LANDRY/FRENCH
CONSTRUCTION COMPANY
68 Mussey Road
Scarborough, ME 04074
Phone: (207) 730-5566
Fax: (207) 730-5567

Submittal Transmittal

TO: Mark Mueller Architects

Date:	10/1/2014
Project #	14-1123 - Seaport Lofts
Submittal #	02
ATTN:	Matt Provencal
RE:	Retaining Wall, Cofferdam & Monitoring

We are sending you the following: ☐ Attached ☐ Under Separate Cover

Via: ☐ 1st Class Mail ☐ Overnight ☐ Facsimile ☐ Pick-Up/Hand Deliver

Copies	Spec No.	Description
1	315000.001	Retaining Wall, Cofferdam & Monitoring

Remarks: See comments by Sebago pertaining to HBF Drawing Title :SOE Design

Received By: WTC Date: 8.02.14

Signed: WTC

Title: VPLA

THESE DRAWINGS OR BROCHURES HAVE BEEN REVIEWED FOR GENERAL COMPLIANCE WITH CONTRACT DOCUMENTS AND CHECKED FOR COMPLETENESS AND FIELD DIMENSIONS THIS REVIEW DOES NOT RELIEVE THE SUBCONTRACTOR OR VENDOR OF RESPONSIBILITY FOR COMPLIANCE WITH CONTRACT DOCUMENTS

☒ NO EXCEPTION TAKEN
☐ MAKE CORRECTIONS NOTED
☐ REVISE AND RESUBMIT
☐ REJECTED

LANDRY/FRENCH CONSTRUCTION

10/1/2014 — DATE
Matt Gagnon — BY

Cofferdam ground support for designed retaining wall construction

Approx. property line
This area of sheeting on abutting property line. Owner may obtain an easement from abutter , if not, an alternate solution may be necessary.

North

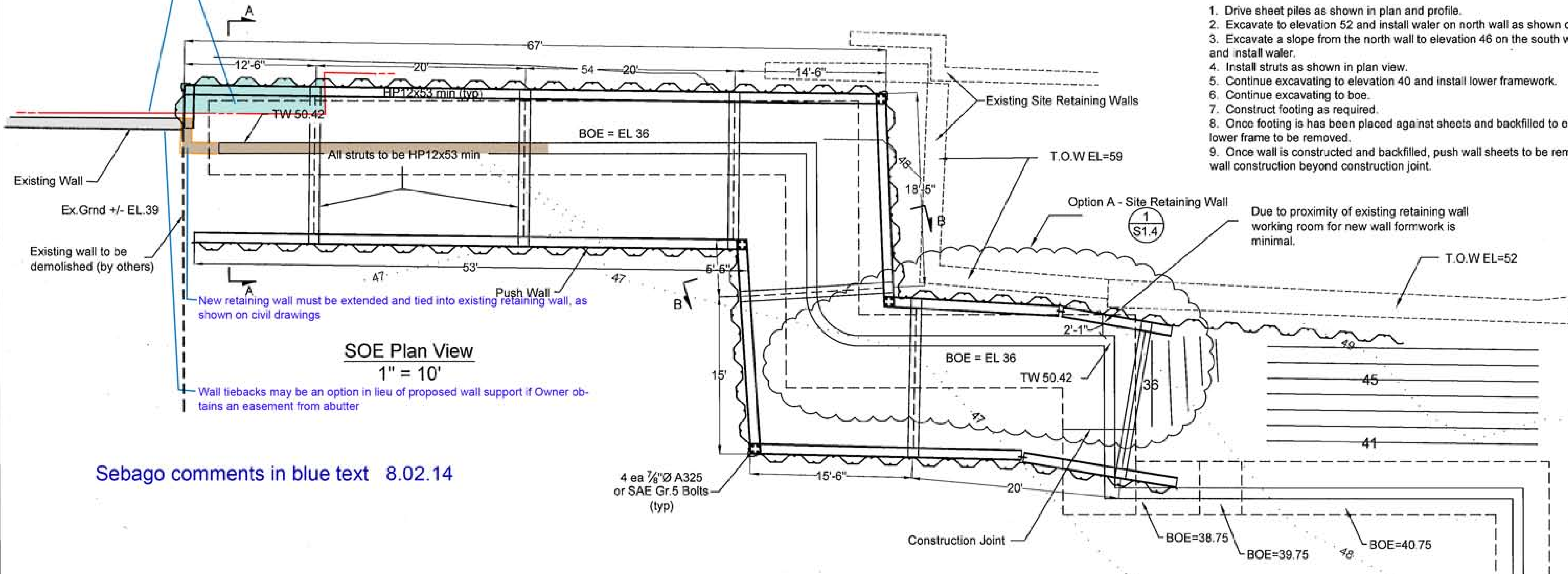
- Monitoring points shall be placed on the existing retaining walls and (1) foundation prior to any work starting to achieve a baseline. See attached plan for locations
  - o - Daily, Weekly and Monthly tracking against the baseline will be done

Notes:

1. Sheet Pile and Wale material will conform to ASTM A572 grade 50 requirements.
2. Sheet pile will have a minimum section modulus of 14.3 in³.
3. Alternate retaining wall detail will need to be used where bubbled on plan due to proximity of existing wall to proposed wall.

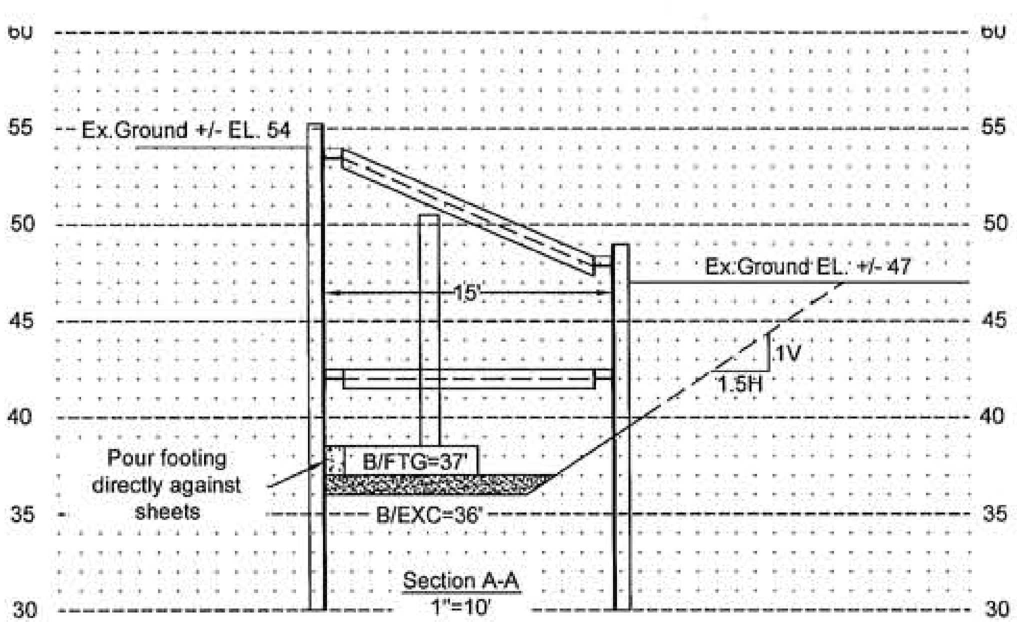
Construction Procedure:

1. Drive sheet piles as shown in plan and profile.
2. Excavate to elevation 52 and install waler on north wall as shown on plan view
3. Excavate a slope from the north wall to elevation 46 on the south wall (push wall) and install waler.
4. Install struts as shown in plan view.
5. Continue excavating to elevation 40 and install lower framework.
6. Continue excavating to boe.
7. Construct footing as required.
8. Once footing is has been placed against sheets and backfilled to elevation 38.5 lower frame to be removed.
9. Once wall is constructed and backfilled, push wall sheets to be removed to continue wall construction beyond construction joint.

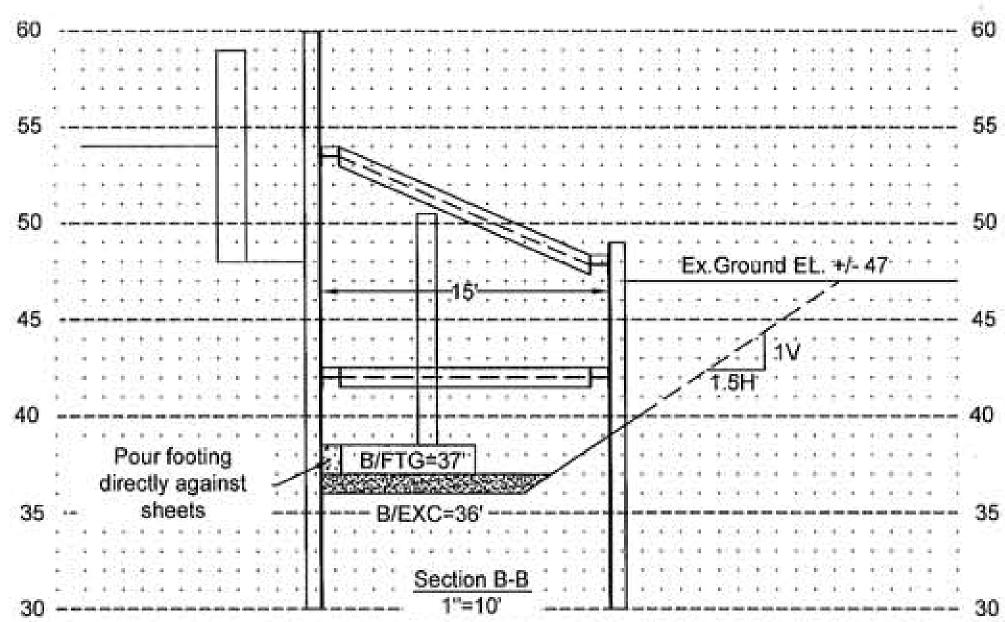


SOE Plan View
1" = 10'

Sebago comments in blue text 8.02.14



Section A-A
1"=10'



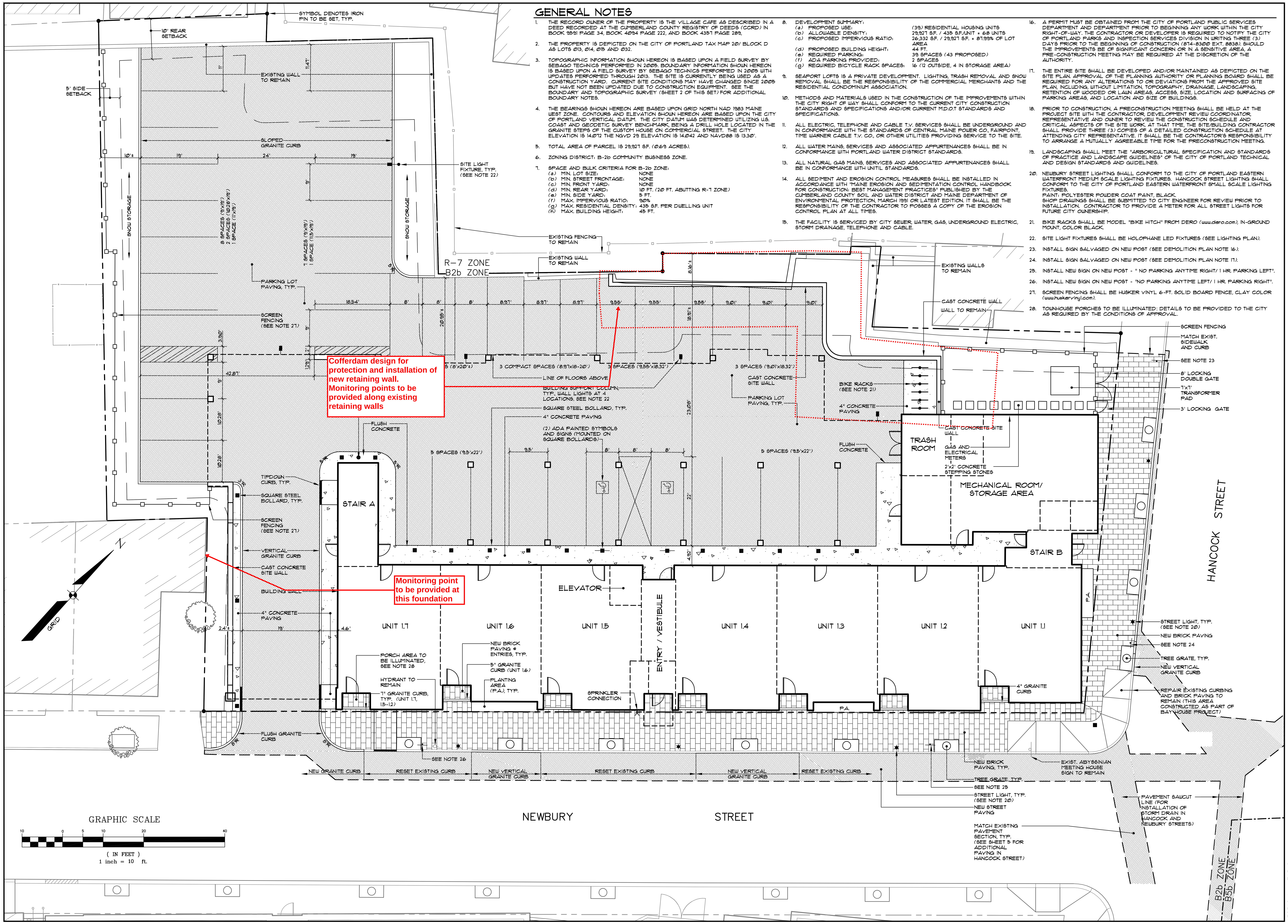
Section B-B
1"=10'

STATE OF MAINE
JOHN S. LINSCOTT IV
No. 11574
LICENSED
PROFESSIONAL ENGINEER

P.E.
9/23/14

H.B. FLEMING
89 PLEASANT AVENUE
SO. PORTLAND, ME 04106
P: 207-799-8514 F: 207-799-8538
www.hbfleming.com

TITLE: SOE Design
PROJECT: Seaport Lofts
LOCATION: Portland, ME
DATE: 09/23/14
SCALE: As Noted



GENERAL NOTES

1. THE RECORD OWNER OF THE PROPERTY IS THE VILLAGE CAFE AS DESCRIBED IN A DEED RECORDED AT THE CUMBERLAND COUNTY REGISTRY OF DEEDS (CCRD) IN BOOK 9591 PAGE 34, BOOK 4094 PAGE 222, AND BOOK 4357 PAGE 289,

2. THE PROPERTY IS DEPICTED ON THE CITY OF PORTLAND TAX MAP 20/ BLOCK D AS LOTS 013, 014, 015 AND 032.

3. TOPOGRAPHIC INFORMATION SHOWN HEREON IS BASED UPON A FIELD SURVEY BY SEBAGO TECHNICS PERFORMED IN 2005. BOUNDARY INFORMATION SHOWN HEREON IS BASED UPON A FIELD SURVEY BY SEBAGO TECHNICS PERFORMED IN 2005 WITH UPDATES PERFORMED THROUGH 2013. THE SITE IS CURRENTLY BEING USED AS A CONSTRUCTION YARD. CURRENT SITE CONDITIONS MAY HAVE CHANGED SINCE 2005 BUT HAVE NOT BEEN UPDATED DUE TO CONSTRUCTION EQUIPMENT. SEE THE BOUNDARY AND TOPOGRAPHIC SURVEY (SHEET 2 OF THIS SET) FOR ADDITIONAL BOUNDARY NOTES.

4. THE BEARINGS SHOWN HEREON ARE BASED UPON GRID NORTH NAD 1983 MAINE WEST ZONE. CONTOURS AND ELEVATION SHOWN HEREON ARE BASED UPON THE CITY OF PORTLAND VERTICAL DATUM. THE CITY DATUM WAS DETERMINED UTILIZING U.S. COAST AND GEODETIC SURVEY BENCHMARK, BEING A DRILL HOLE LOCATED IN THE GRANITE STEPS OF THE CUSTOM HOUSE ON COMMERCIAL STREET. THE CITY ELEVATION IS 14.072 THE NGVD 29 ELEVATION IS 14.042 AND NAVD88 IS 13.30'.

5. TOTAL AREA OF PARCEL IS 29,927 S.F. (0.69 ACRES).

6. ZONING DISTRICT: B-2b COMMUNITY BUSINESS ZONE.

7. SPACE AND BULK CRITERIA FOR B-2b ZONE:
   (a) MIN. LOT SIZE: NONE
   (b) MIN. STREET FRONTAGE: NONE
   (c) MIN. FRONT YARD: NONE
   (d) MIN. REAR YARD: 10 FT. (20 FT. ABUTTING R-7 ZONE)
   (e) MIN. SIDE YARD: 5 FT.
   (f) MAX. IMPERVIOUS RATIO: 90%
   (g) MAX. RESIDENTIAL DENSITY: 435 S.F. PER DWELLING UNIT
   (h) MAX. BUILDING HEIGHT: 45 FT.

8. DEVELOPMENT SUMMARY:
   (a) PROPOSED USE: (39) RESIDENTIAL HOUSING UNITS
   (b) ALLOWABLE DENSITY: 29,927 S.F. / 435 S.F./UNIT = 68 UNITS
   (c) PROPOSED IMPERVIOUS RATIO: 26,332 S.F. / 29,927 S.F. = 87.99% OF LOT AREA
   (d) PROPOSED BUILDING HEIGHT: 44 FT.
   (e) REQUIRED PARKING: 39 SPACES (43 PROPOSED)
   (f) ADA PARKING PROVIDED: 2 SPACES
   (g) REQUIRED BICYCLE RACK SPACES: 16 (12 OUTSIDE, 4 IN STORAGE AREA)

9. SEAPORT LOFTS IS A PRIVATE DEVELOPMENT. LIGHTING, TRASH REMOVAL AND SNOW REMOVAL SHALL BE THE RESPONSIBILITY OF THE COMMERCIAL MERCHANTS AND THE RESIDENTIAL CONDOMINIUM ASSOCIATION.

10. METHODS AND MATERIALS USED IN THE CONSTRUCTION OF THE IMPROVEMENTS WITHIN THE CITY RIGHT OF WAY SHALL CONFORM TO THE CURRENT CITY CONSTRUCTION STANDARDS AND SPECIFICATIONS AND/OR CURRENT M.D.O.T STANDARDS AND SPECIFICATIONS.

11. ALL ELECTRIC, TELEPHONE AND CABLE T.V. SERVICES SHALL BE UNDERGROUND AND IN CONFORMANCE WITH THE STANDARDS OF CENTRAL MAINE POWER CO., FAIRPOINT, TIME WARNER CABLE T.V. CO., OR OTHER UTILITIES PROVIDING SERVICE TO THE SITE.

12. ALL WATER MAINS, SERVICES AND ASSOCIATED APPURTENANCES SHALL BE IN CONFORMANCE WITH PORTLAND WATER DISTRICT STANDARDS.

13. ALL NATURAL GAS MAINS, SERVICES AND ASSOCIATED APPURTENANCES SHALL BE IN CONFORMANCE WITH UNITIL STANDARDS.

14. ALL SEDIMENT AND EROSION CONTROL MEASURES SHALL BE INSTALLED IN ACCORDANCE WITH "MAINE EROSION AND SEDIMENTATION CONTROL HANDBOOK FOR CONSTRUCTION: BEST MANAGEMENT PRACTICES" PUBLISHED BY THE CUMBERLAND COUNTY SOIL AND WATER DISTRICT AND MAINE DEPARTMENT OF ENVIRONMENTAL PROTECTION, MARCH 1991 OR LATEST EDITION. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO POSSES A COPY OF THE EROSION CONTROL PLAN AT ALL TIMES.

15. THE FACILITY IS SERVICED BY CITY SEWER, WATER, GAS, UNDERGROUND ELECTRIC, STORM DRAINAGE, TELEPHONE AND CABLE.

16. A PERMIT MUST BE OBTAINED FROM THE CITY OF PORTLAND PUBLIC SERVICES DEPARTMENT AND DEPARTMENT PRIOR TO BEGINNING ANY WORK WITHIN THE CITY RIGHT-OF-WAY. THE CONTRACTOR OR DEVELOPER IS REQUIRED TO NOTIFY THE CITY OF PORTLAND PARKS AND INSPECTION SERVICES DIVISION IN WRITING THREE (3) DAYS PRIOR TO THE BEGINNING OF CONSTRUCTION (874-8300 EXT. 8838). SHOULD THE IMPROVEMENTS BE OF SIGNIFICANT CONCERN OR IN A SENSITIVE AREA, A PRE-CONSTRUCTION MEETING MAY BE REQUIRED AT THE DISCRETION OF THE AUTHORITY.

17. THE ENTIRE SITE SHALL BE DEVELOPED AND/OR MAINTAINED AS DEPICTED ON THE SITE PLAN. APPROVAL OF THE PLANNING AUTHORITY OR PLANNING BOARD SHALL BE REQUIRED FOR ANY ALTERATIONS TO OR DEVIATIONS FROM THE APPROVED SITE PLAN, INCLUDING, WITHOUT LIMITATION, TOPOGRAPHY, DRAINAGE, LANDSCAPING, RETENTION OF WOODED OR LAWN AREAS, ACCESS, SIZE, LOCATION AND SURFACING OF PARKING AREAS, AND LOCATION AND SIZE OF BUILDINGS.

18. PRIOR TO CONSTRUCTION, A PRECONSTRUCTION MEETING SHALL BE HELD AT THE PROJECT SITE WITH THE CONTRACTOR, DEVELOPMENT REVIEW COORDINATOR, REPRESENTATIVE AND OWNER TO REVIEW THE CONSTRUCTION SCHEDULE AND CRITICAL ASPECTS OF THE SITE WORK. AT THAT TIME, THE SITE/BUILDING CONTRACTOR SHALL PROVIDE THREE (3) COPIES OF A DETAILED CONSTRUCTION SCHEDULE AT ATTENDING CITY REPRESENTATIVE. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO ARRANGE A MUTUALLY AGREEABLE TIME FOR THE PRECONSTRUCTION MEETING.

19. LANDSCAPING SHALL MEET THE "ARBORICULTURAL SPECIFICATION AND STANDARDS OF PRACTICE AND LANDSCAPE GUIDELINES" OF THE CITY OF PORTLAND TECHNICAL AND DESIGN STANDARDS AND GUIDELINES.

20. NEWBURY STREET LIGHTING SHALL CONFORM TO THE CITY OF PORTLAND EASTERN WATERFRONT MEDIUM SCALE LIGHTING FIXTURES. HANCOCK STREET LIGHTING SHALL CONFORM TO THE CITY OF PORTLAND EASTERN WATERFRONT SMALL SCALE LIGHTING FIXTURES.
PAINT: POLYESTER POWDER COAT PAINT, BLACK.
SHOP DRAWINGS SHALL BE SUBMITTED TO CITY ENGINEER FOR REVIEW PRIOR TO INSTALLATION. CONTRACTOR TO PROVIDE A METER FOR ALL STREET LIGHTS FOR FUTURE CITY OWNERSHIP.

21. BIKE RACKS SHALL BE MODEL "BIKE HITCH" FROM DERO (www.dero.com), IN-GROUND MOUNT, COLOR BLACK.

22. SITE LIGHT FIXTURES SHALL BE HOLOPHANE LED FIXTURES (SEE LIGHTING PLAN).

23. INSTALL SIGN SALVAGED ON NEW POST (SEE DEMOLITION PLAN NOTE 16).

24. INSTALL SIGN SALVAGED ON NEW POST (SEE DEMOLITION PLAN NOTE 17).

25. INSTALL NEW SIGN ON NEW POST - " NO PARKING ANYTIME RIGHT/ 1 HR. PARKING LEFT".

26. INSTALL NEW SIGN ON NEW POST - "NO PARKING ANYTIME LEFT/ 1 HR. PARKING RIGHT".

27. SCREEN FENCING SHALL BE HUSKER VINYL 6-FT. SOLID BOARD FENCE, CLAY COLOR (www.huskervinyl.com).

28. TOWNHOUSE PORCHES TO BE ILLUMINATED; DETAILS TO BE PROVIDED TO THE CITY AS REQUIRED BY THE CONDITIONS OF APPROVAL.

REV:	BY:	DATE:	STATUS:
J	WTC	08-06-14	PRICING SET 1 AUGUST 6, 2014
I	WTC	07-22-14	ADDRESS COMMENTS PER WILLIAM CLARKE E-MAIL DATED 07-10-14
H	WTC	06-20-14	CITY SUBMITTAL 8
G	WTC	06-12-14	FOUNDATION PERMIT SET
F	WTC	01-07-13	CITY SUBMITTAL 7
E	WTC	10-15-13	CITY SUBMITTAL 6
D	WTC	10-03-13	CITY SUBMITTAL 5

SEBAGO TECHNICS
WWW.SEBAGOTECHNICS.COM
75 John Roberts Rd. - Suite 1A
South Portland, ME 04106
Tel. 207-200-2100
250 Goddard Rd. - Suite B
Lewiston, ME 04240
Tel. 207-783-5656

PROJECT NO.	FIELD BOOK	DESIGN	CHKD	DRAWN
13251	-	WTC	WTC	MAL

SITE PLAN
OF:
SEAPORT LOFTS
NEWBURY / HANCOCK STREET
PORTLAND, MAINE
FOR:
113 NEWBURY STREET, LLC
35 FAY STREET, SUITE 107B
BOSTON, MA 02118-4320

DATE	SCALE
07-26-13	1" = 10'

13251S.dwg, TAB: S

SHEET 3 OF 12

LANDRY/FRENCH
CONSTRUCTION COMPANY
68 Mussey Road
Scarborough, ME 04074
Phone: (207) 730-5566
Fax: (207) 730-5567

Submittal Transmittal

TO: Mark Mueller Architects

Date:	10/1/2014
Project #	14-1123 - Seaport Lofts
Submittal #	01
ATTN:	Matt Provencal
RE:	Subsurface Aggregate Pier Design

We are sending you the following: ☐ Attached ☐ Under Separate Cover

Via: ☐ 1st Class Mail ☐ Overnight ☐ Facsimile ☐ Pick-Up/Hand Deliver

Copies	Spec No.	Description
1	321010.001	Subsurface Aggregate Pier Design

Remarks: ______________________________

Received By: ____________________ Date: ______________

Signed: ____________________

Title: ____________________

THESE DRAWINGS OR BROCHURES HAVE BEEN REVIEWED FOR GENERAL COMPLIANCE WITH CONTRACT DOCUMENTS AND CHECKED FOR COMPLETENESS AND FIELD DIMENSIONS
THIS REVIEW DOES NOT RELIEVE THE SUBCONTRACTOR OR VENDOR OF RESPONSIBILITY FOR COMPLIANCE WITH CONTRACT DOCUMENTS

☒ NO EXCEPTION TAKEN
☐ MAKE CORRECTIONS NOTED
☐ REVISE AND RESUBMIT
☐ REJECTED

LANDRY/FRENCH CONSTRUCTION

10/1/2014 DATE

Matt Gagnon BY

Job No.:	Page:	
Job Title: SeaPort Lofts Portland, Maine		
Date: 9/24/14	Made by: KO	Checked by: BF

SUBSURFACE CONSTRUCTORS, INC.

Vibro Stone Column Installation Beneath Pad Foundations

For

SeaPort Lofts

In

Portland, Maine

DESIGN CALCULATIONS

SUBSURFACE CONSTRUCTORS, INC.
St. Louis, Missouri

Prepared by: Kenneth Otten   Date: 9/19/2014

Approved by: Bill Faherty   Date: 9/19/2014

STATE OF MAINE
KENNETH R. OTTEN
No. 13044
LICENSED
PROFESSIONAL ENGINEER

INTRODUCTION

Ground improvement using vibro stone columns has been proposed to accommodate the foundations for the proposed SeaPort Lofts Project located at the corner of Newbury and Hancock Streets in Portland, Maine.

The objective of the vibro stone column ground improvement would be to introduce "reinforcing" elements (i.e. dense stone columns) into the soil profile to provide a stone column – soil composite with enhanced bearing capacity and settlement characteristics.

GROUND CONDITIONS

The soil profile beneath the site generally consists of existing fill to a depth of approximately 5 ft. The fill generally consisted of fine to coarse sand and gravel. The fill is underlain by clay and sand soils to the termination depth of the borings.

SOIL PROPERTIES

The soil profile below the anticipated founding depths for the addition is summarized in Table 1 below:

Table 1

Soil Unit	Average Depth Range	SPT "N" Value	Modulus of Vol. Compressibililty
Urban Fill - Sand	0 to 5 ft.	22 to 50+	N/A
Natural Clay Soils	0 to 32.5 ft.	2 to 4	0.4
Natural Sand Soils	0 to 32.5 ft.	3 to 30	N/A

BEARING PRESSURE REQUIREMENTS

The ground improvement has been designed to support the following bearing pressures:

- A maximum uniformly distributed load (UDL) of up to 3,000 psf (143.4 kPa) beneath the pad footings and continuous wall footings.

PERFORMANCE REQUIREMENTS

In addition to safely supporting the specified foundation pressures, the ground improvement is based upon limiting post construction total settlements to a maximum of around 1 inch with a maximum differential of ½ inch. The estimated settlement does not include any settlement that may occur due to the weight of structural fill used to adjust or raise site grades.

DESIGN

Vibro stone columns will be installed beneath the designated footings at the frequency and spacing shown on the vibro stone column layout drawing. Vibro stone column installation will commence from the working platform level, with stone columns installed to a depth of approximately 22 ft. or refusal.

DESIGN CALCULATIONS

Settlement calculations have been produced (taking account of the loading conditions described above) and based upon the average soil profile for the Borings. The calculations are presented in Appendix B and notes on the calculation method are provided in Appendix A.

The calculations are based upon forming stone columns with a typical diameter of the order of 700-750mm (around 2.5 feet) with an assumed angle of internal friction for the stone column of 43 degrees.

The results of the settlement calculations indicate maximum post construction settlements of less than 1 inch. We would anticipate the maximum differential settlement to be less than ½ inch.

INSTALLATION OF SERVICES FOLLOWING STONE COLUMN INSTALLATION

Where installation of services are proposed following installation of vibro stone columns, appropriate measures need to be taken by the contractor installing the foundations and services, to ensure that the integrity of the vibro stone column treatment is not compromised. As a general rule, any excavation which potentially intersects a line drawn down at 45 degrees at underside of foundation level will potentially impact on the integrity of the treated ground due to disturbance of the treated ground. Where this occurs, the disturbed soil should be removed and replaced with suitable granular material placed and compacted in layers or lean mix concrete until back above the 45 degree line, (dependent upon the requirements of the Local Authority).

Job No.:	Page: 1
Job Title: SeaPort Lofts	

e:	Made by:	Checked by:

APPENDIX A

Pad & strip footing settlement Determination

Cohesive Soils

Immediate Settlement – Ueshita and Meyerhof (1968)

The solution of immediate (undrained) settlements within clays is provided by Ueshita and Meyerhof (1968). The solution provides the settlement at the corner of a loaded area, and in order to determine the maximum settlement at the center of a loaded area the principle of superposition should be applied. The expression used by Ueshita and Meyerhof (1968) is as follows:

$$\rho_I = \{q.B.I\}/E_u$$

where

q = uniform applied pressure

B = Foundation width

I = Influence Factor (Fig. 1)

E_u = Undrained shear modulus

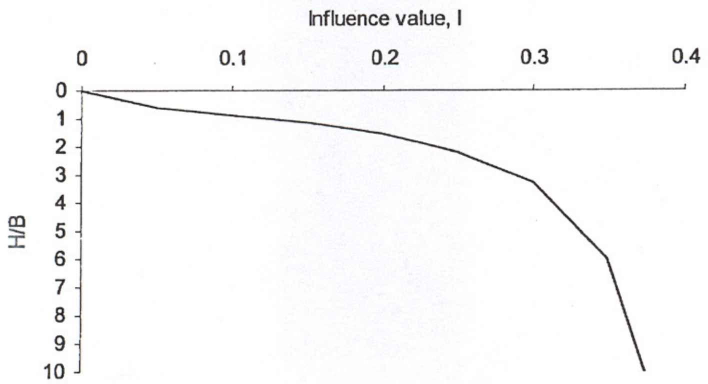


Figure 1: Influence values (I) based on L/B = 1, for various soil layer thickness (H)

Consolidation Settlements - Oedometer or M_v Method

Where cohesive soils are encountered, oedometer tests are often carried out to determine the consolidation characteristics of the soils. For a given pressure increase above the effective vertical stress at the depth the sample was collected, the m_v value can be measured (coefficient of volume compressibility). Using this m_v value the change in thickness/settlement for a soil layer is obtained using the following expression:

$$\rho_{oed} = m_v.H.\Delta\sigma$$

where

m_v. = coefficient of volume compressibility

H = initial thickness of soil layer

$\Delta\sigma$ = change in stress

Skempton and Bjerrum (1957) have taken this a stage further by stating that the settlements predicted by the above equation do not take into account the fact that soils beneath structures are not laterally confined as with the oedometer tests. They introduced a semi-empirical correction factor (μ), to give the consolidation settlement as:

$\rho_c = \mu . \rho_{oed}$

Granular Soils

Immediate Settlements – Burland and Burbridge (1985)

Based on the statistical analysis of observed settlements, Burland and Burbridge (1985) proposed that the average immediate settlement for a foundation founded on the surface of normally consolidated sands is given by:

$$\rho_i = f_s . f_l . q` . B^{0.7} . I_c$$

where,

- q` = average gross effective foundation pressure (kN/m^2)
- B = width of foundations (m)
- I_c = compressibility index
  - $= (1.71)/(N^{1.4})$
- f_s = shape factor
  - $= [\{1.25.(L/B)\}/\{(L/B)+0.2\}]$
- f_l = thickness factor
  - $= (H_s/Z_l).\{2-(H_s/Z_l)\}$ for $H_s < Z_l$
  - $= 1$ for $H_s > Z_l$

where,

- N = average SPT value over depth of influence
- L = foundation length (m)
- B = foundation breadth (m)
- Z_l = depth of influence (Fig. 2)
- H_s = thickness of sand below foundation (m)

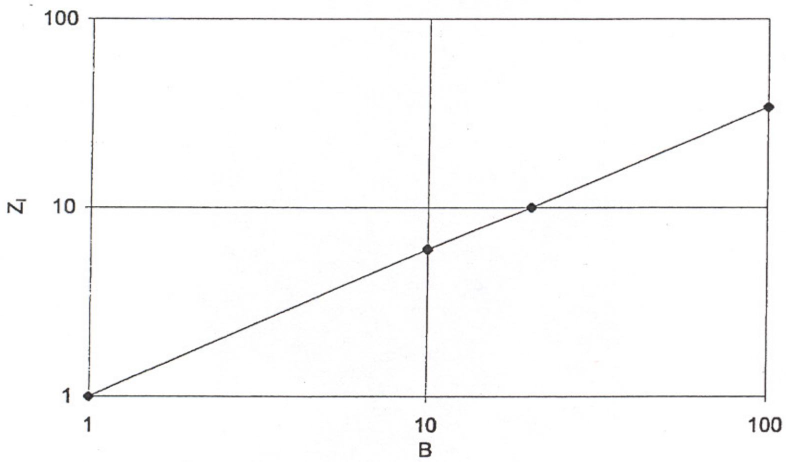


Figure 2: Depth of influence

Creep Settlements (Granular Soils)

A correction is applied to the immediate settlement in granular soils to obtain the long term (or creep) settlement. The correction is given by the term:

$$f_t = 1 + R_3 + R_t . \log_{10}(t/3)$$

where

R_3 = 0.3 for static loads and 0.7 for fluctuating loads

R_t = 0.2 for static loads and 0.8 for fluctuating loads

The corrected immediate settlement is then given by:

$$\rho_t = f_t . \rho_i$$

Job No.:	Page: 4	
Job Title: SeaPort Lofts		
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Stress Distribution

Stress Distribution Beneath Main Foundations

Beneath pad/strip foundations a Bousinessq stress distribution is used.

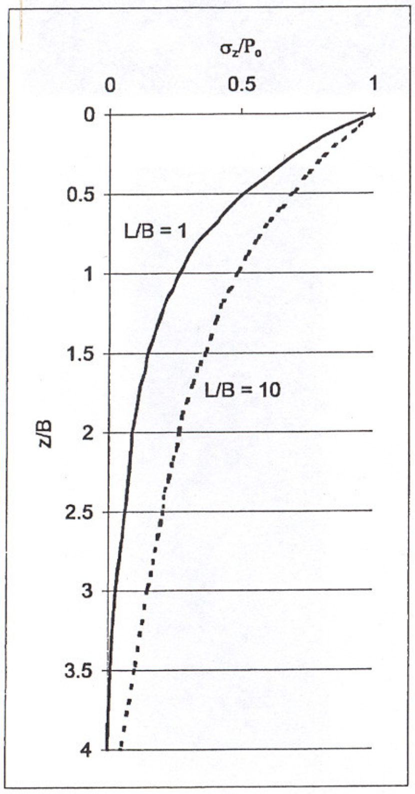

Figure 1: Mean Vertical Stress (σ_z) at a depth z beneath a rectangular area (L x B) loaded to a uniform bearing pressure of P_o.

Stress Distribution Beneath Floor Slabs

The stress beneath a floor slab is determined using the expression of Hobbs (1974):

$$P_z = B.L.P_o \cdot \frac{1}{(B+1.2z)(L+1.2z)}$$

Where,

P_z = Stress at depth z below foundation

P_o = Imposed load from foundation

B = Width of slab area

L = Length of slab area

z = depth below foundation

The settlement beneath the floor slab is only considered to a depth where the applied stress becomes less than 20% of the overburden pressure or where the soils are considered to be incompressible.

Job No.:	Page: 5	
Job Title: SeaPort Lofts		
[illegible]e:	Made by:	Checked by:

Determination of Settlements Beneath Floor Slab

Reduction of Settlements due to Stone Columns

When analysing the effect of stone columns on the settlements beneath floor slab areas, consideration is given to reduction in stress on the in situ soils: If you consider that the settlements beneath the floor slab are a function of the imposed foundation load, then by reducing that applied load on the soils you effectively reduce the settlements. Where stone columns are installed they are generally a magnitude stiffer than the surrounding soils, and by principles of stress share the stone columns will take a greater proportion of the load which is defined by Baumann and Bauer (1974) in the following expressions:

$$\frac{P_c}{P_s} = \frac{1 + 2\left(\frac{E_s}{E_c}\right).k_s.\ln\left(\frac{a}{r_o}\right)}{2\left(\frac{E_s}{E_c}\right)k_c.\ln\left(\frac{a}{r_o}\right)}$$

$$P_o.A_o = P_c.A_c + P_s.A_s$$

Where,

P_o = Imposed load from foundation
P_c = Stress on stone column
P_s = Stress on soil
A_o = Unit area per stone column
A_s = Cross sectional area of stone column
A_c = Cross section area of treated soil
E_c = Modulus of deformation for stone column aggregate
E_s = modulus of deformation for soil
k_s = Earth pressure co-efficient for column
k_c =Earth pressure co-efficient for soil
r_o = stone column radius
a = $(Ao/\Pi)^{0.5}$

From the above equations the values of P_s and P_c can be determined. In determining the settlements beneath the floor slab, post treatment (stone column installation), the value P_s is used for the treated depth, beyond which the imposed load (P_o) used.

Job No.:		Page: 6
Job Title: SeaPort Lofts		
..e:	Made by:	Checked by:

References

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BAUMANN, V. AND BAUER, G. E. A. (1974). The performance of foundations on various soils stabilised by the vibro-compaction method. *Can. Geotech. J.* **II**, 509-529.

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UESHITA, K. AND MEYERHOF, G. G. (1968) Surface displacement of an elastic layer under uniformly distributed loads. *Highway Research Board Record No. 228*, 1-10.

APPENDIX B

Determination of Improvement Factors (Priebe 1995)

Contract Name: Seaport Lofts

Calculation Reference: 3' x 3'

Contract Number:

P_o = 143.4 kN/m^2

A_o = 0.84 m^2

Founding Depth = 1.5239 m

ϕ_c = 43

E_c = 45 MN/m^2

Layer Ref.	d m	Dia. m	A_o/A_c	E_s MN/m^2	γ_s kN/m^3	υ_s	n_0	E_c/E_s	K_{ac}	$(A_c/A_o)_1$	$\Delta(A_o/A_c)$	A_c/A_o	n_1	$\Sigma(\gamma_s.\Delta d)$	P_c/P_s	P_c	K_{oc}	f_d	n_2
								Column Compressibility						Overburden Constraint					
	1.52				18														
1	2.13	0.70	2.18	9	9	0.33	5.62	5.00	0.19	0.42	1.37	0.28	3.16	30.158	8.68	394	0.32	1.20	3.79
2	3.05	0.70	2.18	9	9	0.33	5.62	5.00	0.19	0.42	1.37	0.28	3.16	37.025	8.68	394	0.32	1.25	3.96
3	3.66	0.70	2.18	9	9	0.33	5.62	5.00	0.19	0.42	1.37	0.28	3.16	43.91	8.68	394	0.32	1.31	4.16
4	4.57	0.70	2.18	9	9	0.33	5.62	5.00	0.19	0.42	1.37	0.28	3.16	50.75	8.68	394	0.32	1.38	4.37
5	6.09	0.70	2.18	9	9	0.33	5.62	5.00	0.19	0.42	1.37	0.28	3.16	61.685	8.68	394	0.32	1.51	4.77
6	6.71	0.70	2.18	9	9	0.33	5.62	5.00	0.19	0.42	1.37	0.28	3.16	71.315	8.68	394	0.32	1.64	5.17
7	8.53	0.70	2.18	75	9	0.33	5.62	0.60	0.19	-0.08	-14.09	-0.08	0.56	82.295	6.20	1579	0.32	1.13	0.63
8	10.67	0.70	2.18	75	9	0.33	5.62	0.60	0.19	-0.08	-14.09	-0.08	0.56	100.12	6.20	1579	0.32	1.16	0.65

A_o = Area per stone column
A_c = Cross sectional area of stone column
d = depth to bottom of layer from ground level
Δd = Layer Thickness
K_{oc} = Coeficient of Earth Pressure at rest of column
K_{ac} = Coeficient for Active Earth Pressure of column
E_c = Modulus of Stone Column
E_s = Modulus of Soil

n_0 = Basic improvement factor
n_1 = Improvement factor with Column Compressibility
n_2 = Improvement factor with Overburden Constraint
P_o = Imposed Stress
P_c = Imposed Stress on Column
P_s = Imposed Stress on Soil
γ_s = Unit Weight of soil
υ_s = Poissions Ratio
ϕ_c = Friction angle of Stone Column

Determination of Settlement Beneath Pad/Strip Foundation

Contract Name: ort Lofts

Contract Number: 0

P_o = 143 kN/m^2

A_o = 0.84 m^2

Improvement factor = n2 (n0, n1 or n2)

B = 0.9144 m

L = 0.9144 m

Time = 50 years

							Cohesive Soils						Granular Soils					Improvement		
							Consolidation			Immediate			Immediate		Creep			Vibro	Priebe	
depth m	Δd m	z m	z/B	P_o kN/m^2	P_o/σ_v	Soil Profile	m_v	μ	ρ_c	C_u	E_s/C_u	ρ_i	SPT N	ρ_i	f_t	$\rho_i + \rho_{cr}$	ρ_T	y/n	n2	ρ_{Tn}
0.61	0.61	0.303	0.331	96	3.19		0.4	0.8	18.63	18	180	0.49		0.00	1.54	0.00	19.12	y	3.79	5.05
1.53	0.92	1.0661	1.166	34	0.93		0.4	0.8	10.13	18	180	0.35		0.00	1.54	0.00	10.48	y	3.96	2.64
2.14	0.61	1.8311	2.003	13	0.29		0.4	0.8	2.52	18	180	0.07		0.00	1.54	0.00	2.58	y	4.16	0.62
3.05	0.91	2.5911	2.834	9	0.18		0.4	0.8	2.71	18	180	0.09		0.00	1.54	0.00	2.81	y	4.37	0.64
4.57	1.52	3.8061	4.163	0	0.00		0.4	0.8	0.00	18	180	0.00		0.00	1.54	0.00	0.00	y	4.77	0.00
5.19	0.62	4.8761	5.333	0	0.00		0.4	0.8	0.00	18	180	0.00		0.00	1.54	0.00	0.00	y	5.17	0.00
7.01	1.82	6.0961	6.667	0	0.00				0.00			0.00	50	0.00	1.54	0.00	0.00		1.00	0.00
9.15	2.14	8.0761	8.833	0	0.00				0.00			0.00	50	0.00	1.54	0.00	0.00		1.00	0.00

Pre-Treatment Settlement = 35.00 mm

Post Treatment Settlement = 8.96 mm

A_o = Area per stone column

B = foundation width

C_u = cohesion of soil

depth = depth to top of layer below foundation level

E_s = Youngs modulus

L = foundation Length

m_v = coefficient of volumn compressibility

n_1 = Improvement factor with Column Compressibility

n_2 = Improvement factor with Overburden Constraint

P_o = Imposed Stress

z = depth below foundation to midpoint of layer

Δd = Layer Thickness

μ = correction factor for 3D consolidation

ρ_c = Consolidation Settlement

ρ_i = Immediate Settlement

ρ_{cr} = Creep Settlement

ρ_T = Total Settlement

ρ_{Tn} = Total Settlement with Improvement

σ_v = overburden stress

Determination of Improvement Factors (Priebe 1995)

Contract Name: Seaport Lofts

Contract Number:

Calculation Reference: 4' x 4'

P_o = 143.4 kN/m^2

A_o = 0.74 m^2

Founding Depth = 1.5239 m

ϕ_c = 43

E_c = 45 MN/m^2

Layer Ref.	d (m)	Dia. (m)	A_o/A_c	E_s (MN/m^2)	γ_s (kN/m^3)	υ_s	n_0	E_c/E_s	K_{ac}	$(A_c/A_o)_1$	$\Delta(A_o/A_c)$	A_c/A_o	n_1	$\Sigma(\gamma_s.\Delta d)$	P_c/P_s	P_c	K_{oc}	f_d	n_2
								Column Compressibility						Overburden Constraint					
	1.52				18														
1	2.13	0.70	1.92	9	9	0.33	6.90	5.00	0.19	0.42	1.37	0.30	3.41	30.158	8.92	376	0.32	1.21	4.11
2	3.05	0.70	1.92	9	9	0.33	6.90	5.00	0.19	0.42	1.37	0.30	3.41	37.025	8.92	376	0.32	1.27	4.32
3	3.66	0.70	1.92	9	9	0.33	6.90	5.00	0.19	0.42	1.37	0.30	3.41	43.91	8.92	376	0.32	1.33	4.55
4	4.57	0.70	1.92	9	9	0.33	6.90	5.00	0.19	0.42	1.37	0.30	3.41	50.75	8.92	376	0.32	1.41	4.80
5	6.09	0.70	1.92	9	9	0.33	6.90	5.00	0.19	0.42	1.37	0.30	3.41	61.685	8.92	376	0.32	1.54	5.26
6	6.71	0.70	1.92	9	9	0.33	6.90	5.00	0.19	0.42	1.37	0.30	3.41	71.315	8.92	376	0.32	1.69	5.75
7	8.53	0.70	1.92	75	9	0.33	6.90	0.60	0.19	-0.08	-14.09	-0.08	0.57	82.295	6.21	1557	0.32	1.13	0.64
8	10.67	0.70	1.92	75	9	0.33	6.90	0.60	0.19	-0.08	-14.09	-0.08	0.57	100.12	6.21	1557	0.32	1.16	0.66

A_o = Area per stone column
A_c = Cross sectional area of stone column
d = depth to bottom of layer from ground level
Δd = Layer Thickness
K_{oc} = Coeficient of Earth Pressure at rest of column
K_{ac} = Coeficient for Active Earth Pressure of column
E_c = Modulus of Stone Column
E_s = Modulus of Soil

n_0 = Basic improvement factor
n_1 = Improvement factor with Column Compressibility
n_2 = Improvement factor with Overburden Constraint
P_o = Imposed Stress
P_c = Imposed Stress on Column
P_s = Imposed Stress on Soil
γ_s = Unit Weight of soil
υ_s = Poissions Ratio
ϕ_c = Friction angle of Stone Column

Determination of Settlement Beneath Pad/Strip Foundation

Contract Name: ort Lofts
Contract Number: 0

P_o = 143 kN/m^2
A_o = 0.74 m^2
Improvement factor = n2 (n0, n1 or n2)

B = 1.2191 m
L = 1.2191 m
Time = 50 years

							Cohesive Soils						Granular Soils					Improvement		
							Consolidation			Immediate			Immediate		Creep					
depth	Δd	z	z/B	P_o	P_o/σ_v	Soil Profile												Vibro	Priebe	
m	m	m		kN/m^2			m_v	μ	ρ_c	C_u	E_s/C_u	ρ_i	SPT N	ρ_i	f_t	$\rho_i + \rho_{cr}$	ρ_T	y/n	n2	ρ_{Tn}
0.61	0.61	0.303	0.249	109	3.61		0.4	0.8	21.14	18	180	0.15		0.00	1.54	0.00	21.28	y	4.11	5.17
1.53	0.92	1.0661	0.874	49	1.32		0.4	0.8	14.35	18	180	0.33		0.00	1.54	0.00	14.68	y	4.32	3.40
2.14	0.61	1.8311	1.502	22	0.49		0.4	0.8	4.20	18	180	0.03		0.00	1.54	0.00	4.23	y	4.55	0.93
3.05	0.91	2.5911	2.125	12	0.24		0.4	0.8	3.55	18	180	0.08		0.00	1.54	0.00	3.63	y	4.80	0.76
4.57	1.52	3.8061	3.122	4	0.07		0.4	0.8	2.09	18	180	0.09		0.00	1.54	0.00	2.18	y	5.26	0.41
5.19	0.62	4.8761	4.000	1	0.02		0.4	0.8	0.28	18	180	0.00		0.00	1.54	0.00	0.29	y	5.75	0.05
7.01	1.82	6.0961	5.000	0	0.00				0.00			0.00	50	0.00	1.54	0.00	0.00		1.00	0.00
9.15	2.14	8.0761	6.624	0	0.00				0.00			0.00	50	0.00	1.54	0.00	0.00		1.00	0.00

Pre-Treatment Settlement = 46.30 mm

Post Treatment Settlement = 10.72 mm

A_o = Area per stone column
B = foundation width
C_u = cohesion of soil
depth = depth to top of layer below foundation level
E_s = Youngs modulus
L = foundation Length
m_v = coefficient of volumn compressibility
n_1 = Improvement factor with Column Compressibility
n_2 = Improvement factor with Overburden Constraint

P_o = Imposed Stress
z = depth below foundation to midpoint of layer
Δd = Layer Thickness
μ = correction factor for 3D consolidation
ρ_c = Consolidation Settlement
ρ_i = Immediate Settlement
ρ_{cr} = Creep Settlement
ρ_T = Total Settlement
ρ_{Tn} = Total Settlement with Improvement
σ_v = overburden stress

[illegible]

Determination of Improvement Factors (Priebe 1995)

Contract Name: Seaport Lofts

Contract Number:

Calculation Reference: 5' x 5'

P_o = 143.4 kN/m^2

A_o = 1.16 m^2

Founding Depth = 1.5239 m

ϕ_c = 43

E_c = 45 MN/m^2

Layer Ref.	d m	Dia. m	A_o/A_c	E_s MN/m^2	γ_s kN/m^3	υ_s	n_0	E_c/E_s (Column Compressibility)	K_{ac}	$(A_c/A_o)_1$	$\Delta(A_o/A_c)$	A_c/A_o	n_1	$\Sigma(\gamma_s.\Delta d)$ (Overburden Constraint)	P_c/P_s	P_c	K_{oc}	f_d	n_2
	1.52				18														
1	2.13	0.70	3.01	9	9	0.33	3.73	5.00	0.19	0.42	1.37	0.23	2.64	30.158	8.18	445	0.32	1.17	3.09
2	3.05	0.70	3.01	9	9	0.33	3.73	5.00	0.19	0.42	1.37	0.23	2.64	37.025	8.18	445	0.32	1.22	3.21
3	3.66	0.70	3.01	9	9	0.33	3.73	5.00	0.19	0.42	1.37	0.23	2.64	43.91	8.18	445	0.32	1.27	3.35
4	4.57	0.70	3.01	9	9	0.33	3.73	5.00	0.19	0.42	1.37	0.23	2.64	50.75	8.18	445	0.32	1.32	3.49
5	6.09	0.70	3.01	9	9	0.33	3.73	5.00	0.19	0.42	1.37	0.23	2.64	61.685	8.18	445	0.32	1.42	3.75
6	6.71	0.70	3.01	9	9	0.33	3.73	5.00	0.19	0.42	1.37	0.23	2.64	71.315	8.18	445	0.32	1.52	4.02
7	8.53	0.70	3.01	75	9	0.33	3.73	0.60	0.19	-0.08	-14.09	-0.09	0.53	82.295	6.17	1661	0.32	1.12	0.60
8	10.67	0.70	3.01	75	9	0.33	3.73	0.60	0.19	-0.08	-14.09	-0.09	0.53	100.12	6.17	1661	0.32	1.15	0.61

A_o = Area per stone column
A_c = Cross sectional area of stone column
d = depth to bottom of layer from ground level
Δd = Layer Thickness
K_{oc} = Coeficient of Earth Pressure at rest of column
K_{ac} = Coeficient for Active Earth Pressure of column
E_c = Modulus of Stone Column
E_s = Modulus of Soil

n_0 = Basic improvement factor
n_1 = Improvement factor with Column Compressibility
n_2 = Improvement factor with Overburden Constraint
P_o = Imposed Stress
P_c = Imposed Stress on Column
P_s = Imposed Stress on Soil
γ_s = Unit Weight of soil
υ_s = Poissions Ratio
ϕ_c = Friction angle of Stone Column

Determination of Settlement Beneath Pad/Strip Foundation

Contract Name: ort Lofts
Contract Number: 0

P_o = 143 kN/m^2
A_o = 1.16 m^2
Improvement factor = n2 (n0, n1 or n2)

B = 1.5239 m
L = 1.5239 m
Time = 50 years

							Cohesive Soils						Granular Soils					Improvement		
							Consolidation			Immediate			Immediate		Creep			Vibro	Priebe	
depth m	Δd m	z m	z/B	P_o kN/m^2	P_o/σ_v	Soil Profile	m_v	μ	ρ_c	C_u	E_s/C_u	ρ_i	SPT N	ρ_i	f_t	$\rho_i + \rho_{cr}$	ρ_T	y/n	n2	ρ_{Tn}
0.61	0.61	0.303	0.199	123	4.09		0.4	0.8	23.92	18	180	0.21		0.00	1.54	0.00	24.13	y	3.09	7.82
1.53	0.92	1.0661	0.700	65	1.74		0.4	0.8	19.00	18	180	0.55		0.00	1.54	0.00	19.54	y	3.21	6.09
2.14	0.61	1.8311	1.202	30	0.69		0.4	0.8	5.88	18	180	0.05		0.00	1.54	0.00	5.93	y	3.35	1.77
3.05	0.91	2.5911	1.700	17	0.34		0.4	0.8	5.01	18	180	0.03		0.00	1.54	0.00	5.04	y	3.49	1.44
4.57	1.52	3.8061	2.498	10	0.16		0.4	0.8	4.88	18	180	0.17		0.00	1.54	0.00	5.05	y	3.75	1.35
5.19	0.62	4.8761	3.200	4	0.06		0.4	0.8	0.85	18	180	0.01		0.00	1.54	0.00	0.86	y	4.02	0.21
7.01	1.82	6.0961	4.000	0	0.00				0.00			0.00	50	0.00	1.54	0.00	0.00		1.00	0.00
9.15	2.14	8.0761	5.300	0	0.00				0.00			0.00	50	0.00	1.54	0.00	0.00		1.00	0.00

Pre-Treatment Settlement = 60.55 mm

Post Treatment Settlement = 18.68 mm

A_o = Area per stone column
B = foundation width
C_u = cohesion of soil
depth = depth to top of layer below foundation level
E_s = Youngs modulus
L = foundation Length
m_v = coefficient of volumn compressibility
n_1 = Improvement factor with Column Compressibility
n_2 = Improvement factor with Overburden Constraint

P_o = Imposed Stress
z = depth below foundation to midpoint of layer
Δd = Layer Thickness
μ = correction factor for 3D consolidation
ρ_c = Consolidation Settlement
ρ_i = Immediate Settlement
ρ_{cr} = Creep Settlement
ρ_T = Total Settlement
ρ_{Tn} = Total Settlement with Improvement
σ_v = overburden stress

[illegible]

Determination of Improvement Factors (Priebe 1995)

Contract Name: Seaport Lofts

Calculation Reference: 6' x 6'

Contract Number:

P_o = 143.4 kN/m^2

A_o = 0.84 m^2

Founding Depth = 1.5239 m

ϕ_c = 43

E_c = 45 MN/m^2

Layer Ref.	d m	Dia. m	A_o/A_c	E_s MN/m^2	γ_s kN/m^3	υ_s	n_0	E_c/E_s	K_{ac}	$(A_c/A_o)_1$	$\Delta(A_o/A_c)$	A_c/A_o	n_1	$\Sigma(\gamma_s.\Delta d)$	P_c/P_s	P_c	K_{oc}	f_d	n_2
								Column Compressibility						Overburden Constraint					
	1.52				18														
1	2.13	0.70	2.18	9	9	0.33	5.62	5.00	0.19	0.42	1.37	0.28	3.16	30.158	8.68	394	0.32	1.20	3.79
2	3.05	0.70	2.18	9	9	0.33	5.62	5.00	0.19	0.42	1.37	0.28	3.16	37.025	8.68	394	0.32	1.25	3.96
3	3.66	0.70	2.18	9	9	0.33	5.62	5.00	0.19	0.42	1.37	0.28	3.16	43.91	8.68	394	0.32	1.31	4.16
4	4.57	0.70	2.18	9	9	0.33	5.62	5.00	0.19	0.42	1.37	0.28	3.16	50.75	8.68	394	0.32	1.38	4.37
5	6.09	0.70	2.18	9	9	0.33	5.62	5.00	0.19	0.42	1.37	0.28	3.16	61.685	8.68	394	0.32	1.51	4.77
6	6.71	0.70	2.18	9	9	0.33	5.62	5.00	0.19	0.42	1.37	0.28	3.16	71.315	8.68	394	0.32	1.64	5.17
7	8.53	0.70	2.18	75	9	0.33	5.62	0.60	0.19	-0.08	-14.09	-0.08	0.56	82.295	6.20	1579	0.32	1.13	0.63
8	10.67	0.70	2.18	75	9	0.33	5.62	0.60	0.19	-0.08	-14.09	-0.08	0.56	100.12	6.20	1579	0.32	1.16	0.65

A_o = Area per stone column

A_c = Cross sectional area of stone column

d = depth to bottom of layer from ground level

Δd = Layer Thickness

K_{oc} = Coeficient of Earth Pressure at rest of column

K_{ac} = Coeficient for Active Earth Pressure of column

E_c = Modulus of Stone Column

E_s = Modulus of Soil

n_0 = Basic improvement factor

n_1 = Improvement factor with Column Compressibility

n_2 = Improvement factor with Overburden Constraint

P_o = Imposed Stress

P_c = Imposed Stress on Column

P_s = Imposed Stress on Soil

γ_s = Unit Weight of soil

υ_s = Poissions Ratio

ϕ_c = Friction angle of Stone Column

MFSCALC

Determination of Settlement Beneath Pad/Strip Foundation

Contract Name: ort Lofts
Contract Number: 0

P_o = 143 kN/m^2
A_o = 0.84 m^2
Improvement factor = n2 (n0, n1 or n2)

B = 2.1335 m
L = 2.1335 m
Time = 50 years

							Cohesive Soils						Granular Soils					Improvement		
depth	Δd	z	z/B	P_o	P_o/σ_v	Soil Profile	Consolidation			Immediate			Immediate		Creep			Vibro	Priebe	
m	m	m		kN/m^2			m_v	μ	ρ_c	C_u	E_s/C_u	ρ_i	SPT N	ρ_i	f_t	$\rho_i + \rho_{cr}$	ρ_T	y/n	n2	ρ_{Tn}
0.61	0.61	0.303	0.142	123	4.09		0.4	0.8	23.92	18	180	0.29		0.00	1.54	0.00	24.21	y	3.79	6.40
1.53	0.92	1.0661	0.500	85	2.29		0.4	0.8	24.91	18	180	0.20		0.00	1.54	0.00	25.11	y	3.96	6.34
2.14	0.61	1.8311	0.858	49	1.11		0.4	0.8	9.52	18	180	0.12		0.00	1.54	0.00	9.63	y	4.16	2.32
3.05	0.91	2.5911	1.214	30	0.59		0.4	0.8	8.77	18	180	0.07		0.00	1.54	0.00	8.84	y	4.37	2.02
4.57	1.52	3.8061	1.784	17	0.28		0.4	0.8	8.37	18	180	0.20		0.00	1.54	0.00	8.57	y	4.77	1.80
5.19	0.62	4.8761	2.285	11	0.16		0.4	0.8	2.28	18	180	0.03		0.00	1.54	0.00	2.30	y	5.17	0.45
7.01	1.82	6.0961	2.857	9	0.11				0.00			0.00	50	0.11	1.54	0.17	0.17		1.00	0.17
9.15	2.14	8.0761	3.785	1	0.01				0.00			0.00	50	0.02	1.54	0.03	0.03		1.00	0.03

Pre-Treatment Settlement = 78.87 mm

Post Treatment Settlement = 19.52 mm

A_o = Area per stone column
B = foundation width
C_u = cohesion of soil
depth = depth to top of layer below foundation level
E_s = Youngs modulus
L = foundation Length
m_v = coefficient of volumn compressibility
n_1 = Improvement factor with Column Compressibility
n_2 = Improvement factor with Overburden Constraint

P_o = Imposed Stress
z = depth below foundation to midpoint of layer
Δd = Layer Thickness
μ = correction factor for 3D consolidation
ρ_c = Consolidation Settlement
ρ_i = Immediate Settlement
ρ_{cr} = Creep Settlement
ρ_T = Total Settlement
ρ_{Tn} = Total Settlement with Improvement
σ_v = overburden stress

[illegible]

Determination of Improvement Factors (Priebe 1995)

Contract Name: Seaport Lofts

Contract Number:

Calculation Reference: 7' x 7'

P_o = 143.4 kN/m^2

A_o = 1.14 m^2

Founding Depth = 1.5239 m

ϕ_c = 43

E_c = 45 MN/m^2

Layer Ref.	d (m)	Dia. (m)	A_o/A_c	E_s (MN/m^2)	γ_s (kN/m^3)	υ_s	n_0	E_c/E_s	K_{ac}	$(A_c/A_o)_1$	$\Delta(A_o/A_c)$	A_c/A_o	n_1	$\Sigma(\gamma_s.\Delta d)$	P_c/P_s	P_c	K_{oc}	f_d	n_2
								Column Compressibility						Overburden Constraint					
	1.52				18														
1	2.13	0.70	2.96	9	9	0.33	3.80	5.00	0.19	0.42	1.37	0.23	2.66	30.158	8.20	442	0.32	1.17	3.12
2	3.05	0.70	2.96	9	9	0.33	3.80	5.00	0.19	0.42	1.37	0.23	2.66	37.025	8.20	442	0.32	1.22	3.25
3	3.66	0.70	2.96	9	9	0.33	3.80	5.00	0.19	0.42	1.37	0.23	2.66	43.91	8.20	442	0.32	1.27	3.38
4	4.57	0.70	2.96	9	9	0.33	3.80	5.00	0.19	0.42	1.37	0.23	2.66	50.75	8.20	442	0.32	1.33	3.53
5	6.09	0.70	2.96	9	9	0.33	3.80	5.00	0.19	0.42	1.37	0.23	2.66	61.685	8.20	442	0.32	1.43	3.80
6	6.71	0.70	2.96	9	9	0.33	3.80	5.00	0.19	0.42	1.37	0.23	2.66	71.315	8.20	442	0.32	1.53	4.07
7	8.53	0.70	2.96	75	9	0.33	3.80	0.60	0.19	-0.08	-14.09	-0.09	0.53	82.295	6.18	1656	0.32	1.12	0.60
8	10.67	0.70	2.96	75	9	0.33	3.80	0.60	0.19	-0.08	-14.09	-0.09	0.53	100.12	6.18	1656	0.32	1.15	0.61

A_o = Area per stone column
A_c = Cross sectional area of stone column
d = depth to bottom of layer from ground level
Δd = Layer Thickness
K_{oc} = Coeficient of Earth Pressure at rest of column
K_{ac} = Coeficient for Active Earth Pressure of column
E_c = Modulus of Stone Column
E_s = Modulus of Soil

n_0 = Basic improvement factor
n_1 = Improvement factor with Column Compressibility
n_2 = Improvement factor with Overburden Constraint
P_o = Imposed Stress
P_c = Imposed Stress on Column
P_s = Imposed Stress on Soil
γ_s = Unit Weight of soil
υ_s = Poissions Ratio
ϕ_c = Friction angle of Stone Column

Determination of Settlement Beneath Pad/Strip Foundation

Contract Name: ort Lofts
Contract Number: 0

P_o = 143 kN/m^2
A_o = 1.14 m^2
Improvement factor = n2 (n0, n1 or n2)

B = 2.1335 m
L = 2.1335 m
Time = 50 years

							Cohesive Soils						Granular Soils					Improvement		
depth	Δd	z	z/B	P_o	P_o/σ_v	Soil Profile	Consolidation			Immediate			Immediate		Creep			Vibro	Priebe	
m	m	m		kN/m^2			m_v	μ	ρ_c	C_u	E_s/C_u	ρ_i	SPT N	ρ_i	f_t	$\rho_i + \rho_{cr}$	ρ_T	y/n	n2	ρ_{Tn}
0.61	0.61	0.303	0.142	123	4.09		0.4	0.8	23.92	18	180	0.29		0.00	1.54	0.00	24.21	y	3.12	7.76
1.53	0.92	1.0661	0.500	85	2.29		0.4	0.8	24.91	18	180	0.20		0.00	1.54	0.00	25.11	y	3.25	7.74
2.14	0.61	1.8311	0.858	49	1.11		0.4	0.8	9.52	18	180	0.12		0.00	1.54	0.00	9.63	y	3.38	2.85
3.05	0.91	2.5911	1.214	30	0.59		0.4	0.8	8.77	18	180	0.07		0.00	1.54	0.00	8.84	y	3.53	2.50
4.57	1.52	3.8061	1.784	17	0.28		0.4	0.8	8.37	18	180	0.20		0.00	1.54	0.00	8.57	y	3.80	2.26
5.19	0.62	4.8761	2.285	11	0.16		0.4	0.8	2.28	18	180	0.03		0.00	1.54	0.00	2.30	y	4.07	0.57
7.01	1.82	6.0961	2.857	9	0.11				0.00			0.00	50	0.11	1.54	0.17	0.17		1.00	0.17
9.15	2.14	8.0761	3.785	1	0.01				0.00			0.00	50	0.02	1.54	0.03	0.03		1.00	0.03

Pre-Treatment Settlement = 78.87 mm

Post Treatment Settlement = 23.87 mm

A_o = Area per stone column
B = foundation width
C_u = cohesion of soil
depth = depth to top of layer below foundation level
E_s = Youngs modulus
L = foundation Length
m_v = coefficient of volumn compressibility
n_1 = Improvement factor with Column Compressibility
n_2 = Improvement factor with Overburden Constraint

P_o = Imposed Stress
z = depth below foundation to midpoint of layer
Δd = Layer Thickness
μ = correction factor for 3D consolidation
ρ_c = Consolidation Settlement
ρ_i = Immediate Settlement
ρ_{cr} = Creep Settlement
ρ_T = Total Settlement
ρ_{Tn} = Total Settlement with Improvement
σ_v = overburden stress

The immediate settlements beneath foundations are
Consolidation settlements within the cohesive soil layers given by

Determination of Improvement Factors (Priebe 1995)

Contract Name: Seaport Lofts

Calculation Reference: 10.25' x 13.5'

Contract Number:

P_o = 143.4 kN/m^2

A_o = 0.64 m^2

Founding Depth = 1.5239 m

ϕ_c = 43

E_c = 45 MN/m^2

Layer Ref.	d m	Dia. m	A_o/A_c	E_s MN/m^2	γ_s kN/m^3	υ_s	n_0	E_c/E_s	K_{ac}	$(A_c/A_o)_1$	$\Delta(A_o/A_c)$	A_c/A_o	n_1	$\Sigma(\gamma_s.\Delta d)$	P_c/P_s	P_c	K_{oc}	f_d	n_2
								Column Compressibility						Overburden Constraint					
	1.52				18														
1	2.13	0.70	1.66	9	9	0.33	9.17	5.00	0.19	0.42	1.37	0.33	3.71	30.158	9.21	356	0.32	1.22	4.53
2	3.05	0.70	1.66	9	9	0.33	9.17	5.00	0.19	0.42	1.37	0.33	3.71	37.025	9.21	356	0.32	1.29	4.77
3	3.66	0.70	1.66	9	9	0.33	9.17	5.00	0.19	0.42	1.37	0.33	3.71	43.91	9.21	356	0.32	1.36	5.04
4	4.57	0.70	1.66	9	9	0.33	9.17	5.00	0.19	0.42	1.37	0.33	3.71	50.75	9.21	356	0.32	1.44	5.34
5	6.09	0.70	1.66	9	9	0.33	9.17	5.00	0.19	0.42	1.37	0.33	3.71	61.685	9.21	356	0.32	1.59	5.90
6	6.71	0.70	1.66	9	9	0.33	9.17	5.00	0.19	0.42	1.37	0.33	3.71	71.315	9.21	356	0.32	1.75	6.50
7	8.53	0.70	1.66	75	9	0.33	9.17	0.60	0.19	-0.08	-14.09	-0.08	0.58	82.295	6.22	1537	0.32	1.13	0.66
8	10.67	0.70	1.66	75	9	0.33	9.17	0.60	0.19	-0.08	-14.09	-0.08	0.58	100.12	6.22	1537	0.32	1.16	0.67

A_o = Area per stone column
A_c = Cross sectional area of stone column
d = depth to bottom of layer from ground level
Δd = Layer Thickness
K_{oc} = Coeficient of Earth Pressure at rest of column
K_{ac} = Coeficient for Active Earth Pressure of column
E_c = Modulus of Stone Column
E_s = Modulus of Soil

n_0 = Basic improvement factor
n_1 = Improvement factor with Column Compressibility
n_2 = Improvement factor with Overburden Constraint
P_o = Imposed Stress
P_c = Imposed Stress on Column
P_s = Imposed Stress on Soil
γ_s = Unit Weight of soil
υ_s = Poissions Ratio
ϕ_c = Friction angle of Stone Column

Determination of Settlement Beneath Pad/Strip Foundation

Contract Name: ort Lofts

Contract Number: 0

P_o = 143 kN/m^2

A_o = 0.64 m^2

Improvement factor = n2 (n0, n1 or n2)

B = 3.124 m

L = 4.1146 m

Time = 50 years

depth	Δd	z	z/B	P_o	P_o/σ_v	Soil Profile	Cohesive Soils: Consolidation			Cohesive Soils: Immediate			Granular Soils: Immediate		Granular Soils: Creep		ρ_T	Improvement: Vibro	Improvement: Priebe	ρ_{Tn}
m	m	m		kN/m^2			m_v	μ	ρ_c	C_u	E_s/C_u	ρ_i	SPT N	ρ_i	f_t	$\rho_i + \rho_{cr}$		y/n	n2	
0.61	0.61	0.303	0.097	143	4.76		0.4	0.8	27.81	18	180	0.50		0.00	1.54	0.00	28.31	y	4.53	6.25
1.53	0.92	1.0661	0.341	96	2.59		0.4	0.8	28.29	18	180	0.33		0.00	1.54	0.00	28.62	y	4.77	6.00
2.14	0.61	1.8311	0.586	73	1.67		0.4	0.8	14.28	18	180	0.25		0.00	1.54	0.00	14.53	y	5.04	2.88
3.05	0.91	2.5911	0.829	49	0.96		0.4	0.8	14.20	18	180	0.17		0.00	1.54	0.00	14.37	y	5.34	2.69
4.57	1.52	3.8061	1.218	30	0.49		0.4	0.8	14.65	18	180	0.10		0.00	1.54	0.00	14.75	y	5.90	2.50
5.19	0.62	4.8761	1.561	22	0.30		0.4	0.8	4.27	18	180	0.07		0.00	1.54	0.00	4.34	y	6.50	0.67
7.01	1.82	6.0961	1.951	14	0.17				0.00			0.00	50	0.24	1.54	0.37	0.37		1.00	0.37
9.15	2.14	8.0761	2.585	9	0.09				0.00			0.00	50	0.16	1.54	0.24	0.24		1.00	0.24

Pre-Treatment Settlement = 105.53 mm

Post Treatment Settlement = 21.59 mm

A_o = Area per stone column

B = foundation width

C_u = cohesion of soil

depth = depth to top of layer below foundation level

E_s = Youngs modulus

L = foundation Length

m_v = coefficient of volumn compressibility

n_1 = Improvement factor with Column Compressibility

n_2 = Improvement factor with Overburden Constraint

P_o = Imposed Stress

z = depth below foundation to midpoint of layer

Δd = Layer Thickness

μ = correction factor for 3D consolidation

ρ_c = Consolidation Settlement

ρ_i = Immediate Settlement

ρ_{cr} = Creep Settlement

ρ_T = Total Settlement

ρ_{Tn} = Total Settlement with Improvement

σ_v = overburden stress

[illegible]

Determination of Improvement Factors (Priebe 1995)

Contract Name: Seaport Lofts

Contract Number:

Calculation Reference: 2 ft. strip footing

P_o = 143.4 kN/m^2

A_o = 1.5 m^2

Founding Depth = 1.5239 m

ϕ_c = 43

E_c = 45 MN/m^2

Layer Ref.	d m	Dia. m	A_o/A_c	E_s MN/m^2	γ_s kN/m^3	υ_s	n_0	E_c/E_s (Column Compressibility)	K_{ac}	$(A_c/A_o)_1$	$\Delta(A_o/A_c)$	A_c/A_o	n_1	$\Sigma(\gamma_s.\Delta d)$ (Overburden Constraint)	P_c/P_s	P_c	K_{oc}	f_d	n_2
	1.52				18														
1	2.13	0.70	3.90	9	9	0.33	2.91	5.00	0.19	0.42	1.37	0.19	2.30	30.158	7.85	489	0.32	1.15	2.65
2	3.05	0.70	3.90	9	9	0.33	2.91	5.00	0.19	0.42	1.37	0.19	2.30	37.025	7.85	489	0.32	1.19	2.75
3	3.66	0.70	3.90	9	9	0.33	2.91	5.00	0.19	0.42	1.37	0.19	2.30	43.91	7.85	489	0.32	1.24	2.85
4	4.57	0.70	3.90	9	9	0.33	2.91	5.00	0.19	0.42	1.37	0.19	2.30	50.75	7.85	489	0.32	1.29	2.96
5	6.09	0.70	3.90	9	9	0.33	2.91	5.00	0.19	0.42	1.37	0.19	2.30	61.685	7.85	489	0.32	1.37	3.15
6	6.71	0.70	3.90	9	9	0.33	2.91	5.00	0.19	0.42	1.37	0.19	2.30	71.315	7.85	489	0.32	1.45	3.35
7	8.53	0.70	3.90	75	9	0.33	2.91	0.60	0.19	-0.08	-14.09	-0.10	0.50	82.295	6.14	1776	0.32	1.11	0.55
8	10.67	0.70	3.90	75	9	0.33	2.91	0.60	0.19	-0.08	-14.09	-0.10	0.50	100.12	6.14	1776	0.32	1.14	0.56

A_o = Area per stone column

A_c = Cross sectional area of stone column

d = depth to bottom of layer from ground level

Δd = Layer Thickness

K_{oc} = Coeficient of Earth Pressure at rest of column

K_{ac} = Coeficient for Active Earth Pressure of column

E_c = Modulus of Stone Column

E_s = Modulus of Soil

n_0 = Basic improvement factor

n_1 = Improvement factor with Column Compressibility

n_2 = Improvement factor with Overburden Constraint

P_o = Imposed Stress

P_c = Imposed Stress on Column

P_s = Imposed Stress on Soil

γ_s = Unit Weight of soil

υ_s = Poissions Ratio

ϕ_c = Friction angle of Stone Column

Determination of Settlement Beneath Pad/Strip Foundation

Contract Name: ort Lofts

Contract Number: 0

P_o = 143 kN/m^2

A_o = 1.50 m^2

Improvement factor = n2 (n0, n1 or n2)

B = 0.6096 m

L = 18.287 m

Time = 50 years

							Cohesive Soils						Granular Soils					Improvement		
							Consolidation			Immediate			Immediate		Creep					
depth	Δd	z	z/B	P_o	P_o/σ_v	Soil Profile												Vibro	Priebe	
m	m	m		kN/m^2			m_v	μ	ρ_c	C_u	E_s/C_u	ρ_i	SPT N	ρ_i	f_t	$\rho_i + \rho_{cr}$	ρ_T	y/n	n2	ρ_{Tn}
0.61	0.61	0.303	0.497	108	3.57		0.4	0.8	20.86	18	180	0.73		0.00	1.54	0.00	21.59	y	2.65	8.14
1.53	0.92	1.0661	1.749	46	1.24		0.4	0.8	13.51	18	180	0.47		0.00	1.54	0.00	13.98	y	2.75	5.09
2.14	0.61	1.8311	3.004	22	0.49		0.4	0.8	4.20	18	180	0.15		0.00	1.54	0.00	4.34	y	2.85	1.52
3.05	0.91	2.5911	4.251	7	0.14		0.4	0.8	2.09	18	180	0.07		0.00	1.54	0.00	2.16	y	2.96	0.73
4.57	1.52	3.8061	6.244	0	0.00		0.4	0.8	0.00	18	180	0.00		0.00	1.54	0.00	0.00	y	3.15	0.00
5.19	0.62	4.8761	7.999	0	0.00		0.4	0.8	0.00	18	180	0.00		0.00	1.54	0.00	0.00	y	3.35	0.00
7.01	1.82	6.0961	10.001	0	0.00				0.00			0.00	50	0.00	1.54	0.00	0.00		1.00	0.00
9.15	2.14	8.0761	13.249	0	0.00				0.00			0.00	50	0.00	1.54	0.00	0.00		1.00	0.00

Pre-Treatment Settlement = 42.07 mm

Post Treatment Settlement = 15.49 mm

A_o = Area per stone column

B = foundation width

C_u = cohesion of soil

depth = depth to top of layer below foundation level

E_s = Youngs modulus

L = foundation Length

m_v = coefficient of volumn compressibility

n_1 = Improvement factor with Column Compressibility

n_2 = Improvement factor with Overburden Constraint

P_o = Imposed Stress

z = depth below foundation to midpoint of layer

Δd = Layer Thickness

μ = correction factor for 3D consolidation

ρ_c = Consolidation Settlement

ρ_i = Immediate Settlement

ρ_{cr} = Creep Settlement

ρ_T = Total Settlement

ρ_{Tn} = Total Settlement with Improvement

σ_v = overburden stress

[illegible]

Determination of Improvement Factors (Priebe 1995)

Contract Name: Seaport Lofts

Contract Number:

Calculation Reference: 3.5 ft. strip footing

P_o = 143.4 kN/m^2

A_o = 1.5 m^2

Founding Depth = 1.5239 m

ϕ_c = 43

E_c = 45 MN/m^2

Layer	d	Dia.	A_o/A_c	E_s	γ_s	υ_s	n_0	E_c/E_s	K_{ac}	$(A_c/A_o)_1$	$\Delta(A_o/A_c)$	A_c/A_o	n_1	$\Sigma(\gamma_s.\Delta d)$	P_c/P_s	P_c	K_{oc}	f_d	n_2
Ref.	m	m		MN/m^2	kN/m^3			Column Compressibility						Overburden Constraint					
	1.52				18														
1	2.13	0.70	3.90	9	9	0.33	2.91	5.00	0.19	0.42	1.37	0.19	2.30	30.158	7.85	489	0.32	1.15	2.65
2	3.05	0.70	3.90	9	9	0.33	2.91	5.00	0.19	0.42	1.37	0.19	2.30	37.025	7.85	489	0.32	1.19	2.75
3	3.66	0.70	3.90	9	9	0.33	2.91	5.00	0.19	0.42	1.37	0.19	2.30	43.91	7.85	489	0.32	1.24	2.85
4	4.57	0.70	3.90	9	9	0.33	2.91	5.00	0.19	0.42	1.37	0.19	2.30	50.75	7.85	489	0.32	1.29	2.96
5	6.09	0.70	3.90	9	9	0.33	2.91	5.00	0.19	0.42	1.37	0.19	2.30	61.685	7.85	489	0.32	1.37	3.15
6	6.71	0.70	3.90	9	9	0.33	2.91	5.00	0.19	0.42	1.37	0.19	2.30	71.315	7.85	489	0.32	1.45	3.35
7	8.53	0.70	3.90	75	9	0.33	2.91	0.60	0.19	-0.08	-14.09	-0.10	0.50	82.295	6.14	1776	0.32	1.11	0.55
8	10.67	0.70	3.90	75	9	0.33	2.91	0.60	0.19	-0.08	-14.09	-0.10	0.50	100.12	6.14	1776	0.32	1.14	0.56

A_o = Area per stone column

A_c = Cross sectional area of stone column

d = depth to bottom of layer from ground level

Δd = Layer Thickness

K_{oc} = Coeficient of Earth Pressure at rest of column

K_{ac} = Coeficient for Active Earth Pressure of column

E_c = Modulus of Stone Column

E_s = Modulus of Soil

n_0 = Basic improvement factor

n_1 = Improvement factor with Column Compressibility

n_2 = Improvement factor with Overburden Constraint

P_o = Imposed Stress

P_c = Imposed Stress on Column

P_s = Imposed Stress on Soil

γ_s = Unit Weight of soil

υ_s = Poissions Ratio

ϕ_c = Friction angle of Stone Column

Determination of Settlement Beneath Pad/Strip Foundation

Contract Name: ort Lofts
Contract Number: 0

P_o = 143 kN/m^2
A_o = 1.50 m^2
Improvement factor = n2 (n0, n1 or n2)

B = 1.0667 m
L = 12.191 m
Time = 50 years

depth	Δd	z	z/B	P_o	P_o/σ_v	Soil Profile	Cohesive Soils: Consolidation			Cohesive Soils: Immediate			Granular Soils: Immediate		Granular Soils: Creep			Improvement		
m	m	m		kN/m^2			m_v	μ	ρ_c	C_u	E_s/C_u	ρ_i	SPT N	ρ_i	f_t	$\rho_i + \rho_{cr}$	ρ_T	Vibro y/n	Priebe n2	ρ_{Tn}
0.61	0.61	0.303	0.284	123	4.09		0.4	0.8	23.92	18	180	0.15		0.00	1.54	0.00	24.06	y	2.65	9.08
1.53	0.92	1.0661	0.999	75	2.01		0.4	0.8	21.95	18	180	0.44		0.00	1.54	0.00	22.40	y	2.75	8.15
2.14	0.61	1.8311	1.717	46	1.05		0.4	0.8	8.96	18	180	0.05		0.00	1.54	0.00	9.01	y	2.85	3.16
3.05	0.91	2.5911	2.429	30	0.59		0.4	0.8	8.77	18	180	0.18		0.00	1.54	0.00	8.95	y	2.96	3.02
4.57	1.52	3.8061	3.568	14	0.23		0.4	0.8	6.98	18	180	0.25		0.00	1.54	0.00	7.23	y	3.15	2.29
5.19	0.62	4.8761	4.571	1	0.02		0.4	0.8	0.28	18	180	0.00		0.00	1.54	0.00	0.29	y	3.35	0.09
7.01	1.82	6.0961	5.715	0	0.00				0.00			0.00	50	0.00	1.54	0.00	0.00		1.00	0.00
9.15	2.14	8.0761	7.571	0	0.00				0.00			0.00	50	0.00	1.54	0.00	0.00		1.00	0.00

Pre-Treatment Settlement = 71.94 mm

Post Treatment Settlement = 25.80 mm

A_o = Area per stone column
B = foundation width
C_u = cohesion of soil
depth = depth to top of layer below foundation level
E_s = Youngs modulus
L = foundation Length
m_v = coefficient of volumn compressibility
n_1 = Improvement factor with Column Compressibility
n_2 = Improvement factor with Overburden Constraint

P_o = Imposed Stress
z = depth below foundation to midpoint of layer
Δd = Layer Thickness
μ = correction factor for 3D consolidation
ρ_c = Consolidation Settlement
ρ_i = Immediate Settlement
ρ_{cr} = Creep Settlement
ρ_T = Total Settlement
ρ_{Tn} = Total Settlement with Improvement
σ_v = overburden stress

[illegible]
[illegible]

Determination of Improvement Factors (Priebe 1995)

Contract Name: Seaport Lofts

Calculation Reference: 5 ft. strip footing

Contract Number:

P_o = 143.4 kN/m^2

A_o = 1 m^2

Founding Depth = 1.5239 m

ϕ_c = 43

E_c = 45 MN/m^2

Layer Ref.	d (m)	Dia. (m)	A_o/A_c	E_s (MN/m^2)	γ_s (kN/m^3)	υ_s	n_0	E_c/E_s	K_{ac}	$(A_c/A_o)_1$	$\Delta(A_o/A_c)$	A_c/A_o	n_1	$\Sigma(\gamma_s.\Delta d)$	P_c/P_s	P_c	K_{oc}	f_d	n_2
								Column Compressibility						Overburden Constraint					
	1.52				18														
1	2.13	0.70	2.60	9	9	0.33	4.43	5.00	0.19	0.42	1.37	0.25	2.86	30.158	8.39	420	0.32	1.18	3.38
2	3.05	0.70	2.60	9	9	0.33	4.43	5.00	0.19	0.42	1.37	0.25	2.86	37.025	8.39	420	0.32	1.23	3.53
3	3.66	0.70	2.60	9	9	0.33	4.43	5.00	0.19	0.42	1.37	0.25	2.86	43.91	8.39	420	0.32	1.29	3.69
4	4.57	0.70	2.60	9	9	0.33	4.43	5.00	0.19	0.42	1.37	0.25	2.86	50.75	8.39	420	0.32	1.35	3.86
5	6.09	0.70	2.60	9	9	0.33	4.43	5.00	0.19	0.42	1.37	0.25	2.86	61.685	8.39	420	0.32	1.46	4.18
6	6.71	0.70	2.60	9	9	0.33	4.43	5.00	0.19	0.42	1.37	0.25	2.86	71.315	8.39	420	0.32	1.57	4.50
7	8.53	0.70	2.60	75	9	0.33	4.43	0.60	0.19	-0.08	-14.09	-0.09	0.55	82.295	6.19	1618	0.32	1.12	0.62
8	10.67	0.70	2.60	75	9	0.33	4.43	0.60	0.19	-0.08	-14.09	-0.09	0.55	100.12	6.19	1618	0.32	1.15	0.63

A_o = Area per stone column

A_c = Cross sectional area of stone column

d = depth to bottom of layer from ground level

Δd = Layer Thickness

K_{oc} = Coeficient of Earth Pressure at rest of column

K_{ac} = Coeficient for Active Earth Pressure of column

E_c = Modulus of Stone Column

E_s = Modulus of Soil

n_0 = Basic improvement factor

n_1 = Improvement factor with Column Compressibility

n_2 = Improvement factor with Overburden Constraint

P_o = Imposed Stress

P_c = Imposed Stress on Column

P_s = Imposed Stress on Soil

γ_s = Unit Weight of soil

υ_s = Poissions Ratio

ϕ_c = Friction angle of Stone Column

Determination of Settlement Beneath Pad/Strip Foundation

Contract Name: ort Lofts
Contract Number: 0

P_o = 143 kN/m^2
A_o = 1.00 m^2
Improvement factor = n2 (n0, n1 or n2)

B = 1.5239 m
L = 12.191 m
Time = 50 years

							Cohesive Soils						Granular Soils					Improvement		
depth	Δd	z	z/B	P_o	P_o/σ_v	Soil Profile	Consolidation			Immediate			Immediate		Creep			Vibro	Priebe	
m	m	m		kN/m^2			m_v	μ	ρ_c	C_u	E_s/C_u	ρ_i	SPT N	ρ_i	f_t	$\rho_i + \rho_{cr}$	ρ_T	y/n	n2	ρ_{Tn}
0.61	0.61	0.303	0.199	132	4.37		0.4	0.8	25.59	18	180	0.22		0.00	1.54	0.00	25.81	y	3.38	7.63
1.53	0.92	1.0661	0.700	87	2.36		0.4	0.8	25.75	18	180	0.15		0.00	1.54	0.00	25.90	y	3.53	7.34
2.14	0.61	1.8311	1.202	56	1.27		0.4	0.8	10.92	18	180	0.09		0.00	1.54	0.00	11.01	y	3.69	2.98
3.05	0.91	2.5911	1.700	40	0.79		0.4	0.8	11.69	18	180	0.07		0.00	1.54	0.00	11.76	y	3.86	3.04
4.57	1.52	3.8061	2.498	27	0.44		0.4	0.8	13.25	18	180	0.46		0.00	1.54	0.00	13.71	y	4.18	3.28
5.19	0.62	4.8761	3.200	19	0.26		0.4	0.8	3.70	18	180	0.03		0.00	1.54	0.00	3.73	y	4.50	0.83
7.01	1.82	6.0961	4.000	4	0.05				0.00			0.00	50	0.05	1.54	0.08	0.08		1.00	0.08
9.15	2.14	8.0761	5.300	0	0.00				0.00			0.00	50	0.00	1.54	0.00	0.00		1.00	0.00

Pre-Treatment Settlement = 92.01 mm

Post Treatment Settlement = 25.18 mm

A_o = Area per stone column
B = foundation width
C_u = cohesion of soil
depth = depth to top of layer below foundation level
E_s = Youngs modulus
L = foundation Length
m_v = coefficient of volumn compressibility
n_1 = Improvement factor with Column Compressibility
n_2 = Improvement factor with Overburden Constraint

P_o = Imposed Stress
z = depth below foundation to midpoint of layer
Δd = Layer Thickness
μ = correction factor for 3D consolidation
ρ_c = Consolidation Settlement
ρ_i = Immediate Settlement
ρ_{cr} = Creep Settlement
ρ_T = Total Settlement
ρ_{Tn} = Total Settlement with Improvement
σ_v = overburden stress

[illegible]
[illegible]

Determination of Improvement Factors (Priebe 1995)

Contract Name: Seaport Lofts

Calculation Reference: 7 ft. strip footing

Contract Number:

P_o = 143.4 kN/m^2

A_o = 0.75 m^2

Founding Depth = 1.5239 m

ϕ_c = 43

E_c = 45 MN/m^2

Layer Ref.	d m	Dia. m	A_o/A_c	E_s MN/m^2	γ_s kN/m^3	υ_s	n_0	E_c/E_s	K_{ac}	$(A_c/A_o)_1$	$\Delta(A_o/A_c)$	A_c/A_o	n_1	$\Sigma(\gamma_s.\Delta d)$	P_c/P_s	P_c	K_{oc}	f_d	n_2
								Column Compressibility						Overburden Constraint					
	1.52				18														
1	2.13	0.70	1.95	9	9	0.33	6.74	5.00	0.19	0.42	1.37	0.30	3.38	30.158	8.89	377	0.32	1.21	4.08
2	3.05	0.70	1.95	9	9	0.33	6.74	5.00	0.19	0.42	1.37	0.30	3.38	37.025	8.89	377	0.32	1.27	4.28
3	3.66	0.70	1.95	9	9	0.33	6.74	5.00	0.19	0.42	1.37	0.30	3.38	43.91	8.89	377	0.32	1.33	4.50
4	4.57	0.70	1.95	9	9	0.33	6.74	5.00	0.19	0.42	1.37	0.30	3.38	50.75	8.89	377	0.32	1.41	4.75
5	6.09	0.70	1.95	9	9	0.33	6.74	5.00	0.19	0.42	1.37	0.30	3.38	61.685	8.89	377	0.32	1.54	5.20
6	6.71	0.70	1.95	9	9	0.33	6.74	5.00	0.19	0.42	1.37	0.30	3.38	71.315	8.89	377	0.32	1.68	5.68
7	8.53	0.70	1.95	75	9	0.33	6.74	0.60	0.19	-0.08	-14.09	-0.08	0.57	82.295	6.21	1559	0.32	1.13	0.64
8	10.67	0.70	1.95	75	9	0.33	6.74	0.60	0.19	-0.08	-14.09	-0.08	0.57	100.12	6.21	1559	0.32	1.16	0.66

A_o = Area per stone column
A_c = Cross sectional area of stone column
d = depth to bottom of layer from ground level
Δd = Layer Thickness
K_{oc} = Coeficient of Earth Pressure at rest of column
K_{ac} = Coeficient for Active Earth Pressure of column
E_c = Modulus of Stone Column
E_s = Modulus of Soil

n_0 = Basic improvement factor
n_1 = Improvement factor with Column Compressibility
n_2 = Improvement factor with Overburden Constraint
P_o = Imposed Stress
P_c = Imposed Stress on Column
P_s = Imposed Stress on Soil
γ_s = Unit Weight of soil
υ_s = Poissions Ratio
ϕ_c = Friction angle of Stone Column

Determination of Settlement Beneath Pad/Strip Foundation

Contract Name: ort Lofts
Contract Number: 0

P_o = 143 kN/m^2
A_o = 0.75 m^2
Improvement factor = n2 (n0, n1 or n2)

B = 2.1335 m
L = 12.191 m
Time = 50 years

							Cohesive Soils						Granular Soils					Improvement		
							Consolidation			Immediate			Immediate		Creep					
depth	Δd	z	z/B	P_o	P_o/σ_v	Soil Profile												Vibro	Priebe	
m	m	m		kN/m^2			m_v	μ	ρ_c	C_u	E_s/C_u	ρ_i	SPT N	ρ_i	f_t	$\rho_i + \rho_{cr}$	ρ_T	y/n	n2	ρ_{Tn}
0.61	0.61	0.303	0.142	132	4.37		0.4	0.8	25.59	18	180	0.31		0.00	1.54	0.00	25.90	y	4.08	6.35
1.53	0.92	1.0661	0.500	103	2.79		0.4	0.8	30.40	18	180	0.24		0.00	1.54	0.00	30.64	y	4.28	7.16
2.14	0.61	1.8311	0.858	75	1.70		0.4	0.8	14.56	18	180	0.18		0.00	1.54	0.00	14.73	y	4.50	3.27
3.05	0.91	2.5911	1.214	56	1.10		0.4	0.8	16.29	18	180	0.13		0.00	1.54	0.00	16.42	y	4.75	3.46
4.57	1.52	3.8061	1.784	40	0.65		0.4	0.8	19.53	18	180	0.48		0.00	1.54	0.00	20.01	y	5.20	3.85
5.19	0.62	4.8761	2.285	29	0.41		0.4	0.8	5.83	18	180	0.07		0.00	1.54	0.00	5.90	y	5.68	1.04
7.01	1.82	6.0961	2.857	26	0.31				0.00			0.00	50	0.38	1.54	0.58	0.58		1.00	0.58
9.15	2.14	8.0761	3.785	11	0.11				0.00			0.00	50	0.17	1.54	0.26	0.26		1.00	0.26

Pre-Treatment Settlement = 114.44 mm

Post Treatment Settlement = 25.96 mm

A_o = Area per stone column
B = foundation width
C_u = cohesion of soil
depth = depth to top of layer below foundation level
E_s = Youngs modulus
L = foundation Length
m_v = coefficient of volumn compressibility
n_1 = Improvement factor with Column Compressibility
n_2 = Improvement factor with Overburden Constraint

P_o = Imposed Stress
z = depth below foundation to midpoint of layer
Δd = Layer Thickness
μ = correction factor for 3D consolidation
ρ_c = Consolidation Settlement
ρ_i = Immediate Settlement
ρ_{cr} = Creep Settlement
ρ_T = Total Settlement
ρ_{Tn} = Total Settlement with Improvement
σ_v = overburden stress

INSTALLATION PROCEDURE

GROUND STABILIZATION BY BOTTOM/TOP FEED PROCESS

METHOD STATEMENT

PLANT & EQUIPMENT

The technique involves the use of a vibroflot, comprising a hydraulic powered eccentric weight assembly enclosed in heavy tubular steel casing. The vibroflot is suspended from a crawler crane. The basic length of the vibroflot assembly is 8 meters although extension tubes may be added to increase the vibroflot length as the depth of treatment dictates. The vibrator diameter is 310mm and is powered by a 130 kW portable diesel power pack and thus generates high centrifugal forces in the horizontal plane at a frequency of 50 cycles per second in most cases. The nose of the vibroflot is tapered to aid penetration of the ground while vertical fins prevent the vibroflot rotating during penetration. Attached to the vibroflot is a tube of 200mm diameter, and a stone hopper.

DRY STONE COLUMNS TECHNIQUE

This is a completely dry technique and the cycle of operations is described as follows. The vibroflot and a stone hopper suspended from the crane, are lowered to the ground and penetrate quickly through the weak soils. After reaching the required depth, the sluice gate is open in the hopper, graded aggregate (usually 40mm SS) then travels down the tube, aided by compressed air, this aggregate is then released into the ground at the tip of the vibroflot, where it is compacted. This process is a continuous method and the stone column is fully formed when removal of the flot from the ground occurs.

In areas where the hole is stable, the stone column may be formed using the dry top feed method. Using this method, the vibroflot is withdrawn and a small quantity of graded stone aggregate is introduced into the hole. The vibroflot s lowered again to compact the infill and interlock it tightly with the surrounding soil. This cycle is repeated until a stone column is built up to ground level.

In granular soils, the effect of the vibrations is to produce a marked improvement in the Relative Density of the surrounding material thus significantly improving the allowable bearing capacity and settlement characteristics. In cohesive soils, little improvement occurs in the engineering properties of the clay soils between stone columns and the improvement of the formation is achieved by the combined effect of the weak soils and the stiffer stone columns.

STONE COLUMNS

Compacted stone columns are constructed to effect stabilization of the treated ground. Typically, stone column diameters are in the order of 600mm. The column diameter will naturally vary with the technique and soils condition, but generally the weaker the soils, the larger the diameter of the stone column.

The stone columns are normally constructed directly beneath the main foundations, usually in single or multiple rows beneath strip foundations and in groups beneath pad foundations. Area or floor slab treatment is normally carried out in grid spacing. The spacing and arrangements of the stone columns are dependent on the soils conditions and the loads carried by the foundations.

MODULUS TEST

PLATE LOAD TEST

METHOD STATEMENT

A shallow pit shall be excavated to a depth of approximately 300-600 mm with a base of at least 1,000 mm square. A 600mm diameter rigid steel plate will then be bedded down by hand on the surface exposed by the pit excavation. (A thin layer of sand or quick set may be used if required.)

The load shall be applied centrally to the circular bearing plate by means of a hydraulic jack and the loads measured by an independently calibrated hydraulic gauge or load cell. Two (2) gauges mounted on a reference frame, on either side of the test, will record the deflection of the plate. Certificates of calibration for the gauges jack or load cell will be available on site for inspection.

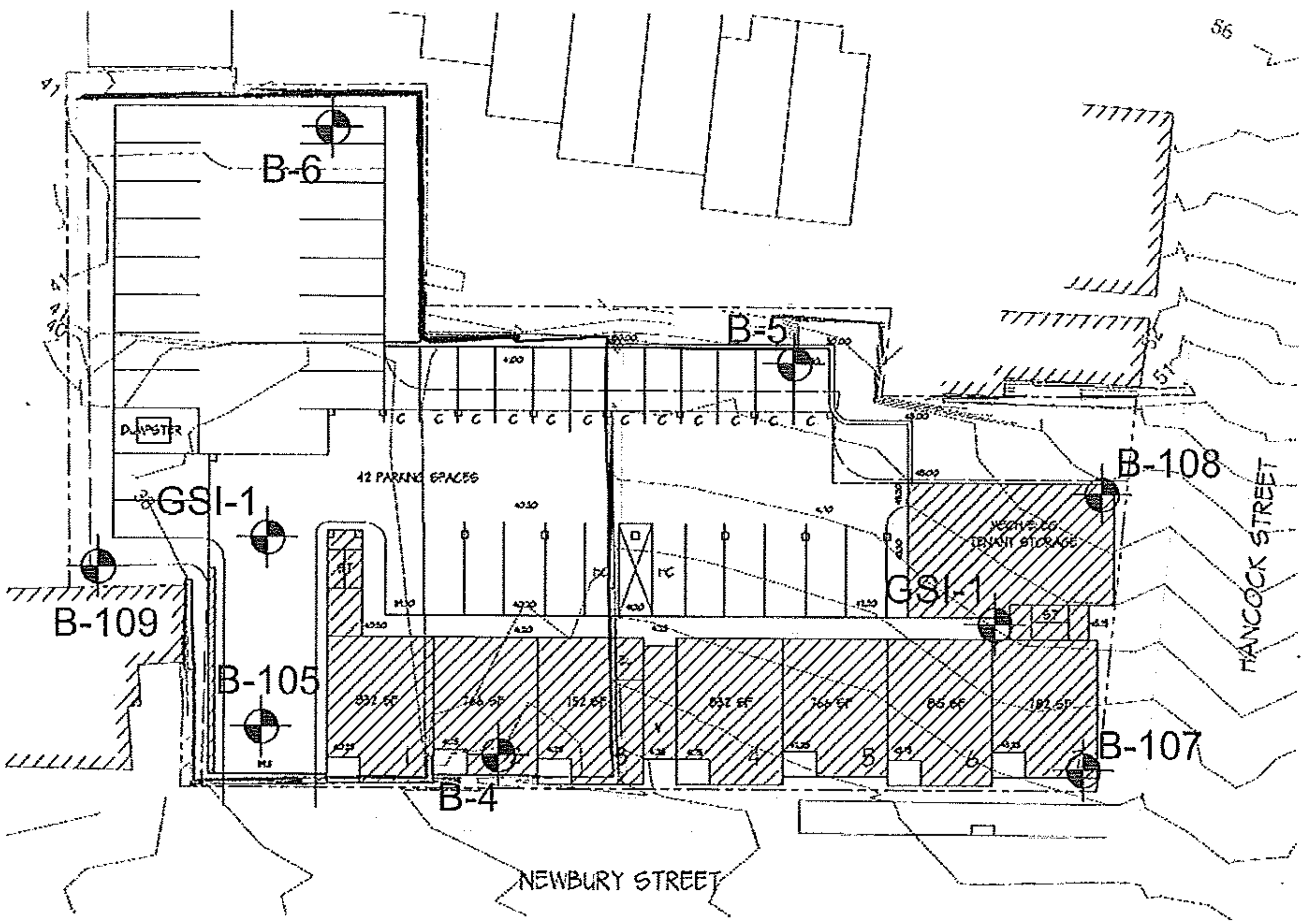
A preload of 2 tons will be permitted. The loading shall be applied at the rate of 2 tons per 5 minutes or until the rate of settlement does not exceed 0.1mm in 1 minute, up to a maximum applied load of two times working load.

At maximum test load, the load shall be held until the rate of settlement is less than 0.1 mm per minute or 10 minutes whichever is the greater.

The elastic compression shall be determined by measuring the recovery which takes place on completely removing the total applied load at the end of the test.

Along the plate load test, individual stone columns records are recorded with the on board computer monitoring system. The data collected is sent electronically to the ftp site of Subsurface Constructors, Inc. and is downloaded by the software that processes the data. Subsurface Constructors, Inc. engineers will then review the installed data and provide installation records to the client.

SOIL BORINGS



B-1 Test Boring Location (Approximate)

BORING LOCATION PLAN	GEOTECHNICAL SERVICES INC. 55 NORTH STARK HIGHWAY, WEARE, NH 03281 TEL. (603) 529-7766 FAX. (603) 529-7760		
The Bay House Portland, Maine	DRAWN BY: KJM	DATE: August 2013	FIGURE NO. 2
	CHECKED BY: HKW	SCALE: NTS	
	FILE NAME: 212234 - Bay House.dwg	PROJECT NO.: 213193	

Geotechnical Services, Inc. 55 North Stark Highway, Weare, NH 03281 Ph. 603/529/7766 Fax: 603/529/7080 30 Newbury Street, 3rd Floor, Boston, MA 02116 Ph. 857/238/9843 Fax: 857/239/9844

GSI

TEST BORING LOG

Boring No. **GSI-1**

Project	Bay House II	GSI Project No.	212234	Elevation	
Location	Portland, ME	Project Mgr.	HKW	Datum	
Client		Inspector	John Roth	Date Started	8/8/2013
Contractor	NHB	Checked By		Date Finished	8/8/2013
Driller	Rich Leonard	Rig Make & Model	Mobile Drill	Rig Model	53

Item:	Auger	Casing	Sampler	Core Barrel
Type		BW	SS	
Inside Diameter (in.)		4"	ST	
Hammer Weight (lb)			140	
Hammer Fall (in.)			30"	

☐ Truck ☐ Skid
☑ Track ☐ ATV
☐ Bomb. ☐ Geoprobe
☐ Tripod ☐ Other
☐ Winch ☑ Cat Head ☑ Roller Bit ☐ Cutting Head

Hammer Type:
☑ Safety Hammer
☐ Doughnut
☐ Automatic

Depth (ft)	Casing (Blows/ft)	No.	Depth (ft)	Rec (in.)	SPT (Bl./6-in.)	Rock RQD (%)	PID Rdg. (ppm)	Stratum Change (ft)	Soil-Rock Visual Classification and Description (Soils - Burmister System) (Rock - U.S. Corps of Engineers System)
								ASPHALT	6 Inches of Asphalt
0		S-1	0-2	24/17	16 13 14 8			URBAN FILL	Dry, medium dense, brown-black, fine to coarse, SAND and GRAVEL, trace to little silt. Some red brick mixed in.
5 (5 1.52)		S-2	5-7	24/8	3 5 1 2			SAND AND SILT	Wet, loose, gray, fine SAND and SILT. N = 3
10 (3.05)		UT-1	10-12						Shelby Tube Taken N = 3
12 (5 3.51)		S-3	12-14	24/24	2 1 1 1			CLAY	Wet, very soft, gray, CLAY, little fine sand. 18.9. .4. .8
15 (4.57)									18.9. .4. .8
20 (2 6.09)		UT-2	20-22						Shelby Tube Taken
22 (2 6.71)		S-4	22-24	24/24	WH 1 1 2				Wet, very soft, gray, CLAY, trace fine sand. 18.9. .4. .8

Water Level Data

Date	Time	Depth (ft) to: Bott. of Casing	Bott. of Hole	Water
8/8	EOD		32'	6'

Sample Identification
O = Open Ended Rod
U = Undisturbed
S = Split Spoon
C = Rock Core
G = Geoprobe

Cohesive Soils N-Value
0 to 2: Very Soft
2 to 4: Soft
4 to 8: Medium Stiff
8 to 15: Stiff
15 to 30 Very Stiff
Over 30: Hard

Granular Soils N- Value
0 to 4: Very Loose
4 to 10: Loose
11 to 30: Medium Dense
31 to 50: Dense
Over 50: Very Dense

Trace (0 to 5%), Little (10 to 20%), Some (20 to 35%), And (35 to 50%)

Notes:

GSI-1

Geotechnical Services, Inc. 55 North Stark Highway, Weare, NH 03281 Ph. 603/529/7766 Fax: 603/529/7080 30 Newbury Street, 3rd Floor, Boston, MA 02116 Ph. 857/238/9843 Fax: 857/239/9844

GSI

TEST BORING LOG

Boring No. **GSI-1**

Project	Bay House II	GSI Project No.	212234	Elevation	
Location	Portland, ME	Project Mgr.	HKW	Datum	
Client		Inspector	John Roth	Date Started	8/8/2013
Contractor	NHB	Checked By		Date Finished	8/8/2013
Driller	Rich Leonard	Rig Make & Model	Mobile Drill	Rig Model	53

Item:	Auger	Casing	Sampler	Core Barrel
Type		BW	SS	
Inside Diameter (in.)		4"	ST	
Hammer Weight (lb)			140	
Hammer Fall (in.)			30"	

☐ Truck ☐ Skid
☑ Track ☐ ATV
☐ Bomb. ☐ Geoprobe
☐ Tripod ☐ Other

Hammer Type: ☑ Safety Hammer ☐ Doughnut ☐ Automatic

☐ Winch ☑ Cat Head ☑ Roller Bit ☐ Cutting Head

Depth (ft)	Casing (Blows/ft)	Sample Data No.	Depth (ft)	Rec (in.)	SPT (Bl./ 6-in.)	Rock RQD (%)	PID Rdg. (ppm)	Stratum Change (ft)	Soil-Rock Visual Classification and Description (Soils - Burmister System) (Rock - U.S. Corps of Engineers System)
25									
30		UT-3	30-32					CLAY	Shelby Tube Taken
32		S-5	32-34	24/24	1 2 2 2				Wet, soft, gray, CLAY, little fine sand.
									Boring terminated at 32 feet and backfilled with cuttings.

Water Level Data

Date	Time	Depth (ft) to: Bott. of Casing	Bott. of Hole	Water
8/8	EOD		32'	6'

Sample Identification
O = Open Ended Rod
U = Undisturbed
S = Split Spoon
C = Rock Core
G = Geoprobe

Cohesive Soils N-Value
0 to 2: Very Soft
2 to 4: Soft
4 to 8: Medium Stiff
8 to 15: Stiff
15 to 30 Very Stiff
Over 30: Hard

Granular Soils N- Value
0 to 4: Very Loose
4 to 10: Loose
11 to 30: Medium Dense
31 to 50: Dense
Over 50: Very Dense

Trace (0 to 5%), Little (10 to 20%), Some (20 to 35%), And (35 to 50%)

Notes:

GSI-1

3

TEST BORING LOG

Boring No. **GSI-2**

Page 1 of 1

Project	Bay House II	GSI Project No.	212234	Elevation	
Location	Portland, ME	Project Mgr.	HKW	Datum	
Client		Inspector	John Roth	Date Started	8/8/2013
Contractor	NHB	Checked By		Date Finished	8/8/2013
Driller	Rich Leonard	Rig Make & Model	Mobile Drill	Rig Model	53

Item:	Auger	Casing	Sampler	Core Barrel
Type		BW	SS	
Inside Diameter (in.)		4"	ST	
Hammer Weight (lb)			140	
Hammer Fall (in.)			30"	

☐ Truck ☐ Skid
☑ Track ☐ ATV
☐ Bomb. ☐ Geoprobe
☐ Tripod ☐ Other
☐ Winch ☑ Cat Head

Hammer Type: ☑ Safety Hammer ☑ Doughnut ☐ Automatic

☑ Roller Bit ☐ Cutting Head

Depth (ft)	Casing (Blows/ft)	No.	Depth (ft)	Rec (in.)	SPT (Bl./6-in.)	Rock RQD (%)	PID Rdg. (ppm)	Stratum Change (ft)	Soil-Rock Visual Classification and Description (Soils - Burmister System) (Rock - U.S. Corps of Engineers System)
0		S-1	0-2	7/8	5 50/1			URBAN FILL	WET, VERY dense, brown-black, fine to coarse, SAND and GRAVEL, trace to little silt. Some red brick mixed in.
1.52									
5 (2.13)		S-2	5-7	24/19	1 1 1 1				Wet, very soft, gray, CLAY, trace fine sand. 18.9, .4, .8
3.05									18.9, .4, .8
10		UT-1	10-12						Shelby Tube Taken
3.64									18.9, .4, .8
12		S-3	12-14	24/24	1 1 1 1			CLAY	Wet, very soft, gray, CLAY, trace fine sand. 18.9, .4, .8
15 (4.57)									18.9, .4, .8
20 (6.09)		UT-2	20-22						Shelby Tube Taken
6.71									18.9, .4, .8
22		S-4	22-24	24/22	15 32 18 12			SAND	Wet, dense, gray, SAND, trace to little silt. d = 50

Water Level Data				
Date	Time	Depth (ft) to: Bott. of Casing	Bott. of Hole	Water
8/8	EOD		28.3'	5'

Sample Identification
O = Open Ended Rod
U = Undisturbed
S = Split Spoon
C = Rock Core
G = Geoprobe

Cohesive Soils N-Value
0 to 2: Very Soft
2 to 4: Soft
4 to 8: Medium Stiff
8 to 15: Stiff
15 to 30 Very Stiff
Over 30: Hard

Granular Soils N- Value
0 to 4: Very Loose
4 to 10: Loose
11 to 30: Medium Dense
31 to 50: Dense
Over 50: Very Dense

Trace (0 to 5%), Little (10 to 20%), Some (20 to 35%), And (35 to 50%)

Notes:

GSI-2

Geotechnical Services, Inc. 55 North Stark Highway, Weare, NH 03281 Ph. 603/529/7766 Fax: 603/529/7080 30 Newbury Street, 3rd Floor, Boston, MA 02116 Ph. 857/238/9843 Fax: 857/239/9844

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GSI

TEST BORING LOG

Boring No. GSI-2

Project	Bay House II	GSI Project No.	212234	Elevation	
Location	Portland, ME	Project Mgr.	HKW	Datum	
Client		Inspector	John Roth	Date Started	8/8/2013
Contractor	NHB	Checked By		Date Finished	8/8/2013
Driller	Rich Leonard	Rig Make & Model	Mobile Drill	Rig Model	53

Item:	Auger	Casing	Sampler	Core Barrel
Type		BW	SS	
Inside Diameter (in.)		4"	ST	
Hammer Weight (lb)			140	
Hammer Fall (in.)			30"	

☐ Truck ☐ Skid
☑ Track ☐ ATV
☐ Bomb. ☐ Geoprobe
☐ Tripod ☐ Other

Hammer Type:
☑ Safety Hammer
☐ Doughnut
☐ Automatic

☐ Winch ☑ Cat Head ☑ Roller Bit ☐ Cutting Head

Depth (ft)	Casing (Blows/ft)	Sample Data No.	Depth (ft)	Rec (in.)	SPT (Bl./ 6-in.)	Rock RQD (%)	PID Rdg. (ppm)	Stratum Change (ft)	Soil-Rock Visual Classification and Description (Soils - Burmister System) (Rock - U.S. Corps of Engineers System)
25								SAND	N = 50
									See note 1. Auger refusal at 28 feet.
									Boring terminated at 28 feet and backfilled with cuttings.
									N = 50+

28 8.53

5 10.67

Water Level Data

Date	Time	Depth (ft) to: Bott. of Casing	Bott. of Hole	Water
8/8	EOD		28.3'	5'

Sample Identification
O = Open Ended Rod
U = Undisturbed
S = Split Spoon
C = Rock Core
G = Geoprobe

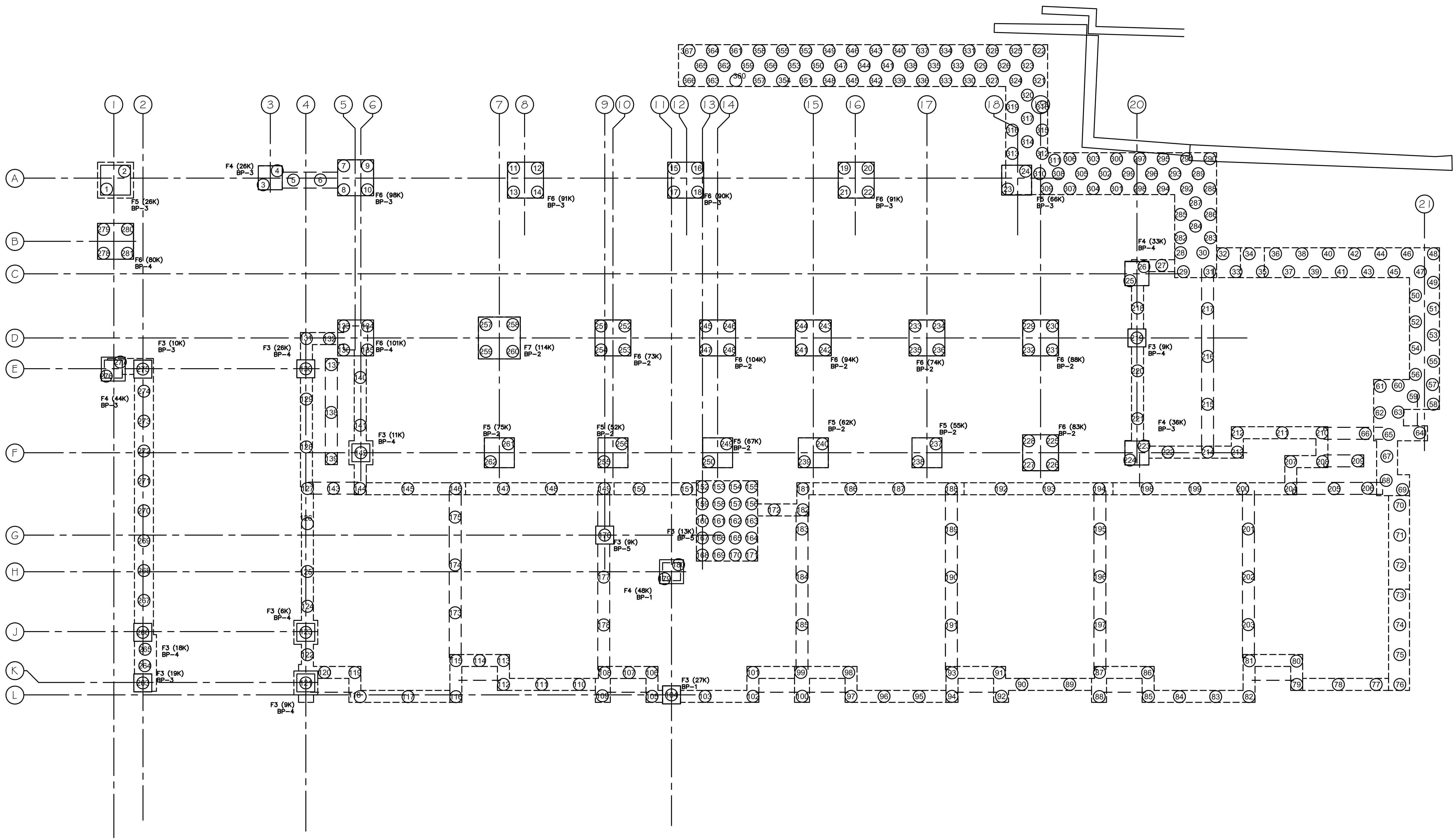
Cohesive Soils N-Value
0 to 2: Very Soft
2 to 4: Soft
4 to 8: Medium Stiff
8 to 15: Stiff
15 to 30 Very Stiff
Over 30: Hard

Granular Soils N- Value
0 to 4: Very Loose
4 to 10: Loose
11 to 30: Medium Dense
31 to 50: Dense
Over 50: Very Dense

Trace (0 to 5%), Little (10 to 20%), Some (20 to 35%), And (35 to 50%)

Notes: 1. Let roller bit grind on refusal material for 5 minutes with no movement. Probable bedrock.

GSI-2



SEAPORT LOFTS
PORTLAND, MAINE

SUBSURFACE CONSTRUCTORS
110 ANGELICA STREET ST. LOUIS MISSOURI 63147 PHONE (314)421.2460

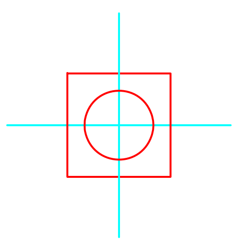
FOUNDATION PLAN

GROUND IMPROVEMENT STONE COLUMNS

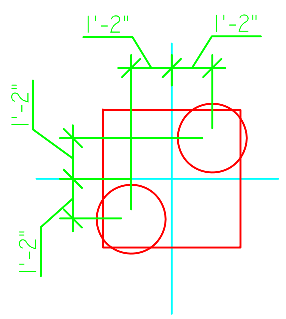
FOR STONE COLUMN LAYOUT ONLY
FOR ALL OTHER BUILDING INFORMATION REFER TO STRUCTURAL PLANS

DATE: 9/24/14

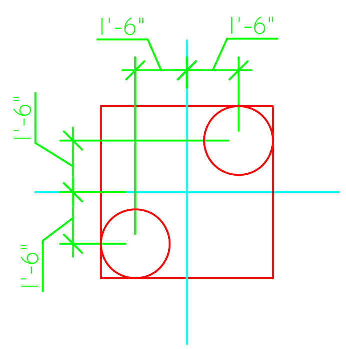
SHEET
1 OF 2



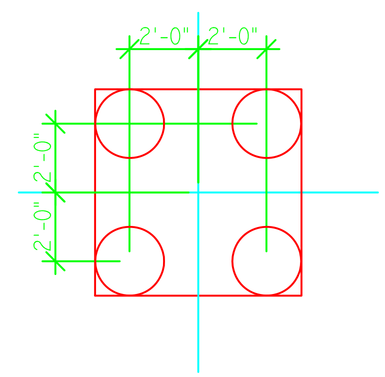
F3
3'×3'



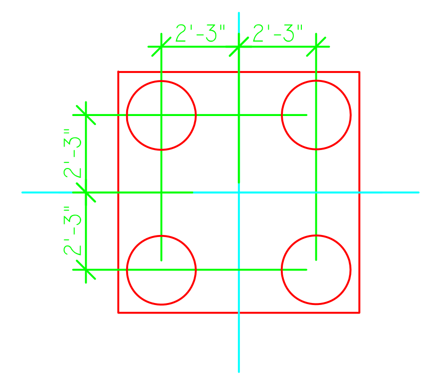
F4
4'×4'



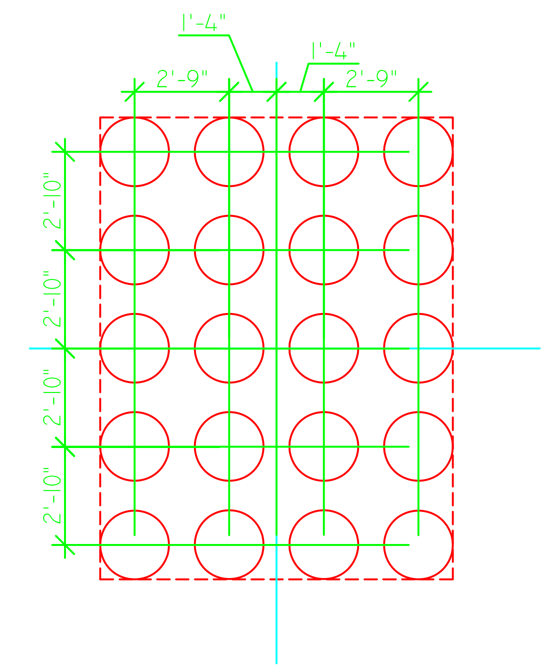
F5
5'×5'



F6
6'×6'



F7
7'×7'



10.25' × 13.5'

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DATE: 9/19/14

SHEET
2 OF 2