe Ratings

T-Pipe Designations for the C150-0121 Bracket	Ultimate Mechanical Strength [1,3] lbs (kN)	Pile Size in (mm)	Product Series	Max Working Capacity [2,3] based on Product Series lbs (kN)	Features
C150-0486[4]	40,000 (178)	1-1/2 (38) Square	SS5 SS150	20,000 (89) 20,000 (89)	Lowest cost with square shaft.
C150-0487[4]	80,000 (356)	1-1/2 (38) Square	SS5 SS150	20,000 (89) 25,000 (111)	Higher capacity with SS150.
C278-0001	40,000 (178)	2-7/8 (73) Round	RS2875.165 RS2875.203 RS2875.262	15,000 (67) 20,000 (89) 20,000 (89)	Lowest cost with round shaft.
C278-0002	80,000 (356)	2-7/8 (73) Round	RS2875.165 RS2875.203 RS2875.262	15,000 (67) 25,000 (111) 30,000 (133)	Higher capacity with RS2875.203 and .262.

Notes:

1. Ultimate mechanical strength is for the Bracket Body and T-Pipe combination.
2. The capacity of Chance® Helical Pile Systems is a function of many individual elements, including the capacity of the foundation, bracket, pile shaft, helix plate and bearing stratum, as well as the strength of the foundation-to-bracket connection, and the quality of the helical pile installation. The fifth column shows typical working capacities of the Chance® Helical Pile System based upon maximum shaft exposure of 2 feet and soil strength having a minimum Standard Penetration Test (SPT) Blow Count "N" of 4. Actual capacities could be higher or lower depending on the above factors.
3. The ultimate capacity of the system, i.e., bracket, T-pipe, and pile shaft, can be increased to the pile shaft compression capacity limit as shown on pages 7-22 and 7-32 provided the pile shaft is reinforced using a pipe sleeve or grout column. The maximum working capacity shall not be greater than one half the ultimate mechanical strength of the bracket and t-pipe combination given above.
4. These products comply with the 1997 Uniform Building Code, the 1999 BOCA National Code, and the 1999 SBCCI Standard Code subject to the conditions as listed in the Legacy Reports in Appendix C.