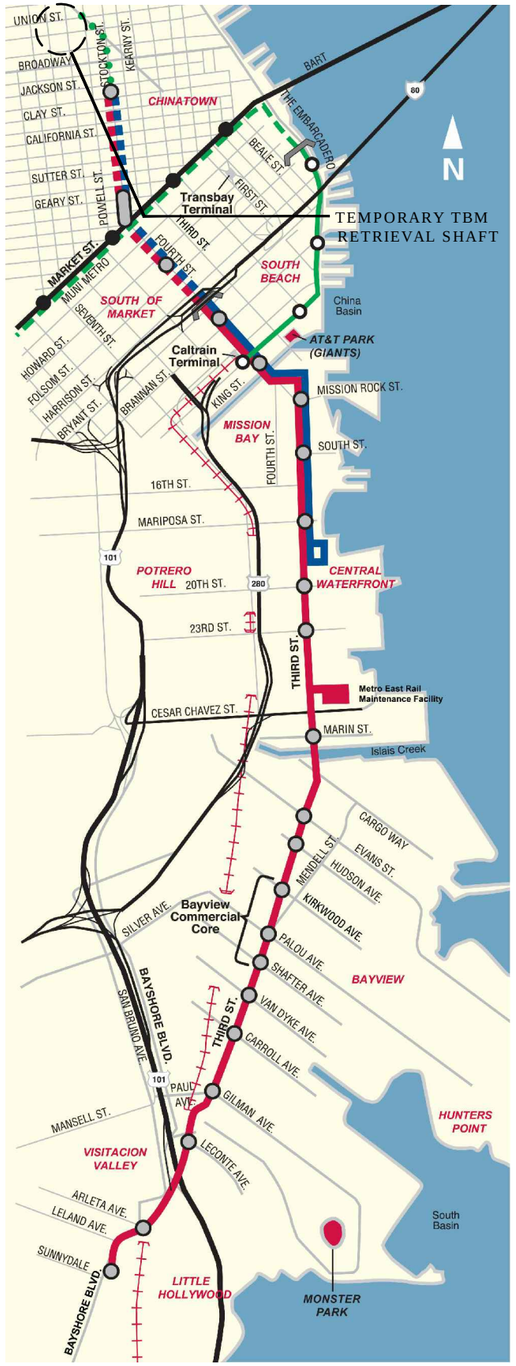


THIRD STREET LIGHT RAIL PROGRAM

PHASE 2 - CENTRAL SUBWAY

CONTRACT 1278

TEMPORARY TBM RETRIEVAL SHAFT

T:\13285 CS DP1\CN 1278\Sheet Files\GE - General\ GE-001.dwg Llorico Wed May 29,2013 - 11:12 am GE-001_R1

DATE	DESCRIPTION	REV. NO.	BY	CHECKED	APPROVED
05/31/2013	ISSUED FOR BID	0			

BORDER REVISED 03/25/2011

PB TELAMON

PB PARSONS BRINCKERHOFF

DESIGNED	D. ABRAHAMS
DRAWN	E. LLORICO
CHECKED	S. KIM
REVIEWED	A. READ
RECOMMENDED	M. FOWLER
APPROVED	R. EDWARDS
DATE	05/31/2013

CITY AND COUNTY OF SAN FRANCISCO
MUNICIPAL TRANSPORTATION AGENCY

APPROVED

DIRECTOR OF TRANSPORTATION

THIRD STREET LIGHT RAIL PROGRAM
PHASE 2 – CENTRAL SUBWAY
TEMPORARY TBM RETRIEVAL SHAFT

GENERAL PLANS
TITLE SHEET

CONTRACT NO.	1278
SFMTA CONTROL NO.	CL-24607
DRAWING NO.	GE-001
REVISION	0
SHEET NO.	1

INDEX OF DRAWINGS

SHT NO.	CTRL NO.	DWG NO.	REV NO.	DRAWING TITLE
GENERAL				
1	CL-24607	GE-001	0	TITLE SHEET
2	CL-24608	GE-011	0	INDEX OF DRAWINGS
CIVIL				
3	CL-24609	CV-101	0	SITE PLAN – SHEET 1 OF 2
4	CL-24610	CV-102	0	SITE PLAN – SHEET 2 OF 2
GEOTECHNICAL				
5	CL-24611	GT-001	0	GENERAL NOTES – LEGENDS AND ABBREVIATIONS
6	CL-24612	GT-101	0	EXPLORATION LOCATIONS
7	CL-24613	GT-121	0	SUBSURFACE INVESTIGATION CROSS SECTION
8	CL-24614	GT-131	0	DEWATERING PLAN
EXCAVATION AND GROUND SUPPORT				
9	CL-24615	ES-011	0	SHORING DESIGN CRITERIA – 1 OF 3
10	CL-24616	ES-012	0	SHORING DESIGN CRITERIA – 2 OF 3
11	CL-24617	ES-013	0	SHORING DESIGN CRITERIA – 3 OF 3
12	CL-24618	ES-101	0	ASSUMED CONSTRUCTION SEQUENCE
13	CL-24619	ES-201	0	TBM BREAKTHROUGH PILES
STRUCTURAL				
14	CL-24620	ST-001	0	GENERAL NOTES
15	CL-24621	ST-101	0	GENERAL PLAN
16	CL-24622	ST-102	0	ROOF PLAN
17	CL-24623	ST-103	0	BRACING LEVEL 1, 2 & 3
18	CL-24624	ST-104	0	BASE SLAB PLAN
19	CL-24625	ST-105	0	SECTIONS
20	CL-24626	ST-201	0	HEADWALL REINFORCEMENT DETAILS – SHEET 1
21	CL-24627	ST-202	0	HEADWALL REINFORCEMENT DETAILS – SHEET 2
22	CL-24628	ST-203	0	STEEL FRAMING DETAILS – SHEET 1 OF 2
23	CL-24629	ST-204	0	STEEL FRAMING DETAILS – SHEET 2 OF 2
24	CL-24630	ST-205	0	CONNECTION SCHEDULE
25	CL-24631	ST-206	0	BASE SLAB DETAILS
26	CL-24632	ST-207	0	ROOF DETAILS
BUILDING PROTECTION				
27	CL-24633	BP-001	0	GENERAL NOTES – LEGENDS AND ABBREVIATIONS
28	CL-24634	BP-011	0	INSTRUMENTATION SCHEDULE
29	CL-24635	BP-021	0	INSTRUMENTATION DETAILS – SHEET 1 OF 3
30	CL-24636	BP-022	0	INSTRUMENTATION DETAILS – SHEET 2 OF 3
31	CL-24637	BP-023	0	INSTRUMENTATION DETAILS – SHEET 3 OF 3
32	CL-24638	BP-101	0	INSTRUMENTATION PLAN
33	CL-24639	BP-102	0	COMPENSATION GROUTING – SHEET 1 OF 2
34	CL-24640	BP-103	0	COMPENSATION GROUTING – SHEET 2 OF 2

T:\13285 CS DP1\CN 1278\Sheet Files\GE – General\ GE-011.dwg Llorico Tue May 28,2013 – 8:10 pm GE-011

DATE	DESCRIPTION	REV. NO.	BY	CHECKED	APPROVED
05/31/2013	ISSUED FOR BID	0			

BORDER REVISED 03/25/2011

PB TELAMON

PB PARSONS BRINCKERHOFF

DESIGNED	D. ABRAHAMS
DRAWN	L. REYES
CHECKED	D. YAVORSKY
REVIEWED	A. READ
RECOMMENDED	M. FOWLER
APPROVED	R. EDWARDS
DATE	05/31/2013

CITY AND COUNTY OF SAN FRANCISCO
MUNICIPAL TRANSPORTATION AGENCY

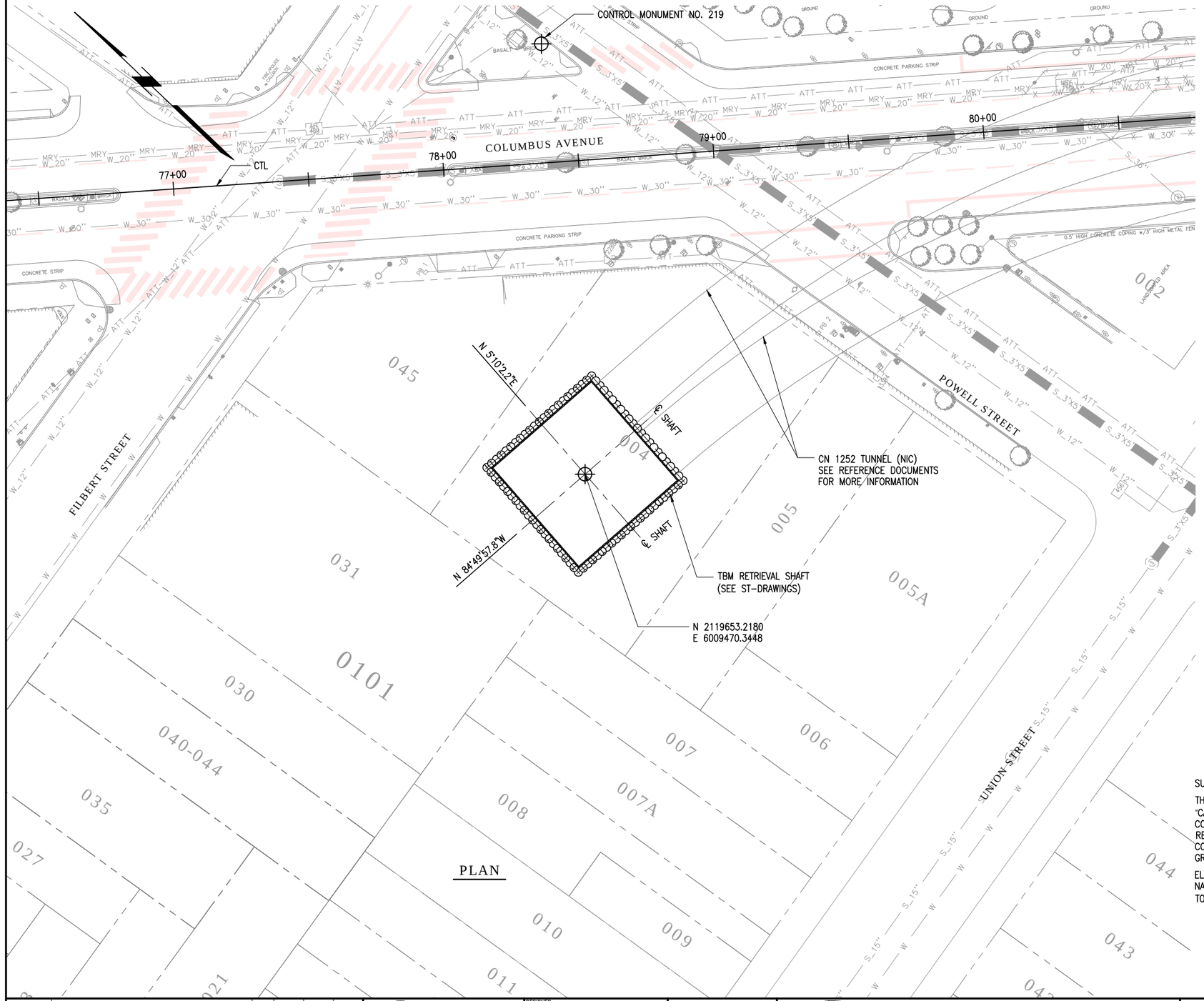
APPROVED

DIRECTOR OF TRANSPORTATION

THIRD STREET LIGHT RAIL PROGRAM
PHASE 2 – CENTRAL SUBWAY
TEMPORARY TBM RETRIEVAL SHAFT

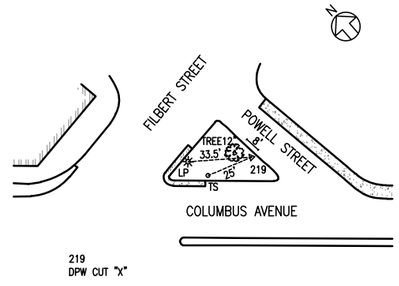
INDEX OF DRAWINGS
GENERAL NOTES

CONTRACT NO.	1278
SFMTA CONTROL NO.	CL-24608
DRAWING NO.	GE-011
REVISION	0
SHEET NO.	2



LEGEND:

EXISTING PROPERTY LINE



219
DPW CUT "X"

CONTROL MONUMENT No. 219
NTS

POINT #	NORTHING	EASTING	ELEVATION	DESCRIPTION
219	2119774.69	6009574.08	59.24	DPW

SURVEY CONTROL NOTE:

THE BASIS OF BEARINGS FOR THIS SURVEY CONTROL NETWORK WAS ESTABLISHED USING THE "CALIFORNIA COORDINATE SYSTEM OF 1983, ZONE 3" (CCS83) (US SURVEY FOOT). SURVEY CONTROL COORDINATES ARE BASED ON A LOCAL SYSTEM USING GROUND DISTANCES AND ARE NOT INTENDED TO REFERENCE THE CALIFORNIA COORDINATE SYSTEM, WHICH WOULD REQUIRE USE OF A "GRID TO GROUND" COMBINED GRID FACTOR DISTANCE CONVERSION. ALL MEASUREMENTS AND CALCULATIONS ARE BASED ON GROUND DISTANCES.

ELEVATIONS SHOWN HEREIN ARE BASED ON NAVD88 AND ARE SHOWN IN FEET, DERIVED FROM A NAVD88 ELEVATION OF 6.633 METERS ON BM-0015 AT THE NORTHERLY CORNER OF 2ND AND TOWNSEND. THE ELEVATION WAS THEN CONVERTED TO APPROXIMATE CCSF DATUM (NAVD88 - 11.353 FT)

20' 0 20' 40'

SCALE = 1"=20'

DATE	DESCRIPTION	REV. NO.	BY	CHECKED	APPROVED
05/31/2013	ISSUED FOR BID	0			

PB TELAMON
PB PARSONS BRINCKERHOFF

DESIGNED C. SUNTHUDKARN
DRAWN O. KURNOVSKAYA
CHECKED D. ABRAHAMS
REVIEWED A. READ
RECOMMENDED M. FOWLER
APPROVED R. EDWARDS
DATE 05/31/2013

CITY AND COUNTY OF SAN FRANCISCO
MUNICIPAL TRANSPORTATION AGENCY

APPROVED

DIRECTOR OF TRANSPORTATION

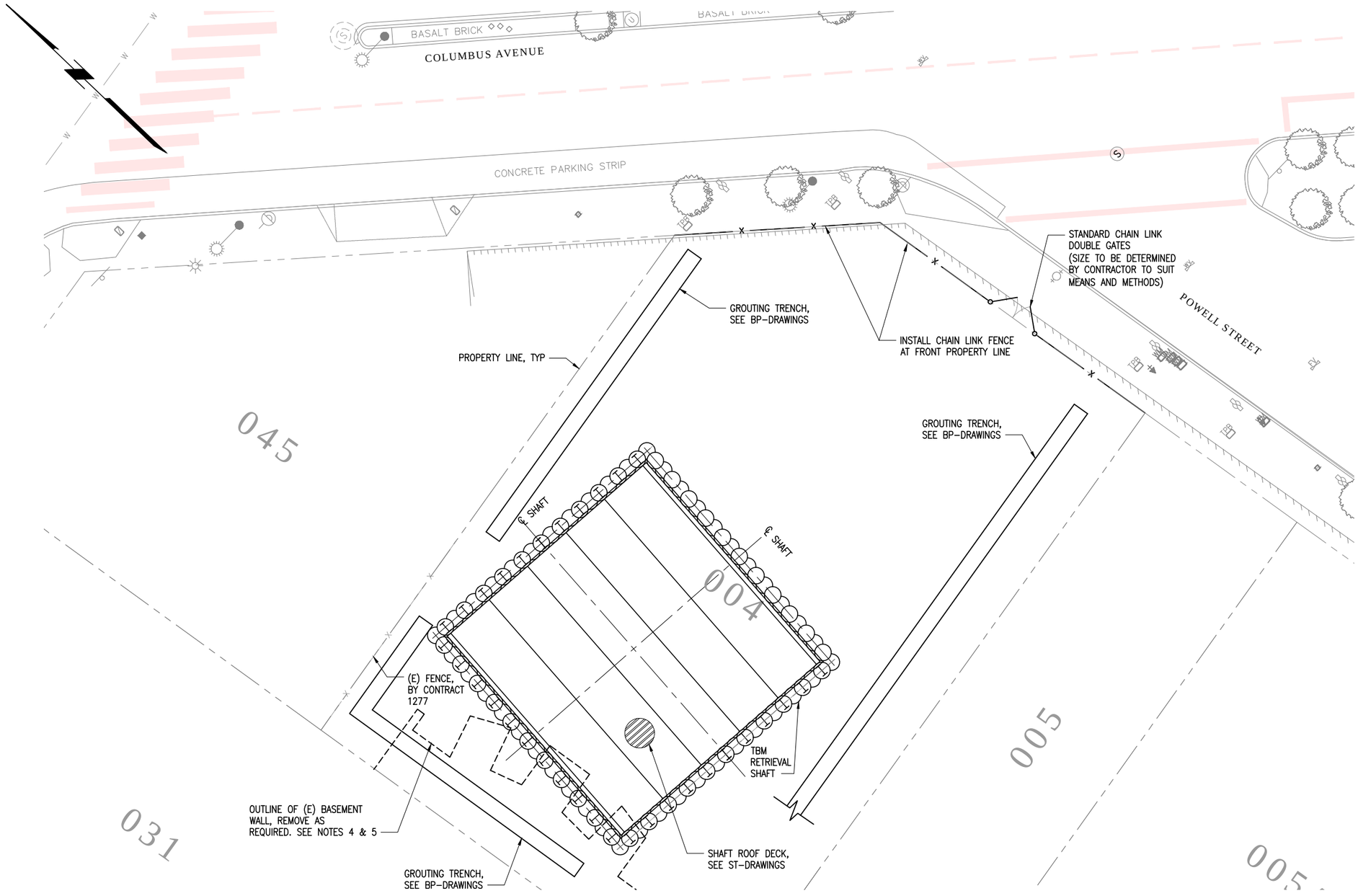
THIRD STREET LIGHT RAIL PROGRAM
PHASE 2 – CENTRAL SUBWAY
TEMPORARY TBM RETRIEVAL SHAFT

CIVIL
SITE PLAN
SHEET 1 OF 2

CONTRACT NO. 1278
SFMTA CONTROL NO. CL-24609
DRAWING NO. CV-101
REVISION 0
SHEET NO. 3

T:\13285 CS DP1\CN 1278\Sheet Files\CV - Civil\ CV-101.dwg Llorico Wed May 29,2013 - 11:56 am CV-101

BORDER REVISED 03/25/2011



PLAN

LEGEND:

- PROTECT IN PLACE EXISTING FIRE HYDRANT
- PROTECT IN PLACE EXISTING MUNI POLE
- PROTECT IN PLACE EXISTING PARKING METER
- PROTECT IN PLACE EXISTING SS VENT
- PROTECT IN PLACE EXISTING STREET SIGN
- PROTECT IN PLACE EXISTING STREET LIGHT
- TPB — PROTECT IN PLACE EXISTING TELEPHONE PULL BOX
- PROTECT IN PLACE EXISTING TRAFFIC SIGNAL
- PROTECT IN PLACE EXISTING TREES
- PROTECT IN PLACE EXISTING UTILITY BOX
- WM — PROTECT IN PLACE EXISTING WATER METER

NOTE:

1. FOR UNDER GROUND UTILITIES, SEE REFERENCE DRAWINGS.
2. EXISTING FACILITIES ARE SHOWN SCREENED BACK, FOR REFERENCE ONLY.
3. EXISTING UTILITY INFORMATION IS BASED ON RECORDS RECEIVED FROM UTILITY AGENCIES. THE LOCATION OF EXISTING UNDERGROUND UTILITIES SHOWN ON THESE PLANS ARE APPROXIMATE LOCATIONS. ACTUAL CONDITIONS MAY VARY.
4. FOR 1731 POWELL ST. BUILDING (BLOCK 0101, LOT 4) DEMOLITION, SEE CN 1277 DOCUMENTS.
5. FOR (E) BUILDING (BLOCK 0101, LOT 4) INFORMATION, SEE REFERENCE DRAWINGS.

10' 0 10' 20'

SCALE = 1"=10'

DATE	DESCRIPTION	REV. NO.	BY	CHECKED	APPROVED
05/31/2013	ISSUED FOR BID	0			

BORDER REVISED 03/25/2011

PB TELAMON

PB PARSONS BRINCKERHOFF

DESIGNED C. SUNTHUDKARN
DRAWN O. KURNOVSKAYA
CHECKED D. ABRAHAMS
REVIEWED A. READ
RECOMMENDED M. FOWLER
APPROVED R. EDWARDS
DATE 05/31/2013

CITY AND COUNTY OF SAN FRANCISCO
MUNICIPAL TRANSPORTATION AGENCY

APPROVED

DIRECTOR OF TRANSPORTATION

THIRD STREET LIGHT RAIL PROGRAM
PHASE 2 – CENTRAL SUBWAY
TEMPORARY TBM RETRIEVAL SHAFT

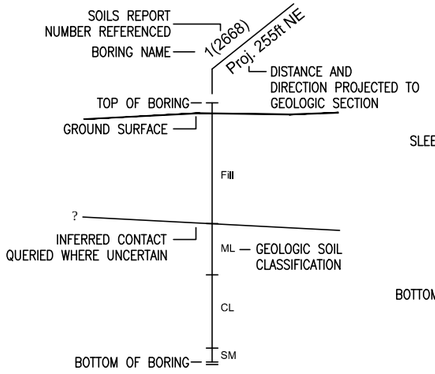
CIVIL
SITE PLAN
SHEET 2 OF 2

CONTRACT NO. 1278
SFMTA CONTROL NO. CL-24610
DRAWING NO. CV-102
REVISION 0
SHEET NO. 4

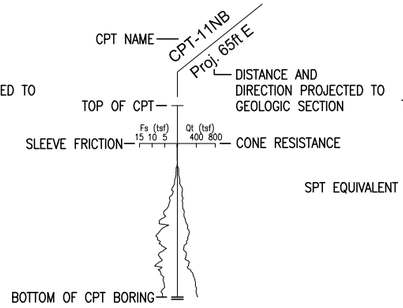
T:\13285 CS DP1\CN 1278\Sheet Files\CV - Civil\ CV-102.dwg Llorico Wed May 29,2013 - 11:57 am CV-102

LEGEND

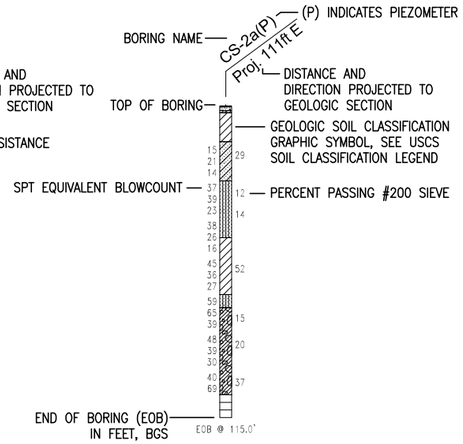
BORING LOG - OTHERS



CPT LOG



BORING LOG



SYMBOLS

3/20/08 — STABILIZED GROUNDWATER LEVEL OBSERVED AND DATE MEASURED

NOTES:

1. ELEVATION DATUM – CCSF
2. CONTROL LINE STATIONING USED FOR GEOLOGICAL PROFILE
3. THE LOGS OF BORINGS AND RELATED INFORMATION SHOWN ON THE SECTIONS DEPICT SUBSURFACE CONDITIONS ONLY AT THOSE SPECIFIC LOCATIONS AND AT THE PARTICULAR TIME THE EXPLORATION WORK WAS PERFORMED. THE PASSAGE OF TIME MAY RESULT IN A CHANGE IN SOIL AND GROUNDWATER CONDITIONS AT THESE LOCATIONS.
4. GEOLOGIC UNITS QUERIED WHERE EXISTENCE UNCERTAIN.
5. NO WARRANTY AS TO THE ACCURACY OF THE TOPOGRAPHIC SURVEY USED AS THE BASIS FOR THESE DRAWINGS IS GIVEN OR IMPLIED. TOPOGRAPHIC SURVEY FEATURES AND LOT BOUNDARIES ARE APPROXIMATE AND DO NOT REFLECT THE ACTUAL OR LEGAL POSITION OF ANY EXISTING STRUCTURE SHOWN. BUILDING LINES, WHERE SHOWN, DO NOT SHOW ALL BUILDING INFORMATION SUCH AS CANOPIES, OVERHANG PROJECTIONS OR ACCESS.

USCS SOIL CLASSIFICATION

CH: High Plasticity Clay	CL: Low Plasticity Clay	GP: Poorly Graded Gravel	MH: High Plasticity Silt	SP–SC: Poorly Graded Sand with Clay
CL–ML: Silty Clay	GC: Clayey Gravel	GM: Silty Gravel	GP–GC: Poorly Graded Gravel with Clay	GP–GM: Poorly Graded Gravel with Silt
GW: Well Graded Gravel	GW–GC: Well Graded Gravel with Clay	GW–GM: Well Graded Gravel with Silt	ML: Low Plasticity Silt	OH: High Plasticity Organic Silt or Clay
OL: Low Plasticity Organic Silt or Clay	SC: Clayey Sand	SM: Silty Sand	SP: Poorly Graded Sand	SP–SM: Poorly Graded Sand with Silt
SW: Well Graded Sand	SW–SC: Well Graded Sand with Clay	SW–SM: Well Graded Sand with Silt	SC–SM: Clayey Sand with Silty Sand	COBBLES
BEDROCK: SS = Sandstone; SH = Shale; SLT = Siltstone; M= Melange; MS = Meta–Sandstone			ASPHALT	CONCRETE

GEOLOGIC UNITS

SURFICIAL DEPOSITS

QUATERNARY

Qaf Artificial Fill (Holocene): Generally consists of very loose to medium dense Sand (SP), Silty Sand (SM), and medium stiff Sandy Clay (CL); locally with miscellaneous debris (bricks, wood, metal, concrete, glass, etc.). Much of this deposit originates from the underlying Dune Sand (Qd).

Qd Dune Sand: Generally consists of loose to medium dense poorly–graded fine to medium grained aeolian Sand (SP).

Qm Bay Mud/Marsh Deposit: Generally consists of very soft to soft, dark greenish gray to black organic–rich Clay and Sandy Clay (CL to CH).

Qu Undifferentiated Deposits: Generally consists of medium stiff to stiff brown Sandy Clay (CL) and medium dense to dense brown Clayey Sand (SC). May comprise colluvium, alluvium, or Colma Formation.

Qc Colma Formation – Generally consists of well–bedded dense to very dense Sand (SP to SM) with interbedded stiff to very stiff Clay and Sandy Clay (CL). Where observed in Project borings, beds range from 1 inch to greater than 2 feet thick. Color is typically brown to yellowish brown, with red, orange, and gray motling.

Qo Undifferentiated Old Bay Deposits: Generally consists of interbedded dense to very dense Sand (SP) and Silty Sand (SM) and stiff to very stiff Clay (CL); locally contains lenses of shell fragments. This unit also contains Older Bay Clay and Mud, which typically are stiff Clays and Silts that are gray to greenish gray in color.

Qcol Colluvium: generally consists of very stiff brown to gray Sandy Clay (CL) to Clayey Gravel (GC). Appears to be decomposed bedrock/residual soil.

FRANCISCAN COMPLEX BEDROCK

Where observed in project borings, this unit is highly variable in composition, hardness, and strength, ranging from soft to hard and from friable to moderately strong. Observed fracture spacing varies from very close (< 0.1 ft) to close (0.1 to 0.3 ft) and, in general, the severity of weathering decreases slighty with depth.

JURASSIC AND CRETACEOUS

KJf FRANCISCAN COMPLEX, UNDIFFERENTIATED; includes sandstone, meta–sandstone, shale, siltstone, serpentine, and melange.

DATE	DESCRIPTION	REV. NO.	BY	CHECKED	APPROVED
05/31/2013	ISSUED FOR BID	0			

PB TELAMON

PB PARSONS BRINCKERHOFF

DESIGNED S. KIM
DRAWN O. KURNOVSKAYA
CHECKED K. TUNG
REVIEWED D. ABRAHAMS
RECOMMENDED M. FOWLER
APPROVED R. EDWARDS
DATE 05/13/2013

CITY AND COUNTY OF SAN FRANCISCO
MUNICIPAL TRANSPORTATION AGENCY
APPROVED
DIRECTOR OF TRANSPORTATION

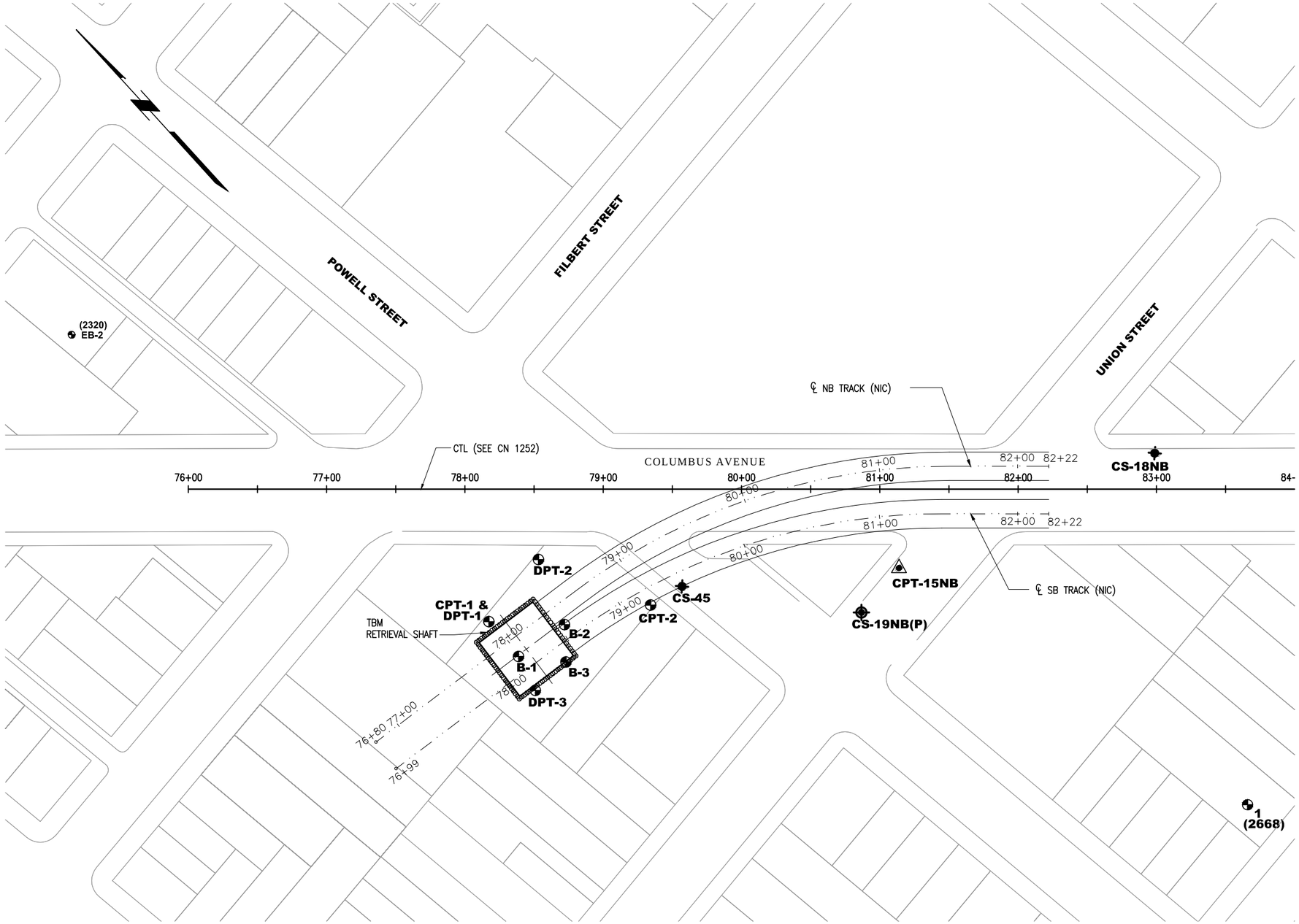
THIRD STREET LIGHT RAIL PROGRAM
PHASE 2 – CENTRAL SUBWAY
TEMPORARY TBM RETRIEVAL SHAFT

GEOTECHNICAL
GENERAL NOTES
LEGEND AND ABBREVIATIONS

CONTRACT NO. 1278
SFMTA CONTROL NO. CL–24611
DRAWING NO. GT–001
SHEET NO. 5
REVISION 0

T:\13285 CS DP1\CN 1278\Sheet Files\GT – Geotechnical\ GT–001.dwg Llorico Tue May 28,2013 – 8:11 pm EXGT001

BORDER REVISED 03/25/2011



LEGEND

- BORING FOR CENTRAL SUBWAY
- CPT FOR CENTRAL SUBWAY
- PIEZOMETER FOR CENTRAL SUBWAY
- BORING, CPT OR TEST PIT BY OTHERS

NOTES:

1. BASE MAP DATA PROVIDED BY SFMTA.
2. SEE EXISTING BORINGS IN REFERENCE DOCUMENT (GEOTECHNICAL INVESTIGATION 1731–1741 POWELL STREET LA CORNETA PLACE, SAN FRANCISCO, CALIFORNIA, DECEMBER 1, 2008, PROJECT NO. 2766.03)
3. BORINGS/TEST PITS BY OTHERS INCLUDE UNIQUE I.D. (IN PARENTHESES). THESE LOGS ARE CONTAINED IN PROJECT FILES.
4. ALL BORINGS/PIEZOMETERS/TEST PIT LOCATIONS ARE APPROXIMATE.

40' 0 40' 80'
SCALE = 1"=40'

DATE	DESCRIPTION	REV. NO.	BY	CHECKED	APPROVED
05/31/2013	ISSUED FOR BID	0			

BORDER REVISED 03/25/2011

PB TELAMON
PB PARSONS BRINCKERHOFF

DESIGNED K. TUNG
DRAWN O. KURNOVSKAYA
CHECKED S. KIM
REVIEWED D. ABRAHAMS
RECOMMENDED N. FOWLER
APPROVED R. EDWARDS
DATE 05/31/2013

CITY AND COUNTY OF SAN FRANCISCO
MUNICIPAL TRANSPORTATION AGENCY

APPROVED

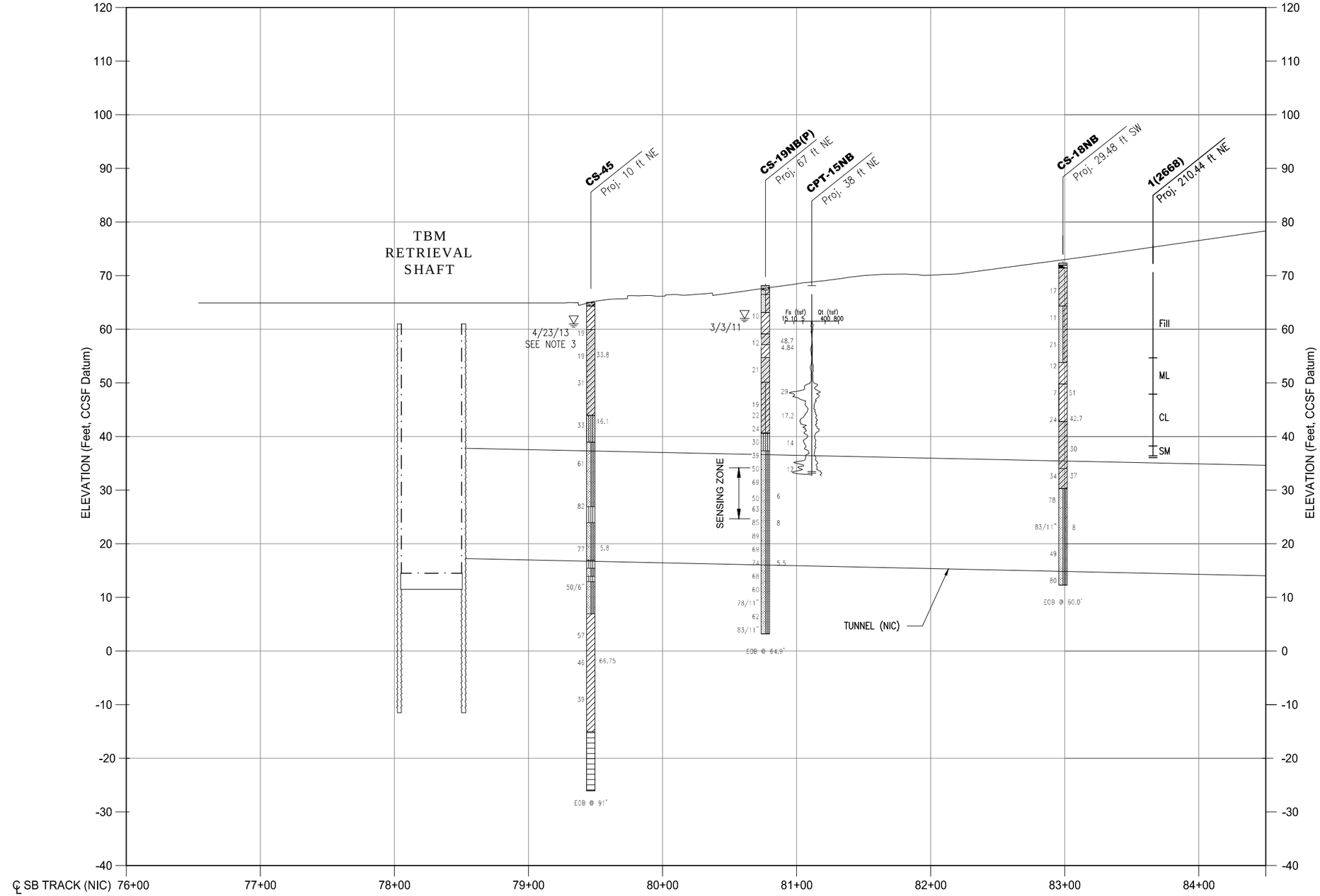
DIRECTOR OF TRANSPORTATION

THIRD STREET LIGHT RAIL PROGRAM
PHASE 2 – CENTRAL SUBWAY
TEMPORARY TBM RETRIEVAL SHAFT

GEOTECHNICAL
EXPLORATION LOCATIONS

CONTRACT NO. 1278
SFMTA CONTROL NO. CL–24612
DRAWING NO. GT–101
REVISION 0
SHEET NO. 6

T:\13285 CS DP1\CN 1278\Sheet Files\GT – Geotechnical\ GT–101.dwg Llorico Wed May 29,2013 – 11:13 am GT101



NOTE:

1. FOR BORING PLAN LOCATIONS REFER TO DRAWING GT–101.
2. SEE EXISTING BORINGS IN REFERENCE DOCUMENT (GEOTECHNICAL INVESTIGATION 1731–1741 POWELL STREET LA CORNETA PLACE, SAN FRANCISCO, CALIFORNIA, DECEMBER 1, 2008, PROJECT NO. 2766.03)
3. MEASURED AT THE TIME OF BORING.

10' 0 10' 20'
SCALE = 1"=10'
VERTICAL

40' 0 40' 80'
SCALE = 1"=40'
HORIZONTAL

DATE	DESCRIPTION	REV. NO.	BY	CHECKED	APPROVED
05/31/2013	ISSUED FOR BID	0			

BORDER REVISED 03/25/2011

PB TELAMON
PB PARSONS BRINCKERHOFF

DESIGNED K. TUNG
DRAWN O. KURNOVSKAYA
CHECKED S. KIM
REVIEWED D. ABRAHAMS
RECOMMENDED M. FOWLER
APPROVED R. EDWARDS
DATE 05/31/2013

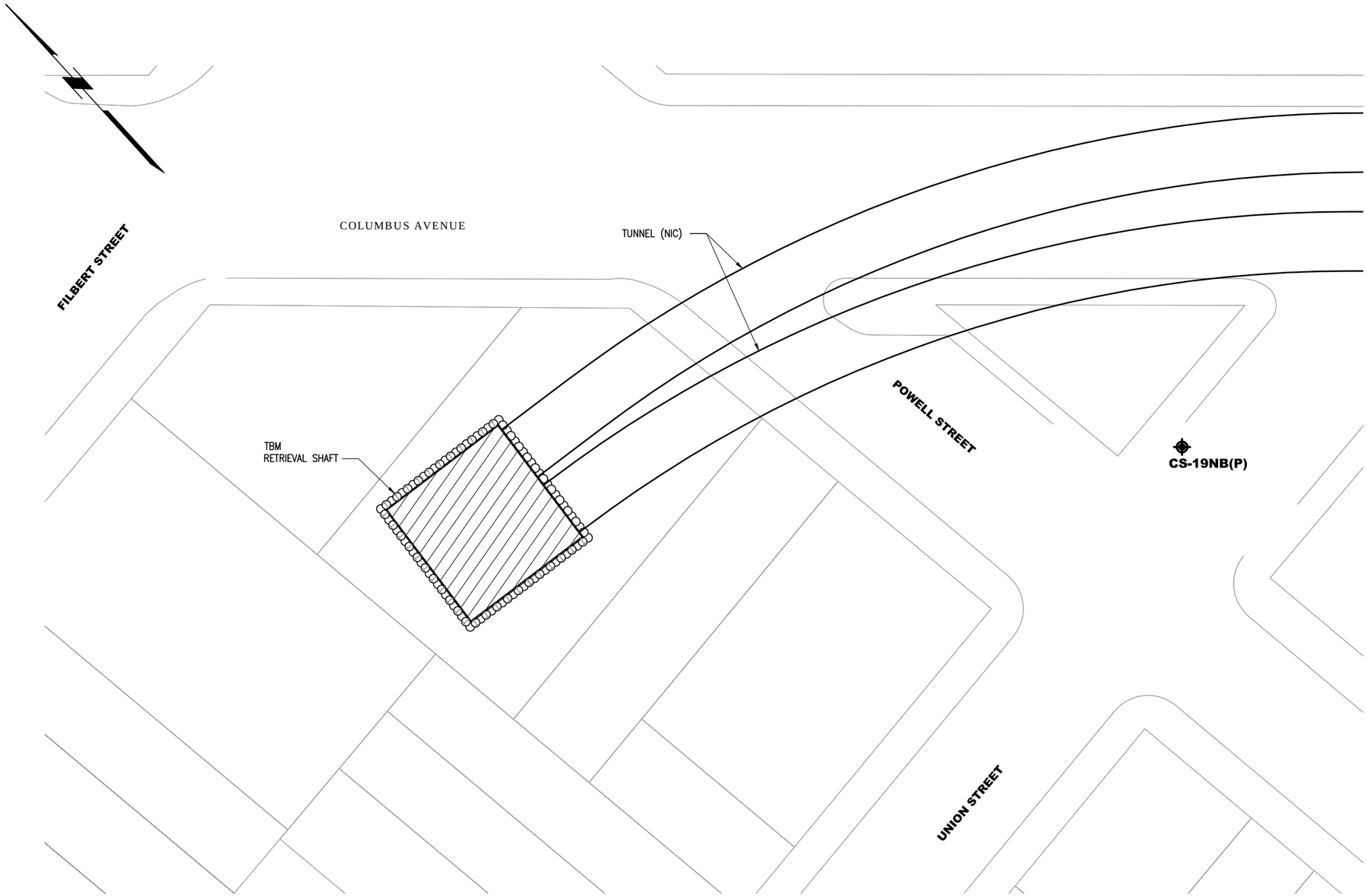
CITY AND COUNTY OF SAN FRANCISCO
MUNICIPAL TRANSPORTATION AGENCY
APPROVED
DIRECTOR OF TRANSPORTATION

THIRD STREET LIGHT RAIL PROGRAM
PHASE 2 – CENTRAL SUBWAY
TEMPORARY TBM RETRIEVAL SHAFT

GEOTECHNICAL SUBSURFACE INVESTIGATION CROSS SECTION

CONTRACT NO. 1278
SFMTA CONTROL NO. CL–24613
DRAWING NO. GT–121
REVISION 0
SHEET NO. 7

T:\13285 CS DP1\CN 1278\Sheet Files\GT – Geotechnical\ GT–121.dwg Llorico Wed May 29,2013 – 11:20 am GT121



LEGEND

AREA TO BE DEWATERED WITHIN SHAFT EXCAVATION

CS–19NB(P) EXISTING PIEZOMETER

NOTES:

1. GROUNDWATER TABLE INSIDE SHAFT EXCAVATION AREA SHALL BE MAINTAINED AT 5 FT. BELOW FINAL BOTTOM OF EXCAVATION BEFORE COMMENCEMENT OF EXCAVATION AND DURING CONSTRUCTION, AND UNTIL BASE SLAB OF STRUCTURE IS POURED AND REACHED ITS 28–DAY STRENGTH UNLESS OTHERWISE APPROVED BY ENGINEER.
2. DEWATERING OPERATIONS SHALL CONTINUE, IF NEEDED, TO PREVENT BOUYANT UPLIFTING OF RETRIEVAL SHAFT STRUCTURE.
3. PRIOR TO CONSTRUCTION, CONTRACTOR SHALL SUBMIT DETAILS OF DEWATERING PLAN INCLUDING ALL WORKS NECESSARY TO MONITOR WATER LEVELS WITHIN EXCAVATION, CONTROL, HANDLE AND DISPOSE OF GROUNDWATER AND SURFACE WATER, AND WORKS NECESSARY TO REPAIR OR REPLACE PROPERTY DAMAGED DUE TO GROUND WATER DEWATERING.
4. BASELINE DEWATERING SYSTEM CAPACITY IS 100 GPM (GALLONS PER MINUTE)
5. CONTRACTOR SHALL SUBMIT DETAILS OF DEWATERING WELL AND PIEZOMETER PENETRATIONS THROUGH BASE SLAB, AND MEANS OF SEALING/CLOSURE OF WELLS AND BASE SLAB AFTER COMPLETION OF REQUIRED DEWATERING.
6. DEWATERING WORK SHALL CONFORM WITH REQUIREMENTS OF SPECIFICATION 31 23 19.

20' 0 20' 40'

SCALE = 1"=20'

DATE	DESCRIPTION	REV. NO.	BY	CHECKED	APPROVED
05/31/2013	ISSUED FOR BID	0			

BORDER REVISED 03/25/2011

PB TELAMON

PB PARSONS BRINCKERHOFF

DESIGNED S. KIM
DRAWN O. KURNOVSKAYA
CHECKED K. JOHNSON
REVIEWED D. ABRAHAMS
RECOMMENDED N. FOWLER
APPROVED R. EDWARDS
DATE 05/31/2013

CITY AND COUNTY OF SAN FRANCISCO
MUNICIPAL TRANSPORTATION AGENCY

APPROVED

DIRECTOR OF TRANSPORTATION

THIRD STREET LIGHT RAIL PROGRAM
PHASE 2 – CENTRAL SUBWAY
TEMPORARY TBM RETRIEVAL SHAFT

GEOTECHNICAL
DEWATERING PLAN

CONTRACT NO. 1278
SFMTA CONTROL NO. CL–24614
DRAWING NO. GT–131
REVISION 0
SHEET NO. 8

T:\13285 CS DP1\CN 1278\Sheet Files\GT – Geotechnical\ GT–131.dwg Llorico Tue May 28,2013 – 8:13 pm GT–131

LOAD FOR TEMPORARY STRUCTURE

STRUCTURE		DEAD LOADS	LIVE LOADS AND OTHER LOADS – VERTICAL	LIVE LOADS AND OTHER LOADS – HORIZONTAL	EARTHQUAKE LOADS [EQT]	LOADING COMBINATIONS (LRFD ONLY) [1]
EXCAVATION SUPPORT STRUCTURE	WALL SYSTEM (ELEMENTS IN CONTACT WITH RETAINED EARTH)	OWN WEIGHT AND REACTIONS FROM DEAD LOADS OF DECK STRUCTURE AND BRACING SYSTEM.	REACTIONS FROM LIVE LOADS ON DECK STRUCTURE [LLT] WALKWAYS AND INCIDENTAL LOADS [LLW] CONSTRUCTION EQUIPMENT [LLH]	LATERAL EARTH PRESSURE [EHAR] DUE TO WEIGHT OF SOIL AND SURCHARGE HYDROSTATIC PRESSURE [WU] AXIAL LOADS FROM END WALLS WHERE APPLICABLE [EHAR] AND [WU]	LATERAL PRESSURE DUE TO EARTHQUAKE	LOAD SERVICE I (SEE GENERAL NOTES FOR LOADING COMBINATIONS) [DW] + [WU] + [DC] + [EV] + [EHS] + [EHAR] + [LLP] + 0.70[EQT] LOAD SERVICE II (SEE GENERAL NOTES FOR LOADING COMBINATIONS) LOAD SERVICE 1 + 0.5[TG] + 0.5[TU] + 0.5[SH] + 0.3[WS] WITHOUT [EQT] LOADING STRENGTH I (SEE TABLE FOR γ_p–VALUES & GENERAL NOTES FOR LOADING COMBINATIONS) γ_p[DW] + γ_p[WU] + γ_p[DC] + γ_p[EV] + γ_p[EHS] + γ_p[EHAR] + 1.75[LLP] + 1.75[LF] + 0.5/1.2[TU] + γ_{TG}[TG] + 0.5/1.2[SH] STRENGTH II (SEE TABLE FOR γ_p–VALUES & GENERAL NOTES FOR LOADING COMBINATIONS) γ_p[DW] + γ_p[WU] + γ_p[DC] + γ_p[EV] + γ_p[EHS] + γ_p[EHAR] + 0.5[LLT] + 0.5[LLW] + 0.5[LLP] + 0.5[LLHT] + 0.5[LF] + 0.5[IT] + 0.5[IH] + 0.5/1.2[TU] + γ_{TG}[TG] + 0.5/1.2[SH] + [EQT]
	BRACING SYSTEM – MAIN MEMBERS (MEMBERS CARRYING COMPUTED LOADS)			SIMPLE BEAM REACTIONS FROM WALL SYSTEM AXIAL LOADS FROM END WALLS WHERE APPLICABLE	REACTION FROM WALL SYSTEM	
	BRACING SYSTEM – SECONDARY BRACING	OWN WEIGHT	AXIAL LOAD EQUAL TO 3% OF THE DESIGN AXIAL LOAD IN THE MAIN BRACED MEMBER		NONE	

1. CONTRACTOR MAY USE ALLOWABLE STRESS DESIGN SUBJECT TO THE APPROVAL OF THE ENGINEER.

* REFERENCES ARE TO AASHTO BRIDGE DESIGN SPECIFICATIONS U.S. CUSTOMARY UNITS.

GENERAL NOTES FOR LOADING COMBINATIONS

1. THE LARGER OF THE TWO VALUES PROVIDED FOR LOAD FACTORS OF TU AND SH SHALL BE USED FOR DEFORMATIONS AND THE SMALLER VALUES FOR ALL OTHER EFFECTS.
2. γ_{TG} SHALL BE TAKEN AS:
   - 0.0 AT THE STRENGTH I & II LIMIT STATES.
   - 1.0 AT THE LOAD SERVICE LIMIT STATES I & II WHEN LIVE LOAD IS NOT CONSIDERED.
   - 0.50 AT THE LOAD SERVICE LIMIT STATES I & II WHEN LIVE LOAD IS CONSIDERED.
3. γ_p LOAD FACTORS SHALL BE APPLIED ACCORDING TO THE FOLLOWING REQUIREMENTS:
   - IN LOAD COMBINATIONS WHERE ONE FORCE EFFECT DECREASES ANOTHER EFFECT, THE MINIMUM VALUE SHALL BE APPLIED TO THE LOAD REDUCING THE FORCE EFFECT.
   - THE LOAD FACTOR THAT PRODUCES THE MORE CRITICAL COMBINATION SHALL BE SELECTED. WHERE THE LOAD INCREASES THE STABILITY OR LOAD–CAVING CAPACITY OF A COMPONENT, THE MINIMUM VALUE OF THE LOAD FACTOR FOR THAT LOAD SHALL ALSO BE INVESTIGATED.
   - ALTHOUGH THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS INDICATES THAT γ_p ARE THE LOAD FACTORS FOR PERMANENT LOADS, THE SHORING DESIGN CRITERIA SHOWN IN THESE CONTRACT DRAWINGS HAVE ASSUMED THAT THE γ_p LOAD FACTORS SHALL SIMILARLY BE APPLIED TO THE TEMPORARY LOAD COMBINATIONS.
4. SEE AASHTO BRIDGE DESIGN SPECIFICATIONS FOR DEFINITIONS OF LOADS DW, DC, EV, TG, TU, SH, AND WS SHOWN IN THE LOAD COMBINATIONS.
5. LOADS NOT EXPLICITLY DEFINED IN AASHTO HAVE THE FOLLOWING DEFINITIONS:

   WU: GROUNDWATER LOAD (HYDROSTATIC)
   EHS: SURCHARGE LOADING FROM EARTH PRESSURE OR BUILDING SURCHARGE
   EHAR: AT REST HORIZONTAL EARTH PRESSURE AT FINAL CONSTRUCTION STAGE
   LLP: ROOF LIVE LOAD
   EQT: FORCES GENERATED BY EARTHQUAKE EFFECTS ON TEMPORARY STRUCTURES

TYPE OF LOAD	γ_p, LOAD FACTOR**	
	MAXIMUM	MINIMUM
DC	1.25	0.9
WU	1.25	1.0
DW	1.5	0.9
EHAC	1.5	0.9
EHAR	1.35	0.9
EV	1.3	0.9
EHS	1.5	0.75

**SEE GENERAL NOTES FOR LOADING COMBINATIONS.

TYPE OF LOAD	γ_{TG}, LOAD FACTOR**	
	MAXIMUM	MINIMUM
TG	1.0	0.5

DATE	DESCRIPTION	REV. NO.	BY	CHECKED	APPROVED
05/31/2013	ISSUED FOR BID	0			

BORDER REVISED 03/25/2011

PB TELAMON
PB PARSONS BRINCKERHOFF

DESIGNED S. KIM
DRAWN O. KURNOVSKAYA
CHECKED D. ABRAHAMS
REVIEWED A. READ
RECOMMENDED M. FOWLER
APPROVED R. EDWARDS
DATE 05/31/2013

CITY AND COUNTY OF SAN FRANCISCO
MUNICIPAL TRANSPORTATION AGENCY
APPROVED
DIRECTOR OF TRANSPORTATION

THIRD STREET LIGHT RAIL PROGRAM
PHASE 2 – CENTRAL SUBWAY
TEMPORARY TBM RETRIEVAL SHAFT

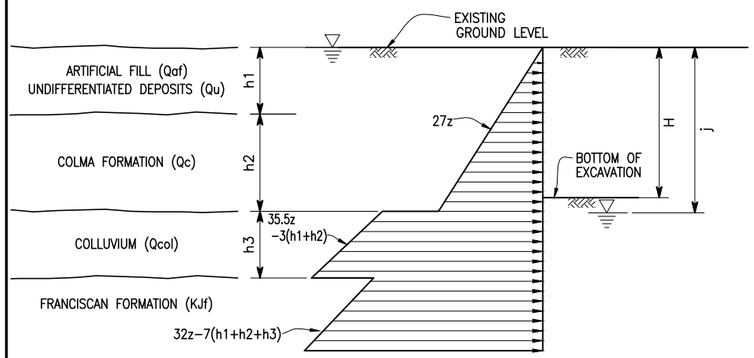
EXCAVATION AND GROUND SUPPORT
SHORING DESIGN CRITERIA
SHEET 1 OF 3

CONTRACT NO. 1278
SFMTA CONTROL NO. CL–24615
DRAWING NO. ES–011
REVISION 0
SHEET NO. 9

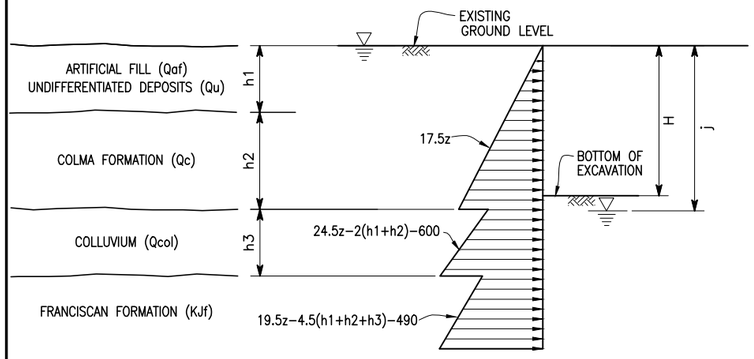
T:\13285 CS DP1\CN 1278\Sheet Files\ES – Excavation and Ground Support\ ES–011.dwg Llorico Tue May 28,2013 – 8:07 pm ES–011

DESIGN LATERAL EARTH PRESSURE FOR SUPPORT OF EXCAVATIONS

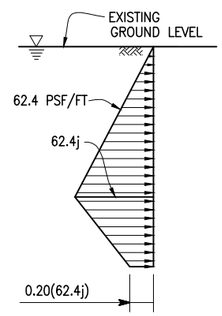
AT–REST PRESSURES



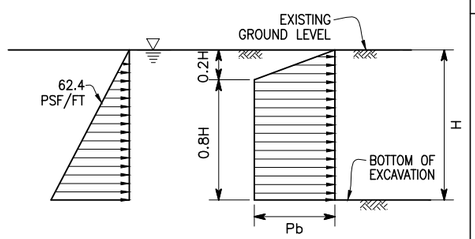
ACTIVE EARTH PRESSURES



NET GROUNDWATER PRESSURE

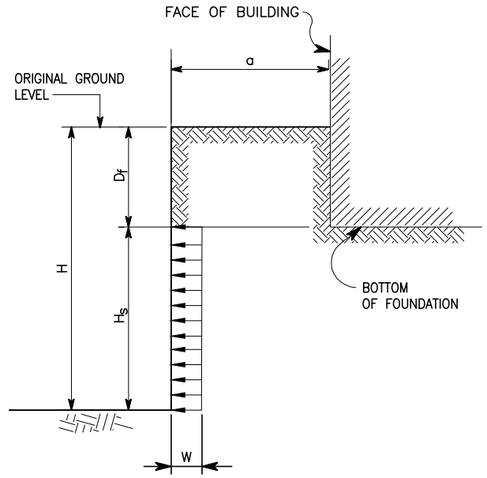


APPARENT PRESSURE DIAGRAM



LATERAL PRESSURE DUE TO SURCHARGE LOADS

BUILDINGS



$$W = 0.4N\left(1 - \frac{a}{1.5H_s}\right) \quad \text{FOR } 0 \le \frac{a}{H_s} \le 1.5$$

$$W = 0 \quad \text{FOR } \frac{a}{H_s} \ge 1.5$$

WHERE:

N = NET BUILDING CONTACT PRESSURE (PSF)
$= q_f - 60D_f$

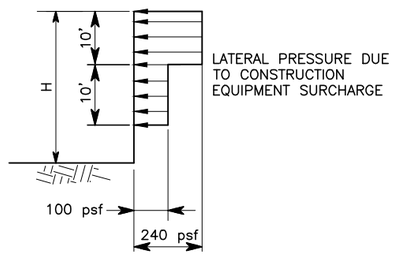
q_f = THE SUM OF ALL THE DEAD LOADS OF THE STRUCTURE AND LIVE LOADS ACTING THEREON (PSF). (LIVE LOAD MAY BE REDUCED IN ACCORDANCE WITH UNIFORM BUILDING CODE, LATEST EDITION).

a, H_s, D_f AS SHOWN (FT).

THIS LATERAL PRESSURE W APPLIES ONLY WHERE BUILDINGS ARE NOT UNDERPINNED.

TRAFFIC & CONSTRUCTION EQUIPMENT SURCHARGE SHOULD BE APPLIED TO HEIGHT D_f IN ALL CASES.

TRAFFIC & CONSTRUCTION SURCHARGE



GENERAL NOTES

1. THE LOADING SHOWN ON THIS DRAWING WAS USED FOR THE DESIGN OF THE TEMPORARY TBM RETRIEVAL SHAFT AND SHALL BE USED FOR ANY OTHER TEMPORARY EARTH RETAINING STRUCTURES AT THE TBM RETRIEVAL SHAFT. THESE LOADS SHALL BE USED IF THE EXCAVATION SUPPORT DESIGN IS ALTERED. IN THE EVENT THAT THE DEPTH TO FRANCISCAN FM. IS SHALLOWER THAN SHOWN ON THIS DRAWING, MODIFICATION OF THE LOADS MAY BE CONSIDERED WITH APPROVAL OF DESIGN MODIFICATION BY ENGINEER.
2. CONTRACTOR SHALL PROVIDE SUFFICIENT TOLERANCES FOR EXCAVATION SUPPORT SYSTEM SUCH THAT OUT–OF–PLUMBNESS OF THE EXCAVATION SUPPORT SYSTEM WILL NOT ENCROACH ON THE REQUIRED EXTERIOR STRUCTURAL WALL THICKNESS.
3. CHANGES IN SOIL DESIGN EARTH PRESSURES AND RESISTANCES SHOWN ARE AT CHANGES IN SOIL TYPES AND ARE SUBJECT TO VERIFICATION AND EFFECT ON DESIGN DURING CONSTRUCTION.
4. SHORING WALL AND BRACING SYSTEMS SHALL BE ANALYZED USING THE AVERAGE OF ACTIVE AND AT–REST SOIL PRESSURE IN ADDITION TO HYDROSTATIC PRESSURE DIAGRAM WITH APPLICABLE SURCHARGES FOR ALL STAGES OF EXCAVATION, BRACING REMOVAL AND BRACING RELOCATION. THE SHORING WALL AND BRACING SYSTEM SHALL ALSO BE ANALYZED USING THE APPARENT PRESSURE DIAGRAM FOR ALL EXCAVATION STAGES WITH TWO OR MORE BRACING LEVELS IN–PLACE AS WELL AS ALL STAGES OF BRACING REMOVAL AND BRACING RELOCATION. NO REDUCTION IN SOIL PRESSURES COMPUTED FOR THE FULL DEPTH EXCAVATION CONDITION SHALL BE TAKEN DURING THE BRACING REMOVAL AND RELOCATION STAGES. THE DESIGN OF VARIOUS COMPONENTS OF THE SHORING SYSTEM SHALL BE BASED ON THE MOST–CRITICAL VALUES OBTAINED FROM THESE ANALYSES.
5. SOIL ARCHING SHALL NOT BE ASSUMED IN THE DESIGN OF SHORING MEMBERS.
6. SURCHARGE LOADS:

   LATERAL PRESSURE FROM SURCHARGE LOADS SHALL BE SUPERIMPOSED ON SOIL AND HYDROSTATIC LATERAL PRESSURES.

   ALL EXCAVATION SHORING SYSTEMS SHALL BE DESIGNED FOR NO LESS THAN THE TRAFFIC AND CONSTRUCTION SURCHARGE SHOWN ON THIS DRAWING.

   THIS LATERAL PRESSURE IS BASED ON AN ASSUMED CONSTRUCTION EQUIPMENT SURCHARGE OF 600 PSF. FOR MORE SEVERE CONSTRUCTION LOADING, SPECIAL ANALYSIS MUST BE MADE.

   SURCHARGE FROM OTHER SOURCES (E.G., EXISTING STRUCTURES) SHALL BE CONSIDERED IN THE DESIGN OF EXCAVATION SHORING SYSTEMS AS APPROPRIATE.

BEARING CAPACITY

STRUCTURE	ALLOWABLE BEARING CAPACITY (PSF)
TBM RETRIEVAL SHAFT	10,000

THICKNESS OF SOIL LAYER & APPARENT PRESSURE MAGNITUDE

STRUCTURE	h1	h2	h3	Pb	j
TBM RETRIEVAL SHAFT	22	32	22	13.5H	H+5

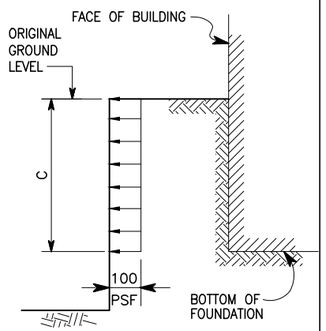
Pb IS THE APPARENT PRESSURE IN UNITS OF PSF PER FOOT OF HORIZONTAL WALL LENGTH SHOWN IN THE APPARENT PRESSURE DIAGRAM ABOVE.

THE GEOLOGIC CONDITIONS AND CONTACTS ARE INTERPRETATIONS BASED ON AVAILABLE INFORMATION. THE ACTUAL CONFIGURATION OF SUBSURFACE GEOLOGIC UNITS AND MATERIALS MAY DIFFER FROM THESE INTERPRETATIONS.

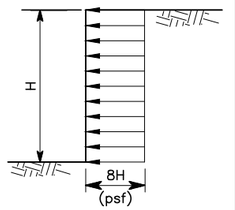
CONTRACTOR SHALL VERIFY VALUES SHOWN AND NOTIFY THE ENGINEER OF ANY DISCREPANCIES DURING ALL STAGES OF CONSTRUCTION.

LATERAL PRESSURE DUE TO EARTHQUAKE

BUILDING



SOIL OR ROCK



LEGEND

H	HEIGHT OF EXCAVATION (ft)
▽	GROUNDWATER TABLE
Pw	WATER PRESSURE (pcf)
psf	POUND PER SQUARE FOOT
pcf	POUND PER CUBIC FOOT
j	VERTICAL DISTANCE (ft) FROM EXISTING GROUND SURFACE TO WATER TABLE INSIDE SHORING WALLS (TEMPORARY CONSTRUCTION CONDITION)

DATE	DESCRIPTION	REV. NO.	BY	CHECKED	APPROVED
05/31/2013	ISSUED FOR BID	0			

PB TELAMON
PB PARSONS BRINCKERHOFF

DESIGNED K. TUNG
DRAWN O. KURNOVSKAYA
CHECKED S. KIM
REVIEWED D. ABRAHAMS
RECOMMENDED M. FOWLER
APPROVED R. EDWARDS
DATE 05/31/2013

CITY AND COUNTY OF SAN FRANCISCO
MUNICIPAL TRANSPORTATION AGENCY
APPROVED
DIRECTOR OF TRANSPORTATION

THIRD STREET LIGHT RAIL PROGRAM
PHASE 2 – CENTRAL SUBWAY
TEMPORARY TBM RETRIEVAL SHAFT

EXCAVATION AND GROUND SUPPORT
SHORING DESIGN CRITERIA
SHEET 2 OF 3

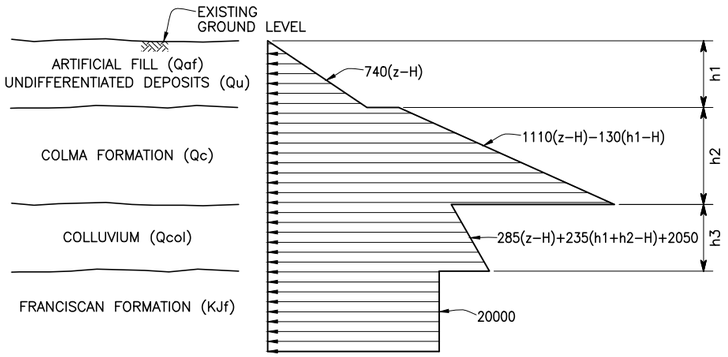
CONTRACT NO. 1278
SFMTA CONTROL NO. CL–24616
DRAWING NO. ES–012
REVISION 0
SHEET NO. 10

BORDER REVISED 03/25/2011

T:\13285 CS DP1\CN 1278\Sheet Files\ES – Excavation and Ground Support\ ES–012.dwg Llorico Tue May 28,2013 – 8:07 pm ES–012

DESIGN PASSIVE RESISTANCE FOR SUPPORT OF EXCAVATION SHORING

TBM RETRIEVAL SHAFT



TOE EMBEDMENT NOTES

1. TOE EMBEDMENT SHALL BE ANALYZED USING THE AVERAGE OF ACTIVE AND AT−REST SOIL PRESSURES IN ADDITION TO HYDROSTATIC PRESSURES WITH APPLICABLE SURCHARGES.
2. CANTILEVER SHORING WALLS SHALL BE ANALYZED IN ACCORDANCE WITH TENG'S SIMPLIFIED METHOD PER THE USS STEEL SHEET PILING DESIGN MANUAL.
3. FOR SHORING SYSTEMS WITH ONE LEVEL OF BRACING, PILE TOE EMBEDMENT SHALL BE COMPUTED BY BALANCING MOMENTS ABOUT THE BRACING ELEVATION.
4. FOR MULTI−LEVEL BRACED SHORING SYSTEMS, PILE TOE EMBEDMENT SHALL BE COMPUTED BY BALANCING MOMENTS RESULTING FROM LOADS ACTING BELOW THE LOWEST BRACING LEVEL.
5. IF SUFFICIENT PASSIVE RESISTANCE IS NOT AVAILABLE BELOW THE BOTTOM OF EXCAVATION TO BALANCE MOMENTS BELOW THE LOWEST BRACING LEVEL, THEN THE SHORING WALL MUST BE DESIGNED AS A CANTILEVER BELOW THE LOWEST BRACING LEVEL. CANTILEVER SHALL BE DESIGNED ASSUMING A MINIMUM WALL PENETRATION OF 5 FT. OR 0.2H, WHICHEVER IS GREATER, WHERE H IS THE DEPTH OF THE EXCAVATION.
6. FOR SINGLE AND MULTI−LEVEL BRACED SYSTEMS, THE MINIMUM PILE TOE PROVIDED SHALL BE 30% GREATER THAN THAT CALCULATED USING THE ABOVE METHODS.
7. FOR CANTILEVERED SYSTEMS, THE MINIMUM PILE TOE PROVIDED SHALL BE 40% GREATER THAN THAT CALCULATED USING THE ABOVE METHODS.
8. MINIMUM TOE EMBEDMENT SHALL BE THE GREATER OF THE PENETRATION FOUND BY THE ANALYSES OUTLINED ABOVE OR REQUIRED FOR GROUNDWATER CUT−OFF.

GENERAL NOTES FOR ANALYSIS AND DESIGN OF TEMPORARY EXCAVATION SUPPORT STRUCTURES

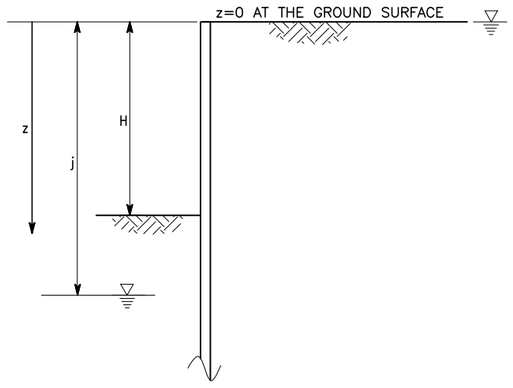
1. DESIGN OF ALL TEMPORARY EXCAVATION SHORING SYSTEMS SHALL CONFORM TO THE "STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION TRENCHING AND SHORING MANUAL" (CTSM), LATEST EDITION, AND THE PROVISIONS OUTLINED BELOW. IN THE EVENT OF CONFLICT, THE PROVISIONS OUTLINED BELOW SHALL CONTROL.
2. DESIGN OF TEMPORARY EXCAVATION SUPPORT STRUCTURES SHALL BE TAKEN FROM THE FOLLOWING REFERENCES:

   STRUCTURAL STEEL − MANUAL OF STEEL CONSTRUCTION AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC), CURRENT EDITION EXCEPT THAT NO OVERSTRESS SHALL BE PERMITTED, U.O.N.

   REINFORCED CONCRETE − BUILDING CODE REQUIREMENTS FOR STRUCTURAL CONCRETE, AMERICAN CONCRETE INSTITUTE, (ACI 318−CURRENT EDITION).

   TIMBER − CALIFORNIA BUILDING CODE (CBC), CURRENT EDITION
3. SUPPORT OF EXCAVATION STRUCTURES SHALL BE ANALYZED FOR ALL CONDITIONS THAT MIGHT OCCUR DURING THE VARIOUS STAGES OF CONSTRUCTION. AMONG OTHERS, THESE CONDITIONS INCLUDE: INSTALLATION, RELOCATION AND REMOVAL OF STRUTS; FLOODING AND DEWATERING OF EXCAVATION; CONCRETING OF EXCAVATION BOTTOM. THE LOADING CONDITIONS ON OPPOSITE SIDES OF THE EXCAVATION MAY NOT BE EQUAL DUE TO DIFFERENTIAL GROUND SURFACE AND/OR SUBGRADE ELEVATIONS, DIFFERENTIAL SURCHARGE LOADING, CURVED EXCAVATION ALIGNMENT, ETC. IN SUCH CASES, BOTH SIDES OF THE EXCAVATION MUST BE DESIGNED FOR AND BE COMPATIBLE WITH THE LARGER LOADING.
4. MEMBERS SUPPORTING VERTICAL LOADS AS WELL AS LATERAL PRESSURE SHALL BE DESIGNED FOR COMBINED AXIAL LOADS AND BENDING MOMENTS.
5. THE LOADS IN WALES AND STRUTS FOR MULTI−LEVEL BRACED SYSTEMS SHALL BE COMPUTED ASSUMING THE WALL IS CONTINUOUS. A FICTITIOUS SUPPORT AT OR BELOW SUBGRADE SHALL NOT BE ASSUMED FOR BRACING LOAD ANALYSIS USING THE AVERAGE OF ACTIVE AND AT−REST SOIL PRESSURES IN ADDITION TO HYDROSTATIC PRESSURE DIAGRAM WITH APPLICABLE SURCHARGES.
6. STRUTS SHALL BE PRELOADED BY JACKING TO THE UNFACTORED LOADS SHOWN ON THE ST DRAWINGS.
7. CONNECTIONS SHALL BE DESIGNED FOR GRADUAL UNLOADING OF STRUTS PRIOR TO THEIR REMOVAL. ALL COMPRESSION MEMBER CONNECTIONS, IN ADDITION TO BEING DESIGNED FOR THEIR COMPRESSIVE LOADS, SHALL BE DESIGNED FOR TENSION AND SHEAR EQUAL TO A MINIMUM OF 10% OF THE COMPRESSIVE LOAD, UNLESS THE ACTUAL TENSION AND SHEAR ARE GREATER.
8. PROVISIONS SHALL BE MADE TO PROTECT STRUTS AGAINST EXCESSIVE DEFORMATIONS AND STRESS VARIATIONS INDUCED BY TEMPERATURE FLUCTUATIONS.
9. AVAILABLE GEOTECHNICAL DATA SHALL BE USED IN CONJUNCTION WITH INDICATED CRITERIA IN THE SELECTION, ANALYSIS AND DESIGN OF EARTH SUPPORT SYSTEMS.
10. THE CONTRACTOR SHALL MAKE ITS OWN ASSESSMENT OF EXISTING CONDITIONS, INCLUDING ADJACENT PROPERTY, WHETHER PRIVATE OR PUBLIC, AND OF THE POSSIBLE EFFECTS OF ITS PROPOSED TEMPORARY WORK, CONSTRUCTION METHODS, AND SEQUENCING, AND SHALL SELECT AND DESIGN SUCH SUPPORT SYSTEMS, CONSTRUCTION METHODS AND DETAILS AS WILL ASSURE SAFETY TO THE PUBLIC, ADJACENT PROPERTY AND OF THE COMPLETED WORK.
11. IF FRANCISCAN BEDROCK (KJf) IS ENCOUNTERED AT DEPTHS LESS THAN THAT SHOWN (h1+h2+h3), ALTERNATE TOE DEPTH MAY BE CONSIDERED. SECANT PILE MUST SOCKET INTO KJf ROCK A MINIMUM OF 5 FEET. FIELD INSPECTION BY ENGINEER AND REVIEW OF DRILLING AND PENETRATION RECORDS BY ENGINEER ARE REQUIRED FOR ACCEPTANCE OF ALTERNATE PILE DEPTH.

TYPICAL SECTION



THICKNESSES OF SOIL LAYERS

STRUCTURE	h1	h2	h3
TBM RETRIEVAL SHAFT	22	32	22

NOTES:

VALUES OF h1, h2, AND h3 INDICATE THE INITIAL THICKNESS OF SOIL LAYERS PRIOR TO EXCAVATION. THESE VALUES MAY VARY DURING THE EXCAVATION, AND FOR FORMULAE THE SOIL PRESSURES SHOWN ARE ALSO VALID WHEN A LAYER IS FULLY EXCAVATED.

z, h1, h2, AND h3 IN UNITS OF FEET.

(z−H) ≥ 0
(h1−H) ≥ 0
(h1+h2−H) ≥ 0

} EXPRESSIONS USED IN THE EQUATIONS ABOVE MUST BE POSITIVE. SET TO ZERO IF EXPRESSION YIELDS A NEGATIVE RESULT.

THE PASSIVE RESISTANCE IS BASED ON AN ASSUMED WATER TABLE INSIDE THE SHORED EXCAVATION, WHICH IS DEWATERED TO LEVEL j AS SHOWN ON ES−012. IF WATER TABLE IS DIFFERENT FROM THE ASSUMED VALUES, THE PASSIVE RESISTANCE WILL NEED TO BE RE−DETERMINED.

DATE	DESCRIPTION	REV. NO.	BY	CHECKED	APPROVED
05/31/2013	ISSUED FOR BID	0			

BORDER REVISED 03/25/2011

PB TELAMON
PB PARSONS BRINCKERHOFF

DESIGNED K. TUNG
DRAWN O. KURNOVSKAYA
CHECKED S. KIM
REVIEWED D. ABRAHAMS
RECOMMENDED M. FOWLER
APPROVED R. EDWARDS
DATE 05/31/2013

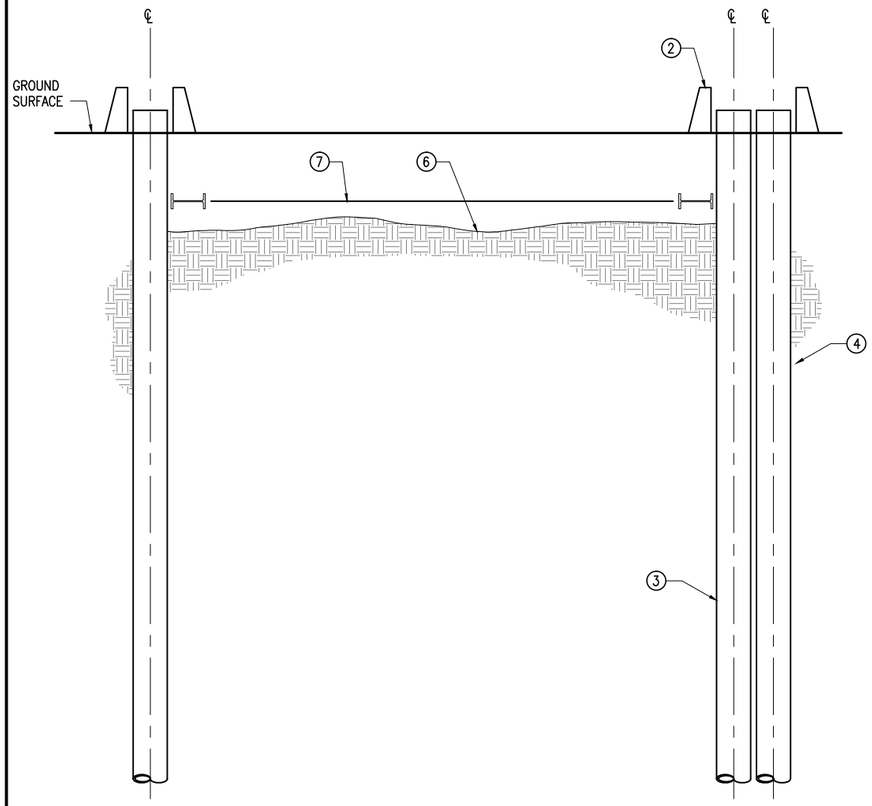
CITY AND COUNTY OF SAN FRANCISCO
MUNICIPAL TRANSPORTATION AGENCY
APPROVED
DIRECTOR OF TRANSPORTATION

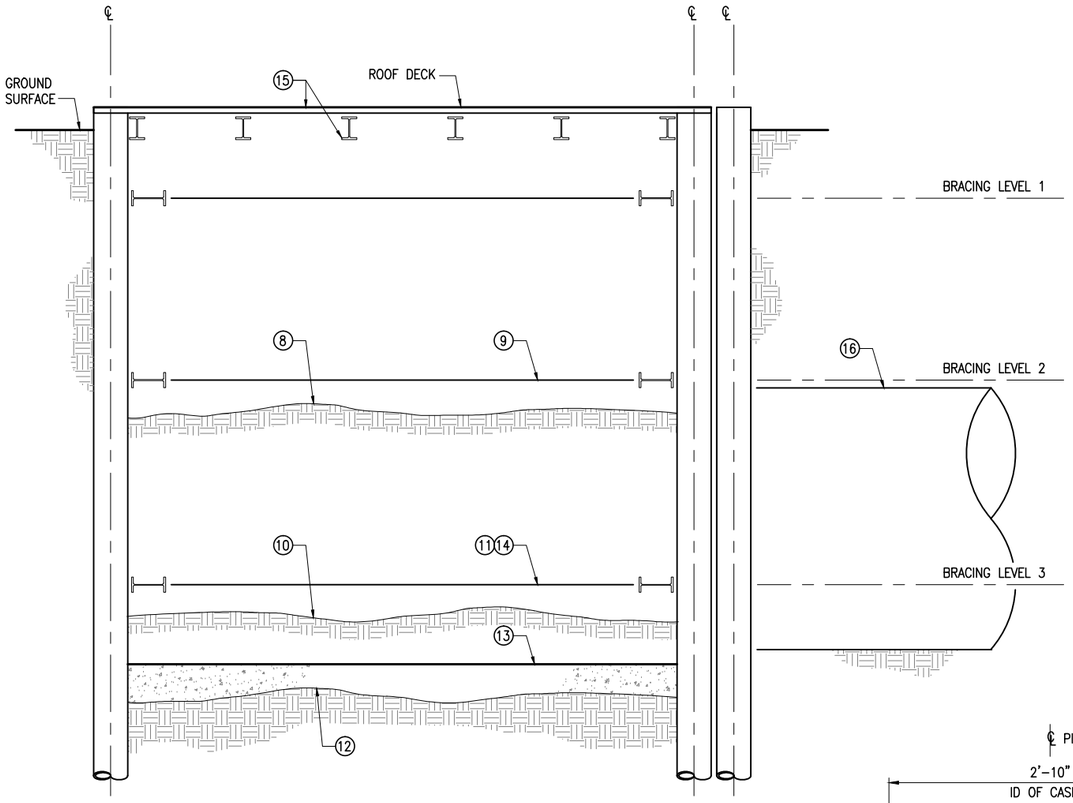
THIRD STREET LIGHT RAIL PROGRAM
PHASE 2 − CENTRAL SUBWAY
TEMPORARY TBM RETRIEVAL SHAFT

EXCAVATION AND GROUND SUPPORT
SHORING DESIGN CRITERIA
SHEET 3 OF 3

CONTRACT NO. 1278
SFMTA CONTROL NO. CL−24617
DRAWING NO. ES−013
REVISION 0
SHEET NO. 11

T:\13285 CS DP1\CN 1278\Sheet Files\ES − Excavation and Ground Support\ ES−013.dwg Llorico Tue May 28,2013 − 8:08 pm ES−013





CONSTRUCTION SEQUENCE

(NTS)

STAGE 1

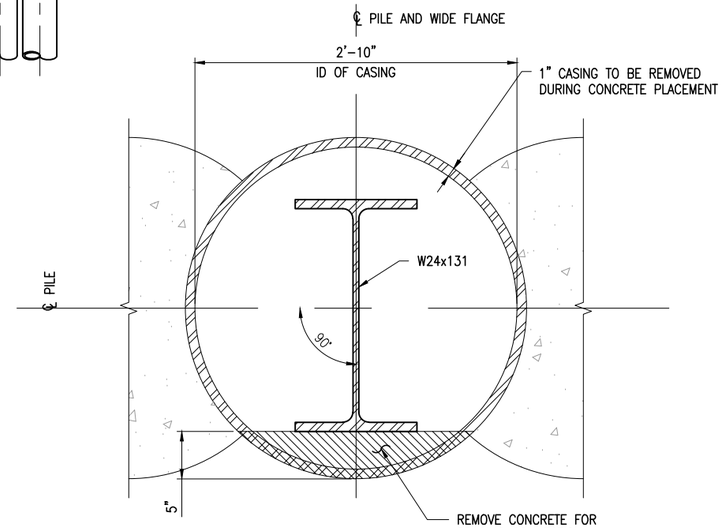
1. INSTALL COMPENSATION GROUTING PIPES, AND INSTRUMENTATION.
2. CONSTRUCT GUIDEWALLS.
3. INSTALL PILES, REPEAT (2) AND (3) UNTIL SIDEWALK, BACKWALL & HEADWALL PILE CONSTRUCTION IS COMPLETE.
4. INSTALL TBM BREAKTHROUGH PILES.
5. START DEWATERING.
6. EXCAVATE TO BELOW BRACING LEVEL 1, EXPOSE PILE STEEL.
7. INSTALL BRACING LEVEL 1. JACK STRUTS IN PLACE.

STAGE 2

8. EXCAVATE TO BELOW BRACING LEVEL 2.
9. INSTALL BRACING LEVEL 2, JACK STRUT.
10. EXCAVATE TO BELOW BRACING LEVEL 3.
11. INSTALL BRACING LEVEL 3, JACK STRUTS.
12. EXCAVATE TO BOTTOM.
13. POUR BASE SLAB.
14. REMOVE BRACING LEVEL 3.
15. INSTALL ROOF DECK AND RESTORE SITE.
16. CN 1252 CONTRACTOR BORES THROUGH AND EXTRACTS TBM. (N.I.C.)

NOTES:

1. FOR STRUCTURAL FRAMING SIZES AND DETAILS, SEE ST-DRAWINGS.



PILE DETAIL

SCALE: 1 1/2"=1'-0"

6" 0 6" 12" 18"

SCALE: 1-1/2"= 1'-0"

DATE	DESCRIPTION	REV. NO.	BY	CHECKED	APPROVED
05/31/2013	ISSUED FOR BID	0			

BORDER REVISED 03/25/2011

PB TELAMON

PB PARSONS BRINCKERHOFF

DESIGNED D. ABRAHAMS
DRAWN E. LLORICO
CHECKED C. BARRATT
REVIEWED A. READ
RECOMMENDED M. FOWLER
APPROVED R. EDWARDS
DATE 05/31/2013

CITY AND COUNTY OF SAN FRANCISCO
MUNICIPAL TRANSPORTATION AGENCY

APPROVED

DIRECTOR OF TRANSPORTATION

THIRD STREET LIGHT RAIL PROGRAM
PHASE 2 – CENTRAL SUBWAY
TEMPORARY TBM RETRIEVAL SHAFT

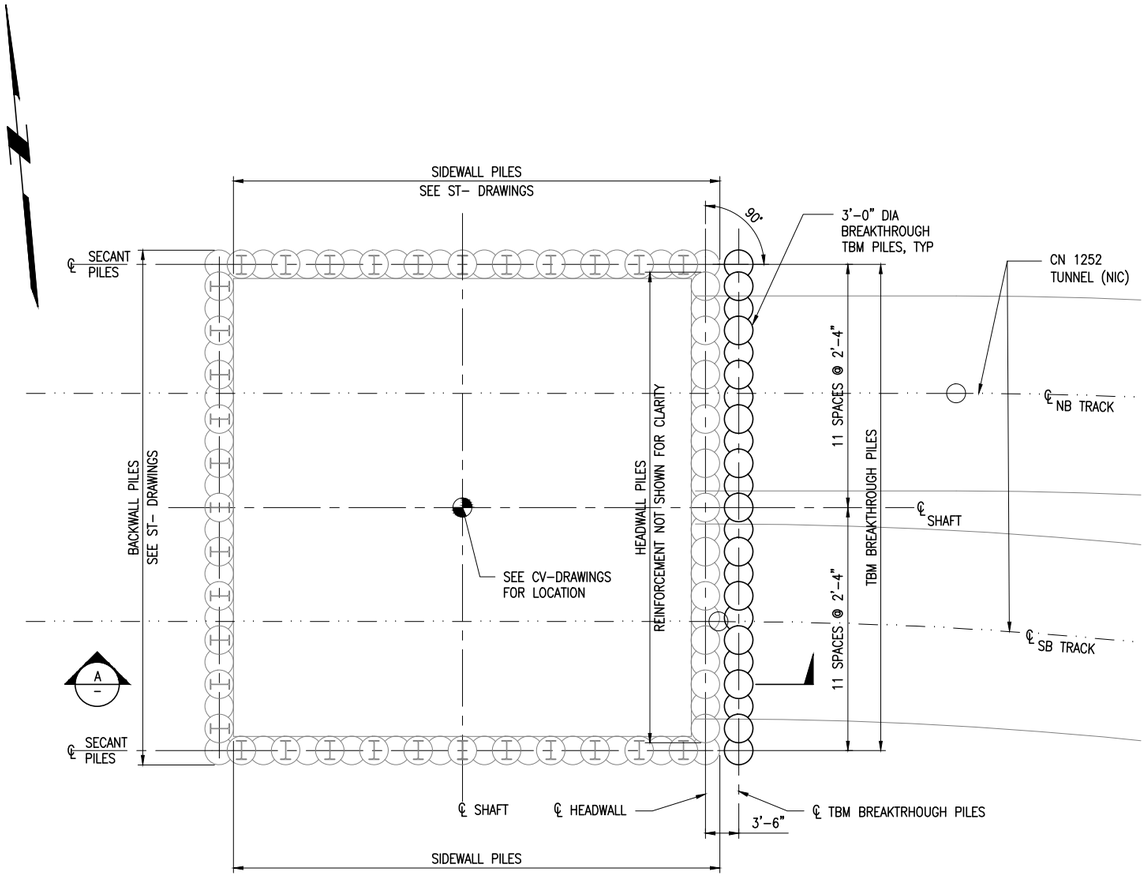
EXCAVATION AND GROUND SUPPORT
ASSUMED CONSTRUCTION SEQUENCE

CONTRACT NO. 1278
SFMTA CONTROL NO. CL-24618
DRAWING NO. ES-101
REVISION 0
SHEET NO. 12

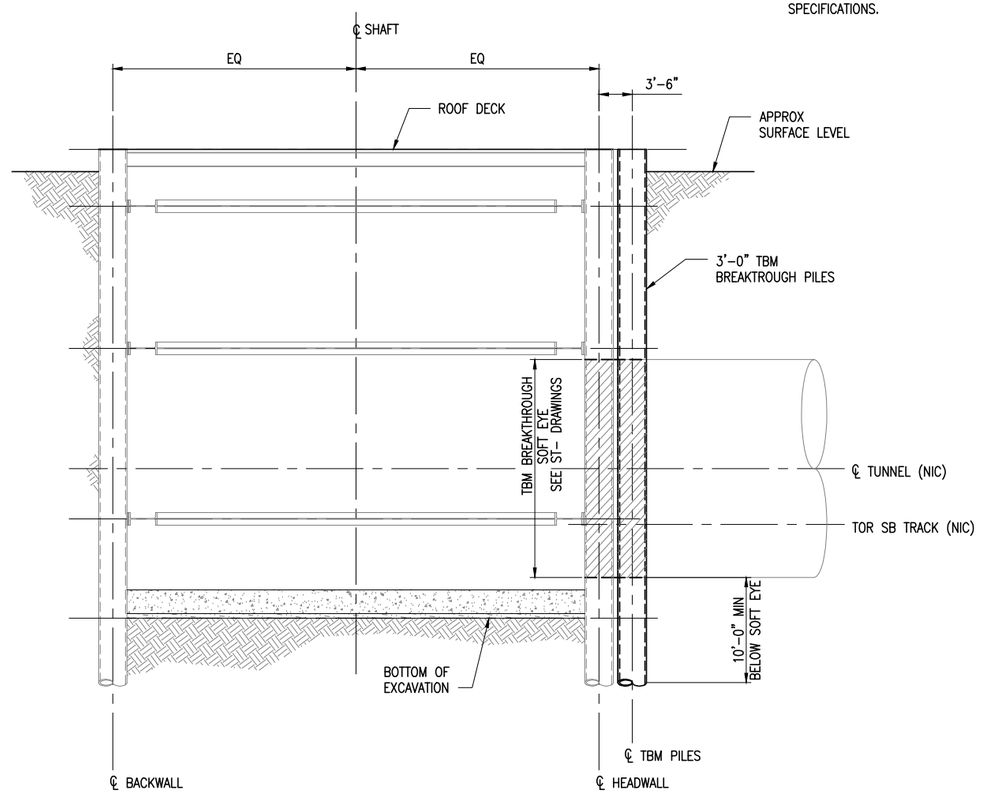
T:\13285 CS DP1\CN 1278\Sheet Files\ES - Excavation and Ground Support\ ES-101.dwg Llorico Tue May 28,2013 - 8:09 pm ES-101

NOTES:

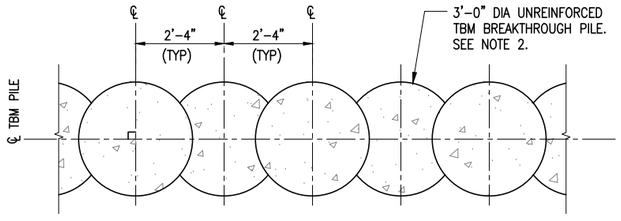
1. FOR GENERAL STRUCTURAL NOTES, SEE DRAWING ST-001.
2. UNREINFORCED SIDEWALK PILES AND TBM BREAKTHROUGH PILES SHALL BE 1500 PSI CONCRETE. SEE ST-DRAWINGS AND SPECIFICATIONS.



PLAN



A
ES-201
SECTION



DETAIL

4' 0 4' 8' 12' 16' 20'

SCALE: 1/8"=1'-0"

DATE	DESCRIPTION	REV. NO.	BY	CHECKED	APPROVED
05/31/2013	ISSUED FOR BID	0			

BORDER REVISED 03/25/2011

PB TELAMON
PB PARSONS BRINCKERHOFF

DESIGNED D. ABRAHAMS
DRAWN O. KURNOVSKAYA
CHECKED C. BARRATT
REVIEWED A. READ
RECOMMENDED M. FOWLER
APPROVED R. EDWARDS
DATE 05/31/2013

CITY AND COUNTY OF SAN FRANCISCO
MUNICIPAL TRANSPORTATION AGENCY

APPROVED

DIRECTOR OF TRANSPORTATION

THIRD STREET LIGHT RAIL PROGRAM
PHASE 2 – CENTRAL SUBWAY
TEMPORARY TBM RETRIEVAL SHAFT

EXCAVATION AND GROUND SUPPORT
TBM BREAKTHROUGH PILES

CONTRACT NO. 1278
SFMTA CONTROL NO. CL-24619
DRAWING NO. ES-201
REVISION 0
SHEET NO. 13

T:\13285 CS DP1\CN 1278\Sheet Files\ES - Excavation and Ground Support\ ES-201.dwg Llorico Tue May 28,2013 - 8:09 pm ES-201

GENERAL NOTES

CODES AND STANDARDS
AMERICAN CONCRETE INSTITUTE, ACI 318 BUILDING CODE REQUIREMENTS FOR REINFORCED CONCRETE

CALIFORNIA BUILDING CODE, CBC TITLE 24

AMERICAN INSTITUTE OF STEEL (AISC) SPECIFICATION FOR STRUCTURAL STEEL BUILDINGS

AMERICAN WELDING SOCIETY (AWS) D1.1 STRUCTURAL WELDING CODE – STEEL

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

AMERICAN SOCIETY OF CIVIL ENGINEERS, (ASCE) MINIMUM DESIGN LOADS FOR BUILDINGS AND OTHER STRUCTURES

AMERICAN ASSOCATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS (AASHTO) LRFD BRIDGE DESIGN SPECIFICATIONS

REINFORCED CONCRETE

PRIMARY PILE CAST–IN–PLACE CONCRETE:	f'c = 1,500 PSI
SECONDARY HEADWALL PILE CAST–IN–PLACE CONCRETE:	f'c = 5,000 PSI
SECONDARY SIDEWALL AND BACKWALL PILES	f'c = 1,500 PSI
MUD SLAB:	f'c = 2,000 PSI
BASE SLAB:	f'c = 5,000 PSI
REINFORCING STEEL (ASTM A706):	fy = 60,000 PSI
NON–SHRINK GROUT (ASTM 1107)	f'c = 6,000 PSI
TBM BREAKTHROUGH PILES	f'c = 1500 PSI
GFRP (F70 & E = 5,700 KSI)	fy = 70000 PSI

GENERAL
CONTRACT 1278, TEMPORARY TBM RETRIEVAL SHAFT, IS TO BE CONSTRUCTED BELOW GROUND SURFACE AT 1731 POWELL STREET (BLOCK 0101, LOT 004) FOR THE FUTURE EXTRACTION OF THE CONTRACT 1252 TUNNEL BORING MACHINE AS PART OF PHASE 2 OF THE THIRD STREET LIGHT RAIL PROGRAM. THE SHAFT IS APPROXIMATELY 50 FEET LONG, 50 FEET WIDE, AND 50 FEET DEEP.

THE CONSTRUCTION METHOD ASSUMED BY THE CONTRACT DRAWINGS AND SPECIFICATIONS IS VERTICAL SECANT PILE CONSTRUCTION AS GROUND SUPPORT REINFORCED WITH REINFORCING STEEL OR WIDE FLANGE SECTIONS WITH STEEL WALE AND DIAGONAL STRUTS FOR CROSS LOT BRACING. ONCE THE EXCAVATION HAS BEEN COMPLETED AND THE BASE SLAB HAS REACHED THE REQUIRED STRENGTH, THE THIRD LEVEL OF BRACING WILL BE REMOVED AND THE ROOF DECK SYSTEM WILL BE INSTALLED. THE ASSUMED CONSTRUCTION SEQUENCE IS SHOWN ON THE EXCAVATION AND GROUND SUPPORT (ES) DRAWINGS.

PRIOR TO INSTALLATION OF THE DRILLED SHAFTS, A BUILDING AND UTILITY MONITORING SYSTEM WILL BE INSTALLED TO MONITOR THE MOVEMENT OF THE SURROUNDING SOIL, STRUCTURES AND UTILITIES RESULTING FROM THE SHAFT CONSTRUCTION. IN ADDITION, COMPENSATION GROUTING TUBE A MACHETTES WILL BE DRILLED FROM GROUND SURFACE TO MITIGATE EXCESSIVE MOVEMENT DUE TO SHAFT CONSTRUCTION. GROUT WILL BE PUMPED INTO THE GROUND IF MOVEMENTS OBSERVED BY THE INSTRUMENTATION EXCEED A SPECIFIED THRESHOLD. THE INSTRUMENTATION INSTALLATION SCHEDULE AND LIMITS OF COMPENSATION GROUTING ARE SHOWN ON THE BUILDING PROTECTION (BP) DRAWINGS. GROUTING TUBES AND INSTRUMENTATION SHALL BE CLEANED AND HANDED OVER TO THE SFMTA UPON COMPLETION OF CONSTRUCTION, INCLUDING BUT NOT LIMITED TO GROUTING RECORDS AND INSTRUMENTATION DATA.

THE BRACING SYSTEM SHALL BE CONSTRUCTED OF STEEL WIDE FLANGE WALERS, PIPE STRUTS, PLATES AND BEAMS TO SUPPORT AND BRACE THE GROUND SUPPORT SYSTEM. DURING EXCAVATION THE STRUTS WILL BE JACKED IN PLACE PER THE LOADS DESCRIBED IN THE DRAWINGS. UPON COMPLETION OF THE EXCAVATION, THE BASE SLAB CONNECTIONS SHALL BE EITHER WELDED TO THE WIDE FLANGE PILES OR DOWELED INTO THE REINFORCED CONCRETE HEADWALLS, AND THE REINFORCED CONCRETE BASE SLAB SHALL BE PLACED. THE PILES, FRAMING AND BASE SLAB DETAILS ARE SHOWN ON THE STRUCTURAL (ST) DRAWINGS.

THE CONTRACTOR SHALL CAREFULLY REVIEW THE DRAWINGS, TO IDENTIFY THE EXTENT OF THE SCOPE OF WORK, VISIT THE SITE TO RELATE THE SCOPE OF WORK TO THE EXISTING CONDITIONS AND DETERMINE THE EXTENT TO WHICH THOSE CONDITIONS AND PHYSICAL SURROUNDINGS WILL IMPACT THE WORK. LOT BOUNDARIES ARE APPROXIMATE AND DO NOT REFLECT THE ACTUAL OR LEGAL POSITION OF ANY EXISTING STRUCTURE OR FIXTURE SHOWN. BUILDING LINES, WHERE SHOWN, DO NOT SHOW ALL BUILDING INFORMATION SUCH AS CANOPIES, OVERHANG PROJECTIONS OR ACCESS.

THE CONTRACTOR SHALL. SUBMIT FINAL AS–BUILT OR RECORD DRAWINGS PER SPECIFICATIONS, INCLUDING BUT NOT LIMITED TO GUIDEWALLS AND PILES

DEMOLISH GUIDEWALLS AS REQUIRED BY THE CONTRACT DOCUMENTS.

THE PILES SHALL BE CONSTRUCTED USING A TEMPORARY CASING FOR THE FULL DEPTH OF THE PILE. THE REINFORCED GUIDEWALL WILL BE CONSTRUCTED PRIOR TO THE STARTING OF PILING. IT WILL BE ACCURATELY SET OUT BY A SURVEYOR AND RECHECKED WHEN BUILT. THE FIRST CASING TUBE SECTION SHALL BE EQUIPPED WITH A CASING SHOE (TOGETHER WITH A RING OF CUTTING TEETH) FOR PENETRATION OF FIRM SOILS, CONCRETE AND OTHER OBSTACLES.

STRUTS SHALL BE PRELOADED BY JACKING TO LOADS SHOWN ON THE DRAWINGS.

CONNECTIONS SHALL BE DESIGNED FOR GRADUAL UNLOADING OF STRUTS PRIOR TO THEIR REMOVAL. ALL COMPRESSION CONNECTIONS, IN ADDITION TO BEING DESIGNED FOR THEIR COMPRESSIVE LOADS, SHALL BE DESIGNED FOR TENSION AND SHEAR EQUAL TO A MINIMUM OF 10% OF THE COMPRESSIVE LOAD, UNLESS ACTUAL TENSION AND SHEAR ARE GREATER.

DESIGN BASIS

ROOF LIVE LOAD:	30 PSF OF 300 LB CONCENTRATED LOAD
HYDROSTATIC PRESSURE: (WATER TABLE AT SURFACE LEVEL)	SEE SHORING CRITERIA ES–DRAWINGS
SOIL:	
CONSTRUCTION:	
EQ:	

CONSTRUCTION AREA
WORK AREA SHALL BE FENCED AND BARRICADED FROM PUBLIC ACCESS. CONSTRUCTION AREA TRAFFIC RESTRICTIONS SHALL CONFORM TO SPECIFICATION. SEE DIV. 1 SPECIFICATIONS.

STRUCTURAL STEEL FRAMING

IN ADDITION TO THE CONTRACT DRAWINGS AND SPECIFICATIONS, THE FOLLOWING REQUIREMENTS RELATE TO THE DESIGN, FABRICATION AND ERECTION OF STRUCTURAL STEEL FOR THIS CONTRACT:

1. THE BASIC CODE FOR DESIGN AND FABRICATION OF STRUCTURAL STEEL IS THE "CODE OF STANDARD PRACTICE FOR STEEL BUILDINGS AND BRIDGES", AMERICAN INSTITUTE OF STEEL CONSTRUCTION, APRIL 14, 2010. UNDER SECTION 3. "DESIGN DRAWINGS AND SPECIFICATION, ARTICLE 3.1.2.", THE OPTION SPECIFIED FOR THIS CONTRACT IS: (OPTION 3) IN THE STRUCTURAL DESIGN DRAWINGS OR SPECIFICATIONS, THE CONNECTIONS SHALL BE DESIGNATED TO BE DESIGNED BY A LICENSED PROFESSIONAL ENGINEER WORKING FOR THE CONTRACTOR'S FABRICATOR. IN ADDITION, THE PROFESSIONAL ENGINEER SHALL BE LICENSED IN THE STATE OF CALIFORNIA.

   THE DESIGN CRITERIA FOR CONNECTION LOAD TABLES PROVIDED BY THE CONTRACT DRAWINGS IS LOAD AND RESISTANCE FACTOR DESIGN (LRFD). LOAD TABLES ARE PROVIDED FOR SHEAR CONNECTIONS, MOMENT CONNECTIONS, AND BRACING CONNECTIONS. THE CONNECTIONS SHOWN ON THE DRAWINGS THAT HAVE BEEN PROVIDED WITH LOAD TABLES SHALL BE CONSIDERED SCHEMATIC FOR ONE OF THE ABOVE THREE TYPICAL CONNECTION TYPES.

   SHOP AND ERECTION DRAWINGS SHALL BE ACCOMPANIED BY FINAL SUBSTANTIATING CONNECTION INFORMATION IN THE FORM OF CALCULATIONS FOR ALL OPTION 3 CONNECTIONS AND A LETTER STATING THAT THE SHOP AND ERECTION DRAWINGS INCORPORATE OPTION 3 DESIGN REQUIREMENTS. THE CONNECTION DESIGN INFORMATION ON THE SHOP AND ERECTIONS DRAWINGS SHALL BE SIGNED AND SEALED BY THE LICENSED PROFESSIONAL ENGINEER IN RESPONSIBLE CHARGE OF THE CONNECTION DESIGNS. PROVIDE CROSS REFERENCING INFORMATION ON THE DRAWINGS TO DESIGN INFORMATION FOR THE PURPOSE OF SFMTA REVIEW.

2. FIELD CONNECTIONS SHALL BE BOLTED OR WELDED USING FILLET ONLY WELDS UNLESS OTHERWISE ALLOWED BY THE SFMTA'S ENGINEER OF RECORD;

3. MOMENT CONNECTIONS BETWEEN TWO END TO END BEAMS OR COLUMNS WILL BE FULL STRENGTH MOMENT AND SHEAR CONNECTIONS DESIGNED FOR THE STRENGTH OF THE SMALLER SECTION;

4. | | |
|---|---|
| WIDE FLANGE SHAPES | ASTM A992, GRADE 50 AS INDICATED; |
| PLATE | ASTM A572, GRADE 50, WHERE INDICATED, OR ASTM A36, TYPICAL UNLESS NOTED OTHERWISE; |
| PIPE STRUTS AND PILES | API 5L GRADE X50 AS INDICATED OR EQUIVALENT; |
| HIGH STRENGTH BOLTS | ASTM A325 OR ASTM A490; |
| ANCHOR BOLTS | ASTM F1554, GRADE 36 UNLESS NOTED OTHERWISE |
| ANCHORS | MIN. TENSILE STRENGTH=60 KSI; |
| STEEL DECKING | ASTM A653, SS GRADE 40; |
| THREADED RODS | ASTM A307, GRADE A; |
| FORGED HARDWARE | AISI C–1035, CARBON STEEL |
| ANGLES | ASTM A36 |

STEEL WORK SHALL CONFORM TO ALL REQUIREMENTS OF AISC, CODE OF STANDARD PRACTICE FOR STEEL BUILDINGS AND BRIDGES, LATEST EDITION.

PILES

PILES SHALL BE INSTALLED PER SPECIFICATIONS AND ACI 336.1.

THERE ARE THREE SECANT PILE TYPES:
1. HEADWALL PILES – SECANT PILES AT TBM BREAKTHROUGH WALL. SECONDARY PILES ARE REINFORCED WITH ASTM A706 STEEL AND GFRP. SEE DRAWING NOS. ST–201 AND ST–202.
2. SIDEWALL AND BACKWALL PILES – SECANT PILES WITH SECONDARY PILE REINFORCED WITH ASTM A992 WIDE FLANGE STEEL. SEE ST–203 AND ST–204.
3. TBM BREAKTHROUGH PILES – UNREINFORCED SECANT PILES IN FRONT OF HEADWALL PILES. SEE ES–DRAWINGS.

PAGODA PALACE DEMOLITION

CN 1277, PRIOR TO CN 1278 WILL BE THE DEMOLITION OF THE PAGODA PALACE BUILDING AT 1731–1741 POWELL ST. IN SAN FRANCISCO, CA. DEMOLITION INCLUDES REMOVAL OF ALL ABOVE GRADE WALLS AND ROOF, INTERIOR FINISHES, MECHANICAL, ELECTRICAL AND PLUMBING. SEE REFERENCE DOCUMENTS.

LEGEND

&	AND
∠	ANGLE SECTION
@	AT
#	BAR SIZE
C OR MC	CHANNEL SECTION
⊕	CONTROL POINT
ø	DIAMETER
=	EQUAL TO
>	GREATER THAN
≥	GREATER THAN OR EQUAL TO
<	LESS THAN
≤	LESS THAN OR EQUAL TO
%	PERCENTAGE
	WORK POINT
W	WIDE FLANGE SECTION
	GROUND WATER TABLE

CONCRETE IN SECTION

GROUND LINE

STEEL IN SECTION

ABBREVIATIONS

ADD'L	ADDITIONAL	LB.	POUND
		LIN.	LINEAR
BOT.	BOTTOM	LF	LINEAR FEET
C/L	CENTERLINE	MAX.	MAXIMUM
C.I.P.	CAST IN PLACE	MIN.	MINIMUM
CLR.	CLEAR		
CONC.	CONCRETE	NIC	NOT IN CONTRACT
CONN.	CONNECTION		
CONT.	CONTINUOUS	PCF	POUNDS PER CUBIC FOOT
CJ	CONSTRUCTION JOINT	PL	PLATE
		PROJ.	PROJECT
DIAG.	DIAGONAL	PSF	POUNDS PER SQUARE FOOT
Ø	DIAMETER	PSI	POUNDS PER SQUARE INCH
DIA.	DIAMETER		
DN	DOWN	REINF.	REINFORCING
DWG	DRAWING		
		SECT	SECTION
EA	EACH	SPA.	SPACES
EL.	ELEVATION	SPECS.	SPECIFICATIONS
EQ	EQUAL	SIM.	SIMILAR
		STA.	STATION
FIN	FINISH	STD	STANDARD
FT	FEET		
FTG	FOOTING	T&B	TOP AND BOTTOM
		T.O.C.	TOP OF CONCRETE
GFRP	GLASS FIBER REINFORCED POLYMER	TYP	TYPICAL
HORIZ.	HORIZONTAL	UON	UNLESS OTHERWISE NOTED
IN.	INCH	VERT.	VERTICAL
		VIF	VERIFY IN FIELD

DATE	DESCRIPTION	REV. NO.	BY	CHECKED	APPROVED
05/31/2013	ISSUED FOR BID	0			

PB TELAMON
PB PARSONS BRINCKERHOFF

DESIGNED D. ABRAHAMS
DRAWN E. LLORICO
CHECKED D. YAVORSKY
REVIEWED A. READ
RECOMMENDED M. FOWLER
APPROVED R. EDWARDS
DATE 05/31/2013

CITY AND COUNTY OF SAN FRANCISCO
MUNICIPAL TRANSPORTATION AGENCY
APPROVED
DIRECTOR OF TRANSPORTATION

THIRD STREET LIGHT RAIL PROGRAM
PHASE 2 – CENTRAL SUBWAY
TEMPORARY TBM RETRIEVAL SHAFT

STRUCTURAL
GENERAL NOTES

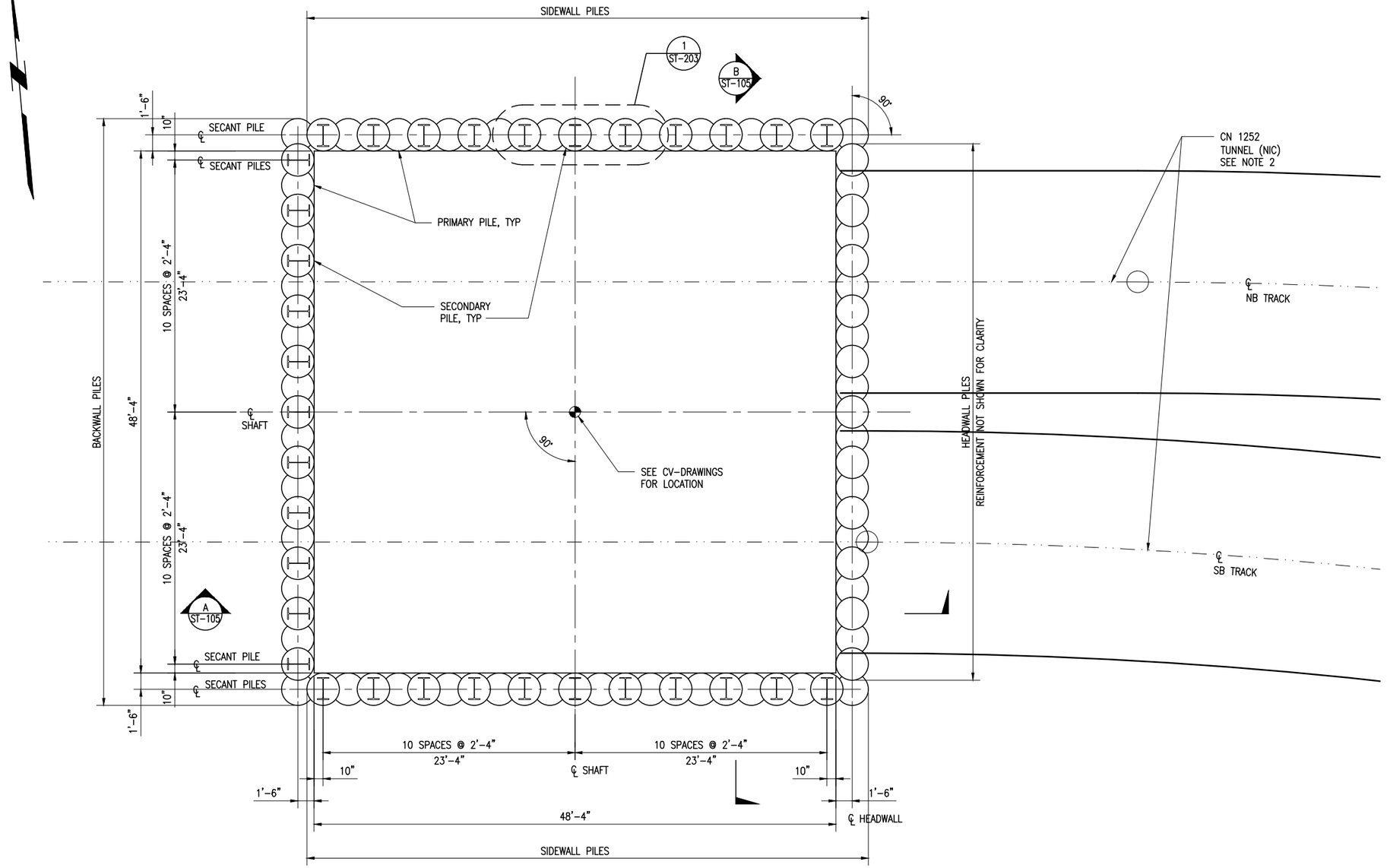
CONTRACT NO. 1278
SFMTA CONTROL NO. CL–24620
DRAWING NO. ST–001
REVISION 0
SHEET NO. 14

BORDER REVISED 03/25/2011

T:\13285 CS DP1\CN 1278\Sheet Files\ST – Structural\ ST–001.dwg Llorico Tue May 28,2013 – 8:14 pm ST–001

NOTES:

1. FOR GENERAL STRUCTURAL NOTES SEE DRAWING ST–001.
2. FOR TUNNEL DETAILS SEE REFERENCE DRAWINGS.



GENERAL ARRANGEMENT

(TBM PILES NOT SHOWN FOR CLARITY)

4' 2' 0 4' 8' 12'

SCALE: 3/16"=1'–0"

DATE	DESCRIPTION	REV. NO.	BY	CHECKED	APPROVED
05/31/2013	ISSUED FOR BID	0			

BORDER REVISED 03/25/2011

PB TELAMON

PB PARSONS BRINCKERHOFF

DESIGNED	D. ABRAHAMS
DRAWN	O. KURNOVSKAYA
CHECKED	C. BARRATT
REVIEWED	A. READ
RECOMMENDED	M. FOWLER
APPROVED	R. EDWARDS
DATE	05/31/2013

CITY AND COUNTY OF SAN FRANCISCO
MUNICIPAL TRANSPORTATION AGENCY

APPROVED

DIRECTOR OF TRANSPORTATION

THIRD STREET LIGHT RAIL PROGRAM
PHASE 2 – CENTRAL SUBWAY
TEMPORARY TBM RETRIEVAL SHAFT

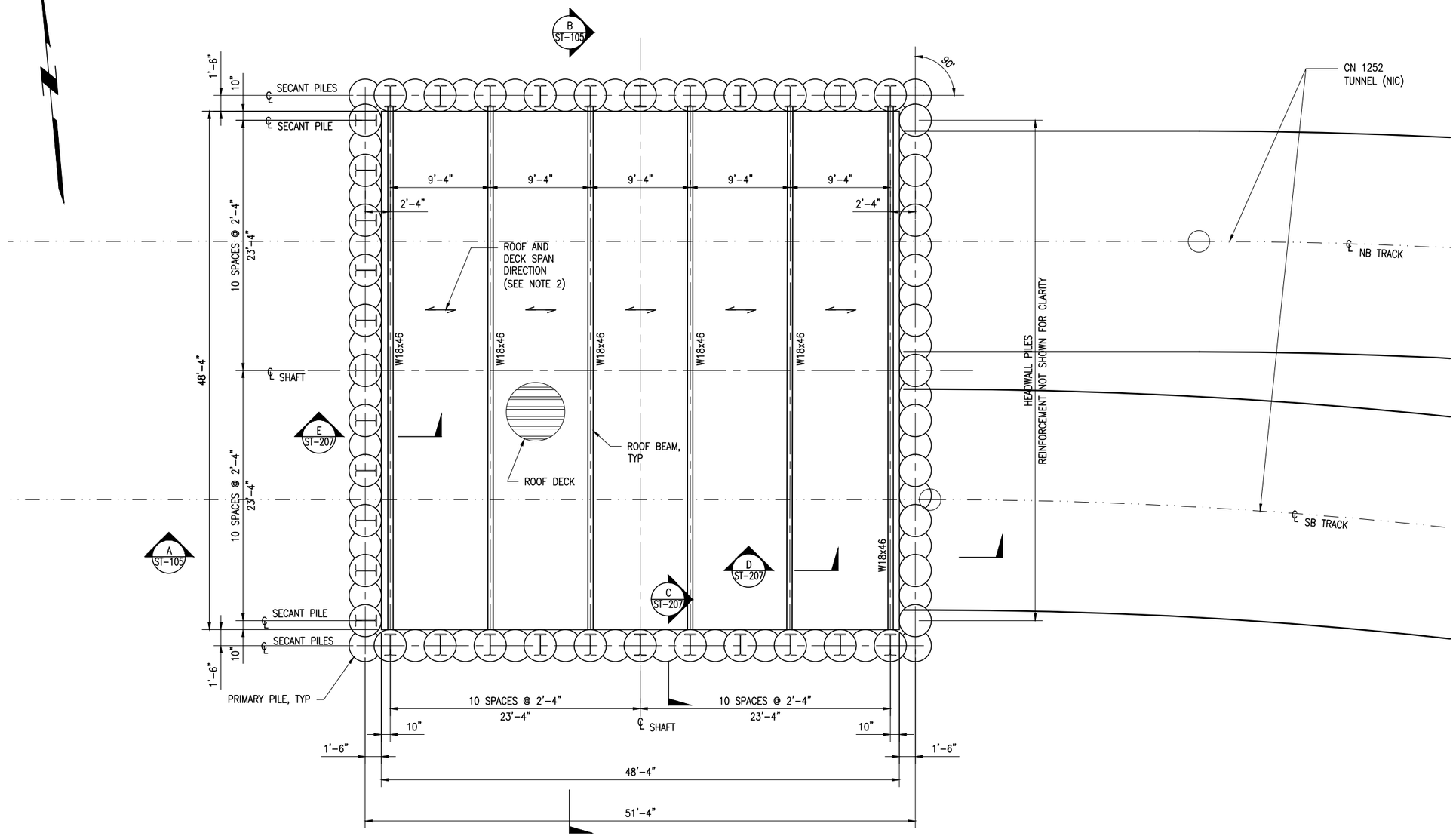
STRUCTURAL
GENERAL PLAN

CONTRACT NO.	1278
SFMTA CONTROL NO.	CL–24621
DRAWING NO.	ST–101
REVISION	0
SHEET NO.	15

T:\13285 CS DP1\CN 1278\Sheet Files\ST – Structural\ ST–101.dwg Llorico Tue May 28,2013 – 8:15 pm ST–101

NOTES:

1. FOR GENERAL STRUCTURAL NOTES SEE DRAWING ST-001.
2. ROOF DECK
   A. PROFILE: 3" DEEP RIB DECK
   B. DECK TYPE: 22 GAGE
   C. DECK FINISH: G90 GALVANIZED



ROOF PLAN

(TBM PILES OMITTED FOR CLARITY)

4' 2' 0 4' 8' 12'

SCALE: 3/16"=1'-0"

DATE	DESCRIPTION	REV. NO.	BY	CHECKED	APPROVED
05/31/2013	ISSUED FOR BID	0			

BORDER REVISED 03/25/2011

PB TELAMON

PB PARSONS BRINCKERHOFF

DESIGNED	D. ABRAHAMS
DRAWN	O. KURNOVSKAYA
CHECKED	C. BARRATT
REVIEWED	A. READ
RECOMMENDED	M. FOWLER
APPROVED	R. EDWARDS
DATE	05/31/2013

CITY AND COUNTY OF SAN FRANCISCO
MUNICIPAL TRANSPORTATION AGENCY

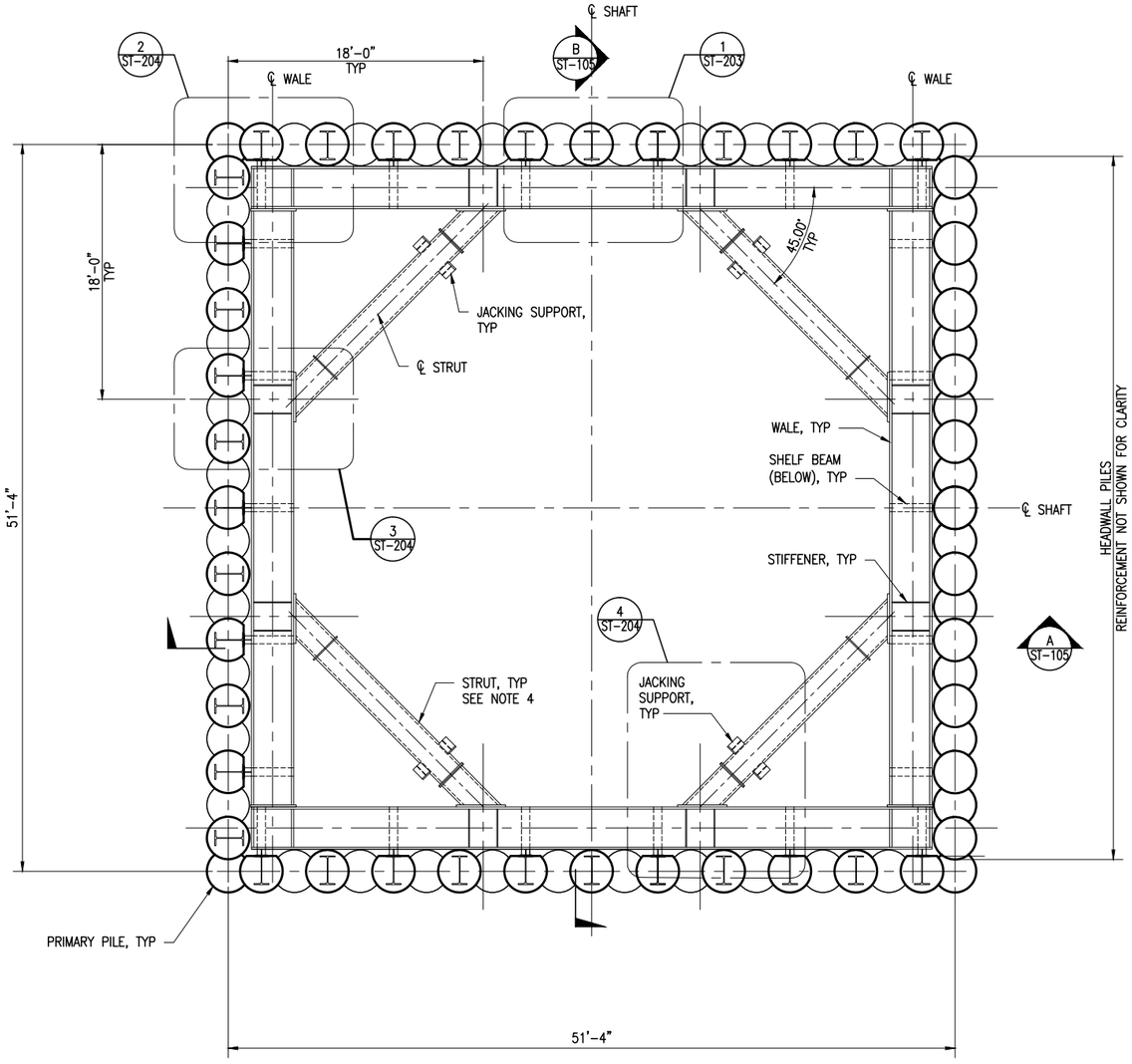
APPROVED

DIRECTOR OF TRANSPORTATION

THIRD STREET LIGHT RAIL PROGRAM
PHASE 2 – CENTRAL SUBWAY
TEMPORARY TBM RETRIEVAL SHAFT

STRUCTURAL
ROOF PLAN

CONTRACT NO.	1278
SFMTA CONTROL NO.	CL-24622
DRAWING NO.	ST-102
REVISION	0
SHEET NO.	16



JACKING LOAD PER STRUT	
LEVEL	LOAD (K)
LEVEL 1	400
LEVEL 2	1000
LEVEL 3	1400

NOTES:

1. FOR GENERAL STRUCTURAL NOTES SEE DRAWING ST-001.
2. FOR STRUT AND WALE PROPERTIES SEE DRAWING ST-203.
3. BRACING LEVEL 3 TO BE REMOVED WHEN BASE SLAB HAS REACHED 28 DAY STRENGTH.
4. INSTALL AND MONITOR GROUPINGS (TRIPLETS OR MORE) OF STRAIN GAGES AT EACH STRUT IN ACCORDANCE WITH SPECIFICATION SECTION 31 09 13 GEOTECHNICAL INSTRUMENTATION AND MONITORING.
5. TUNNELS (NIC) NOT SHOWN FOR CLARITY.

BRACING LEVEL 1, 2 & 3

PLAN

(TBM PILES OMITTED FOR CLARITY)

4' 2' 0 4' 8' 12'

SCALE: 3/16"=1'-0"

DATE	DESCRIPTION	REV. NO.	BY	CHECKED	APPROVED
05/31/2013	ISSUED FOR BID	0			

BORDER REVISED 03/25/2011

PB TELAMON

PB PARSONS BRINCKERHOFF

DESIGNED	D. ABRAHAMS
DRAWN	O. KURNOVSKAYA
CHECKED	C. BARRATT
REVIEWED	A. READ
RECOMMENDED	M. FOWLER
APPROVED	R. EDWARDS
DATE	05/31/2013

CITY AND COUNTY OF SAN FRANCISCO
MUNICIPAL TRANSPORTATION AGENCY

APPROVED

DIRECTOR OF TRANSPORTATION

THIRD STREET LIGHT RAIL PROGRAM
PHASE 2 – CENTRAL SUBWAY
TEMPORARY TBM RETRIEVAL SHAFT

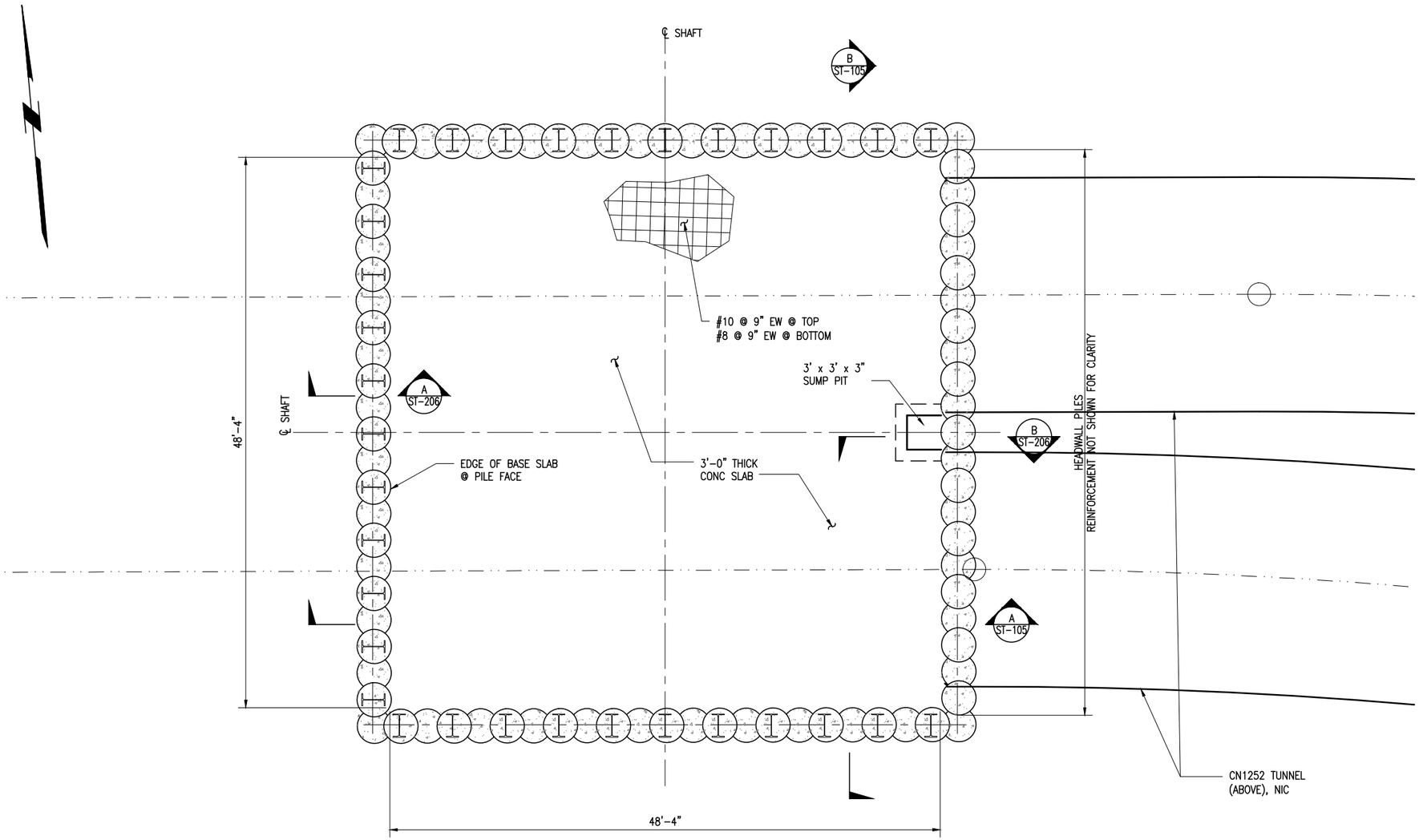
STRUCTURAL
BRACING LEVEL 1, 2 & 3

CONTRACT NO.	1278
SFMTA CONTROL NO.	CL-24623
DRAWING NO.	ST-103
REVISION	0
SHEET NO.	17

T:\13285 CS DP1\CN 1278\Sheet Files\ST - Structural\ ST-103.dwg Llorico Tue May 28,2013 - 8:18 pm ST-103

NOTES:

1. FOR GENERAL STRUCTURAL NOTES SEE DRAWING ST-001.



PLAN

(TBM PILES OMITTED FOR CLARITY)

4' 2' 0 4' 8' 12'

SCALE: 3/16"=1'-0"

DATE	DESCRIPTION	REV. NO.	BY	CHECKED	APPROVED
05/31/2013	ISSUED FOR BID	0			

BORDER REVISED 03/25/2011

PB TELAMON

PB PARSONS BRINCKERHOFF

DESIGNED D. ABRAHAMS
DRAWN O. KURNOVSKAYA
CHECKED C. BARRATT
REVIEWED A. READ
RECOMMENDED M. FOWLER
APPROVED R. EDWARDS
DATE 05/31/2013

CITY AND COUNTY OF SAN FRANCISCO
MUNICIPAL TRANSPORTATION AGENCY

APPROVED

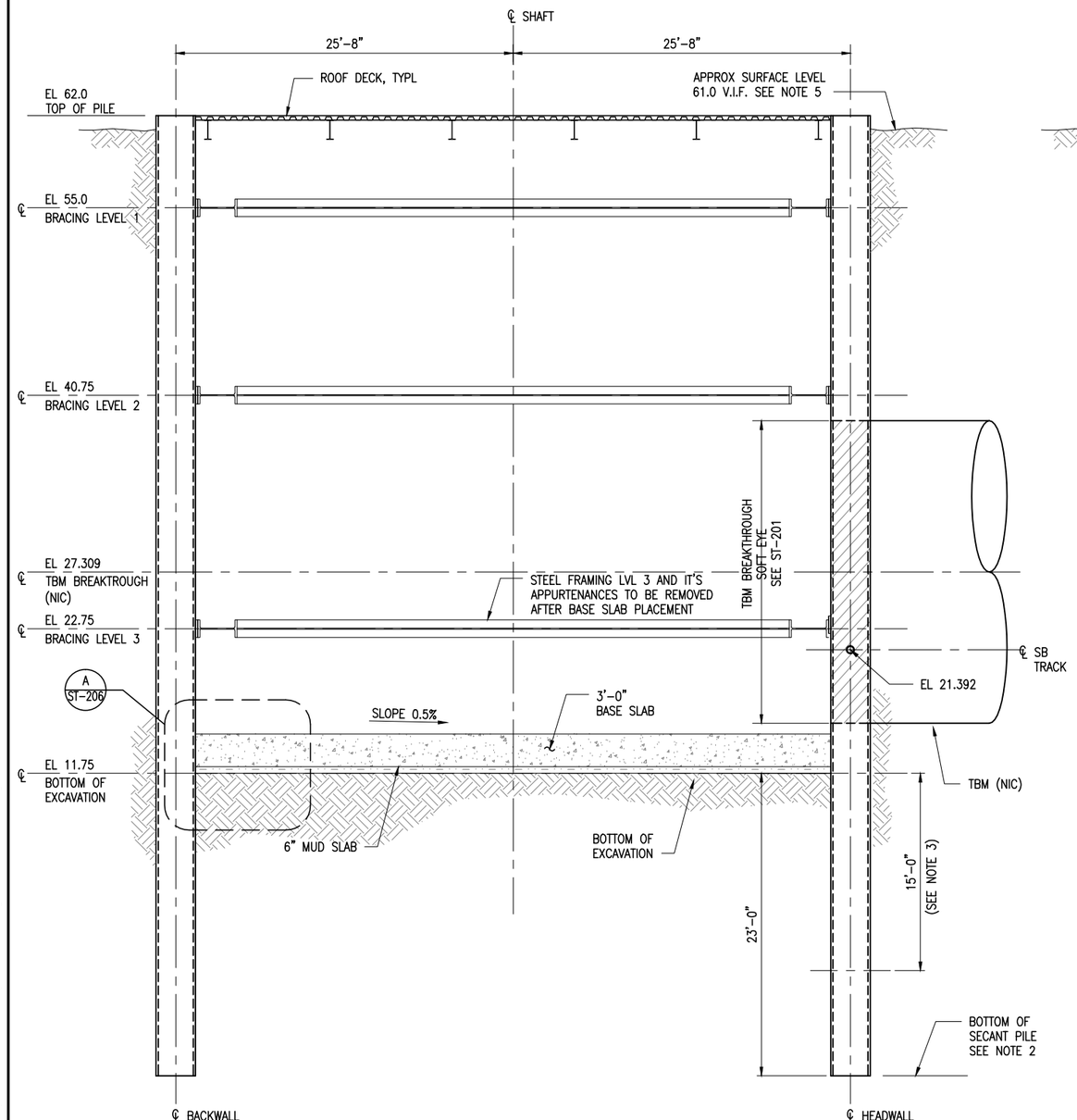
DIRECTOR OF TRANSPORTATION

THIRD STREET LIGHT RAIL PROGRAM
PHASE 2 – CENTRAL SUBWAY
TEMPORARY TBM RETRIEVAL SHAFT

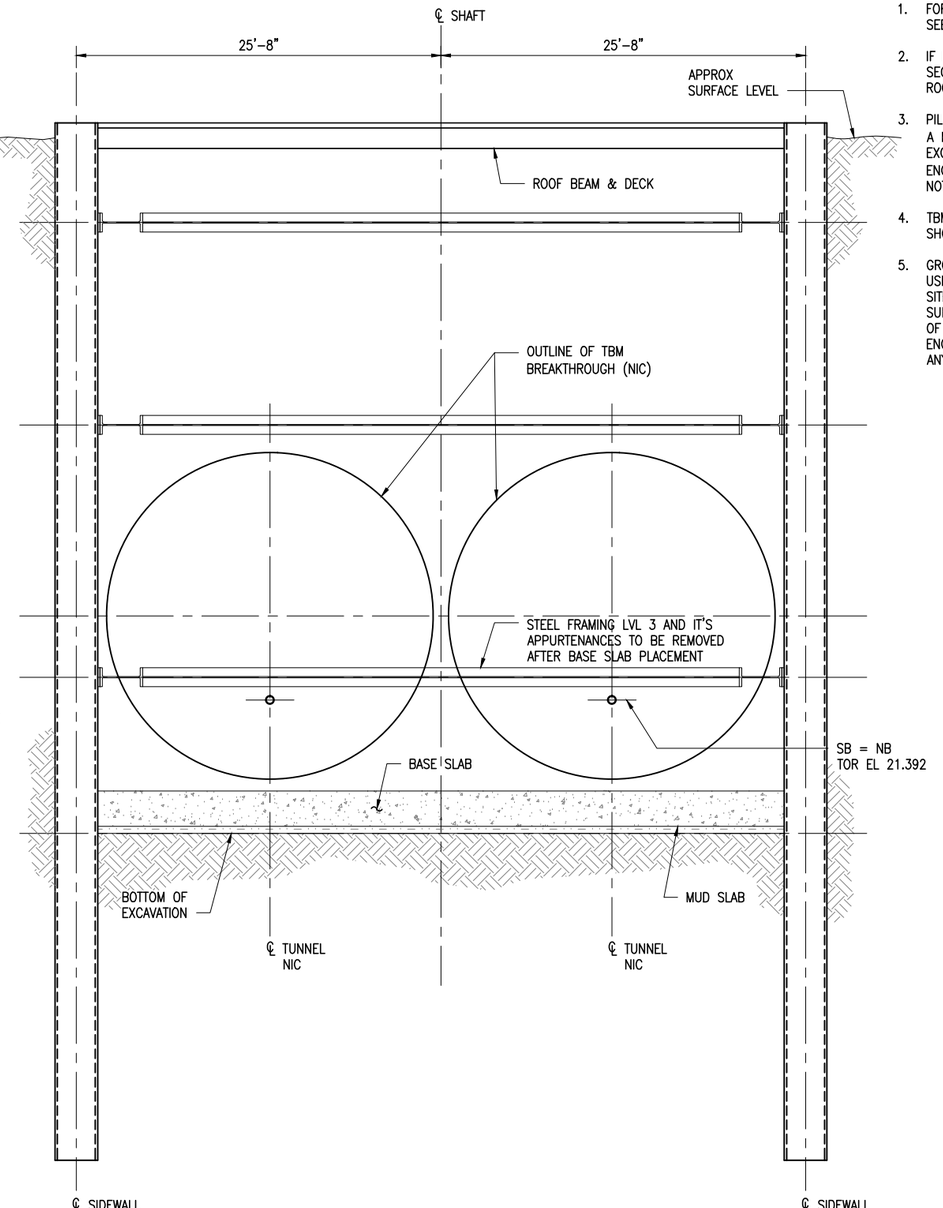
STRUCTURAL
BASE SLAB PLAN

CONTRACT NO. 1278
SFMTA CONTROL NO. CL-24624
DRAWING NO. ST-104
REVISION 0
SHEET NO. 18

T:\13285 CS DP1\CN 1278\Sheet Files\ST - Structural\ ST-104.dwg Llorico Wed May 29,2013 - 11:35 am ST-104



A ST-105 SECTION



B ST-105 SECTION

4' 2' 0 4' 8' 12'

SCALE: 3/16"=1'-0"

NOTES:

1. FOR GENERAL STRUCTURAL NOTES SEE DRAWING ST-001.
2. IF KJF BEDROCK IS ENCOUNTERED, SECANT PILES SHALL SOCKET INTO ROCK, SEE ES-013 DRAWING.
3. PILE REINFORCEMENT SHALL EXTEND A MIN. 15'-0" BELOW BOTTOM OF EXCAVATION. IF ROCK IS ENCOUNTERED ABOVE 15'-0", SEE NOTE 2.
4. TBM BREAKTHROUGH PILES NOT SHOWN, SEE ES-DRAWINGS.
5. GROUND SURFACE APPROXIMATED BY USING SURVEYED CURB LINES AND SITE VISIT. CONTRACTOR SHALL SUBMIT GROUND SURFACE CONTOUR OF 1731 POWELL STREET TO ENGINEER FOR APPROVAL PRIOR TO ANY SECANT PILE CONSTRUCTION.

DATE	DESCRIPTION	REV. NO.	BY	CHECKED	APPROVED
05/31/2013	ISSUED FOR BID	0			

PB TELAMON

PB PARSONS BRINCKERHOFF

DESIGNED D. ABRAHAMS
DRAWN E. LLORICO
CHECKED C. BARRATT
REVIEWED A. READ
RECOMMENDED M. FOWLER
APPROVED R. EDWARDS
DATE 05/31/2013

CITY AND COUNTY OF SAN FRANCISCO
MUNICIPAL TRANSPORTATION AGENCY

APPROVED

DIRECTOR OF TRANSPORTATION

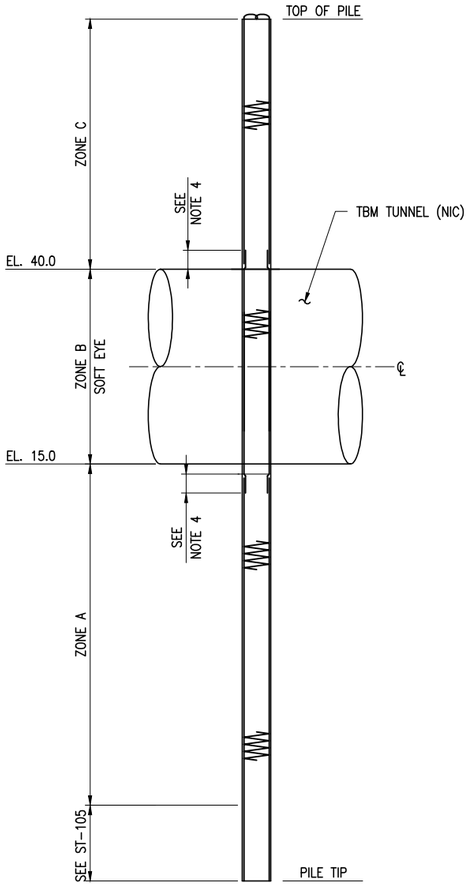
THIRD STREET LIGHT RAIL PROGRAM
PHASE 2 – CENTRAL SUBWAY
TEMPORARY TBM RETRIEVAL SHAFT

STRUCTURAL SECTIONS

CONTRACT NO. 1278
SFMTA CONTROL NO. CL-24625
DRAWING NO. ST-105
REVISION 0
SHEET NO. 19

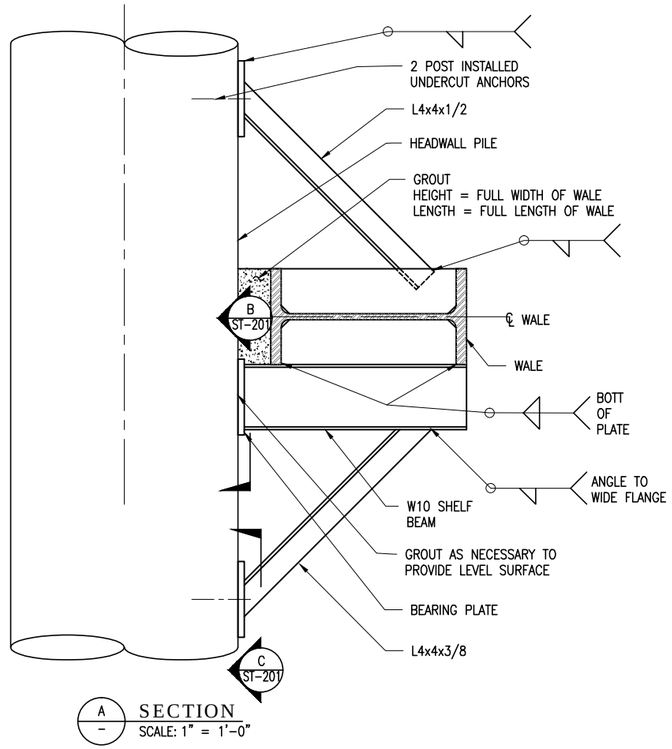
BORDER REVISED 03/25/2011

T:\13285 CS DP1\CN 1278\Sheet Files\ST - Structural\ ST-105.dwg Llorico Wed May 29,2013 - 11:35 am ST-105

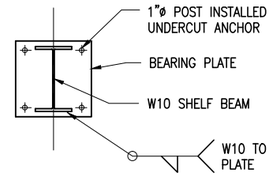


PILES CUT BY TBM
SCALE: NTS

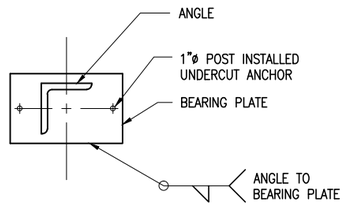
TBM PILES OMITTED FOR CLARITY



A — SECTION
SCALE: 1" = 1'-0"



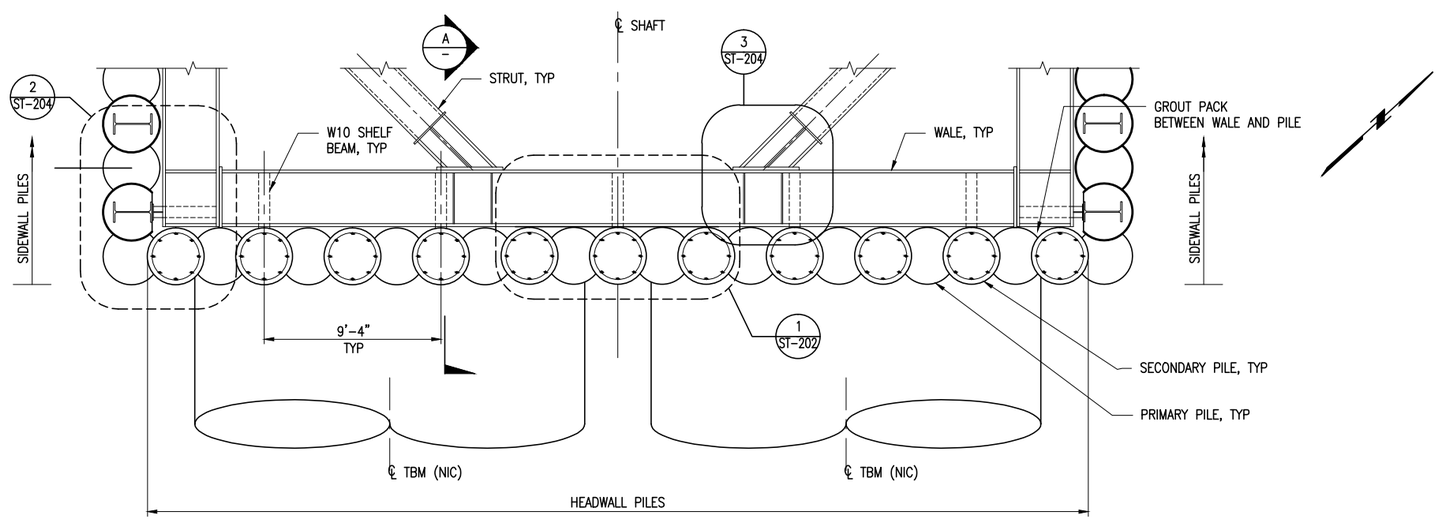
B — SECTION
SCALE: NTS



C — SECTION
SCALE: NTS

NOTES:

1. FOR GENERAL STRUCTURAL NOTES, SEE DRAWING ST-001.
2. DISTANCE SPACER, STIFFENING RING AND BOTTOM PLATE TO BE DESIGNED BY CONTRACTOR.
3. SPLICES OR EQUIVALENT SHALL CONFORM TO ACI-318. MINIMUM SPLICES POSITIONS SHOWN. CONTRACTOR TO USE ADDITIONAL SPLICES AS NEEDED PER HIS MEANS AND METHODS, SUBJECT TO COMPLY WITH ANY MANDATORY REQUIREMENTS.
4. AVOID SPLICES AT POINTS OF MAXIMUM STRESS WHENEVER POSSIBLE.
5. POST INSTALLED ANCHORS AT LEVEL 3 TO BE REMOVED DURING BRACING REMOVAL.



PLAN
SCALE: 1/4"=1'-0"

TBM PILES OMITTED FOR CLARITY

DATE	DESCRIPTION	REV. NO.	BY	CHECKED	APPROVED
05/31/2013	ISSUED FOR BID	0			

BORDER REVISED 03/25/2011

PB TELAMON
PB PARSONS BRINCKERHOFF

DESIGNED D. ABRAHAMS
DRAWN O. KURNOVSKAYA
CHECKED C. BARRATT
REVIEWED A. READ
RECOMMENDED M. FOWLER
APPROVED R. EDWARDS
DATE 05/31/2013

CITY AND COUNTY OF SAN FRANCISCO
MUNICIPAL TRANSPORTATION AGENCY

APPROVED

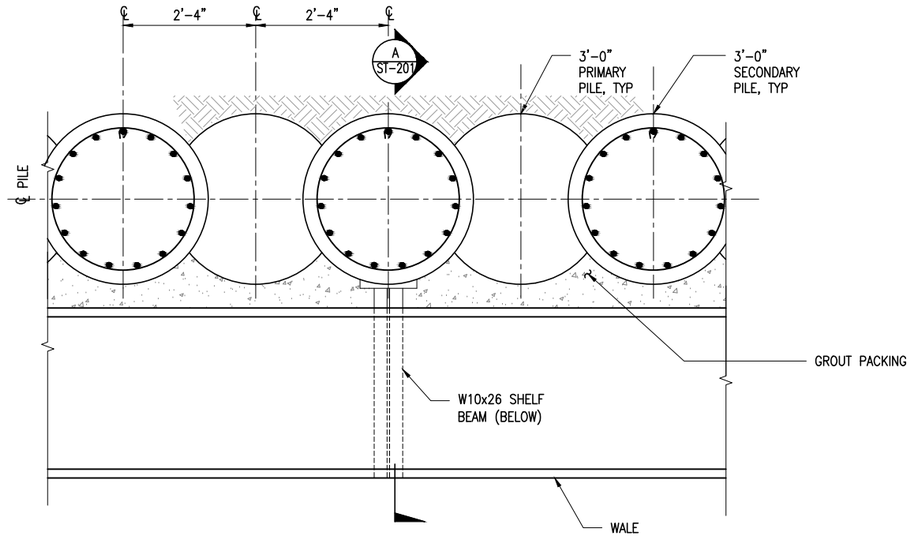
DIRECTOR OF TRANSPORTATION

THIRD STREET LIGHT RAIL PROGRAM
PHASE 2 – CENTRAL SUBWAY
TEMPORARY TBM RETRIEVAL SHAFT

STRUCTURAL
HEADWALL REINFORCEMENT DETAILS
SHEET 1 OF 1

CONTRACT NO. 1278
SFMTA CONTROL NO. CL-24626
DRAWING NO. ST-201
REVISION 0
SHEET NO. 20

T:\13285 CS DP1\CN 1278\Sheet Files\ST - Structural\ ST-201.dwg Llorico Wed May 29,2013 - 11:36 am ST-201



GROUT PACK

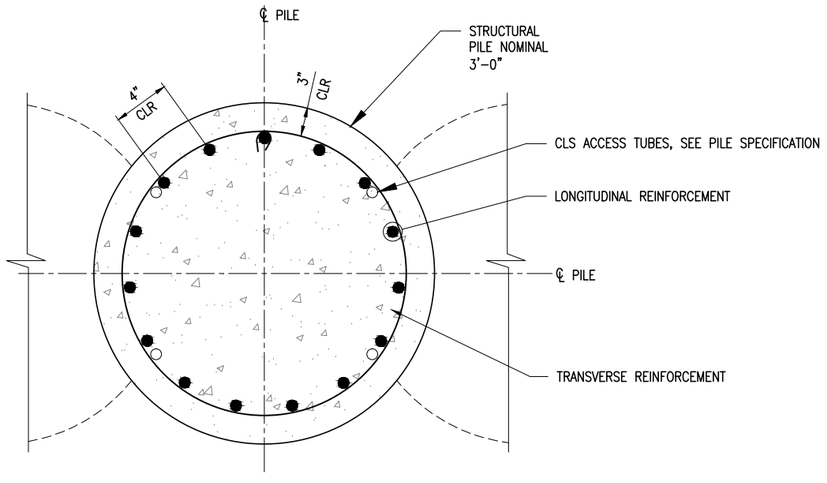
1 ST-202 DETAIL
SCALE: 3/4"=1'-0"

MINIMUM REQUIRED REINFORCEMENT - HEADWALL SECONDARY PILE

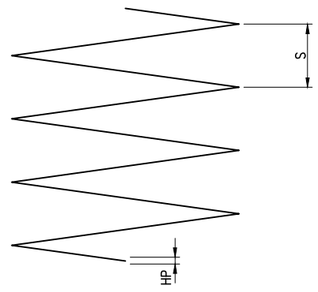
	PRIMARY LONGITUDINAL DIRECTION		TRANSVERSE REINFORCEMENT (GFRP-HOOPS)	
REINFORCEMENT ZONE	NUMBER OF BARS	BAR SIZE	BAR SIZE	SPACING (IN.)
ZONE A	12	#11	#5	6
ZONE B	15 (GFRP)	#11	#5	4
ZONE C	15	#11	#5	4

NOTES:

1. FOR GENERAL STRUCTURAL NOTES, SEE DRAWING ST-001.



SECONDARY PILE REINFORCEMENT
SCALE: 1 1/2"=1'-0"



SPIRAL
DETAIL
NTS

DATE	DESCRIPTION	REV. NO.	BY	CHECKED	APPROVED
05/31/2013	ISSUED FOR BID	0			

PB TELAMON
PB PARSONS BRINCKERHOFF

DESIGNED D. ABRAHAMS
DRAWN O. KURNOVSKAYA
CHECKED C. BARRATT
REVIEWED A. READ
RECOMMENDED M. FOWLER
APPROVED R. EDWARDS
DATE 05/31/2013

CITY AND COUNTY OF SAN FRANCISCO
MUNICIPAL TRANSPORTATION AGENCY
APPROVED
DIRECTOR OF TRANSPORTATION

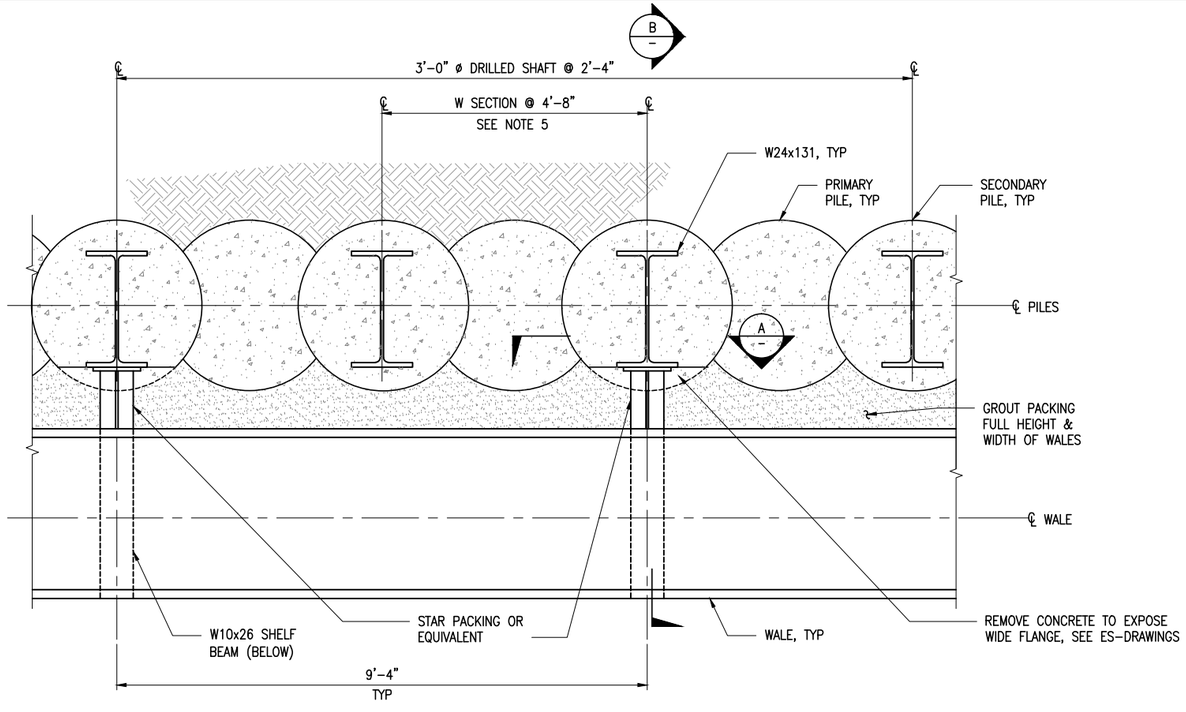
THIRD STREET LIGHT RAIL PROGRAM
PHASE 2 – CENTRAL SUBWAY
TEMPORARY TBM RETRIEVAL SHAFT

STRUCTURAL
HEADWALL REINFORCEMENT DETAILS
SHEET 2 OF 2

CONTRACT NO. 1278
SFMTA CONTROL NO. CL-24627
DRAWING NO. ST-202
REVISION 0
SHEET NO. 21

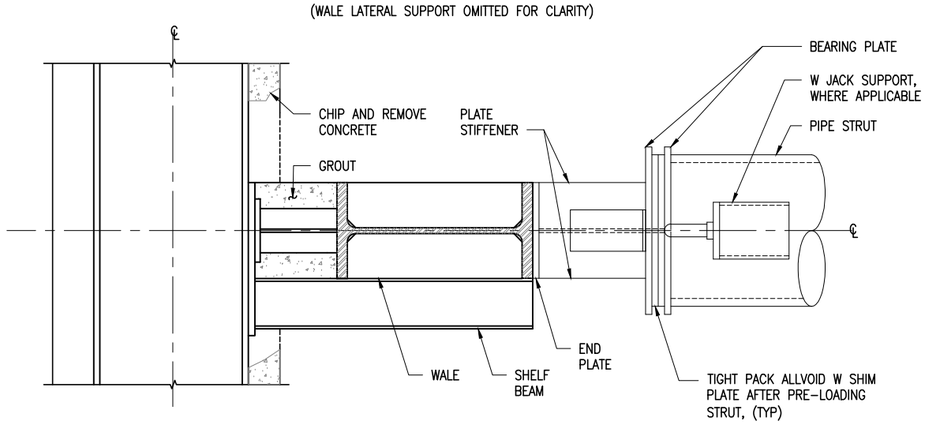
T:\13285 CS DP1\CN 1278\Sheet Files\ST – Structural\ ST-202.dwg Llorico Tue May 28,2013 – 8:20 pm ST-202

BORDER REVISED 03/25/2011



1 / ST-103 DETAIL
SCALE: 3/4"=1'-0"

(WALE LATERAL SUPPORT OMITTED FOR CLARITY)



A / - SECTION
NTS

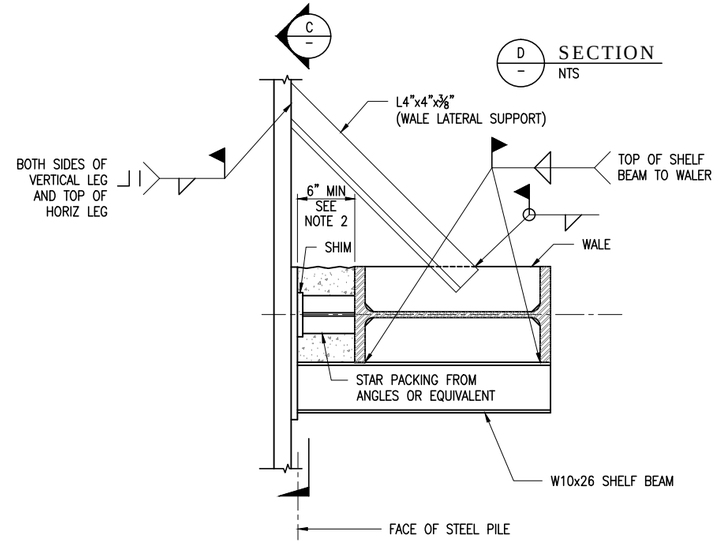
WALE SCHEDULE	
LEVEL	SIZE
LEVEL 1	W24x131
LEVEL 2	W36x302
LEVEL 3	W36x302

STRUT SCHEDULE	
LEVEL	SIZE
LEVEL 1	24"ø x 3/4" PIPE
LEVEL 2	36"ø x 1 1/2" PIPE
LEVEL 3	36"ø x 1 1/2" PIPE

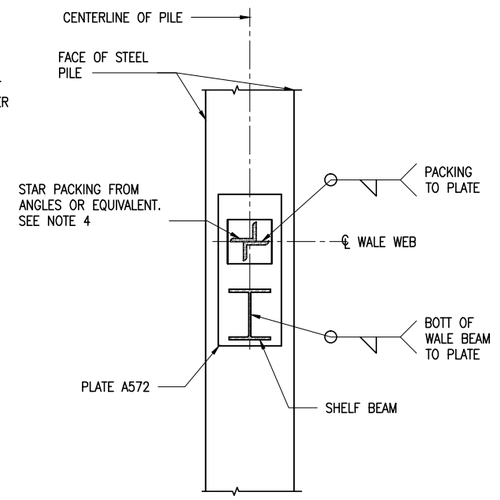
NOTES:

1. FOR GENERAL STRUCTURAL NOTES, SEE DRAWING ST-001.
2. MINIMUM STAR PACKING OR EQUIVALENT LENGTH SHALL BE BASED ON WORST CASE INWARD PILE INSTALLATION.
3. CONNECTION DETAILS SHOWN FOR SUGGESTED CONCEPTUAL DESIGN ONLY. CONNECTIONS SHALL BE DESIGNED BY FABRICATOR'S ENGINEER BASED ON LOADS PROVIDED.
4. STAR PACKING OR EQUIVALENT SHALL BE ALTERNATING PILE WIDE FLANGE LOCATIONS.
5. WIDE FLANGE REINFORCEMENT SIZE AND SPACING IS FOR SIDEWALL AND BACKWALL PILES. FOR HEADWALL REINFORCEMENT SEE ST-201 & ST-202.

C / - SECTION
NTS



D / - SECTION
NTS



B / - SECTION
NTS

C / - SECTION
NTS

DATE	DESCRIPTION	REV. NO.	BY	CHECKED	APPROVED
05/31/2013	ISSUED FOR BID	0			

BORDER REVISED 03/25/2011

PB TELAMON
PB PARSONS BRINCKERHOFF

DESIGNED D. ABRAHAMS
DRAWN O. KURNOVSKAYA
CHECKED C. BARRATT
REVIEWED A. READ
RECOMMENDED M. FOWLER
APPROVED R. EDWARDS
DATE 05/31/2013

CITY AND COUNTY OF SAN FRANCISCO
MUNICIPAL TRANSPORTATION AGENCY

APPROVED

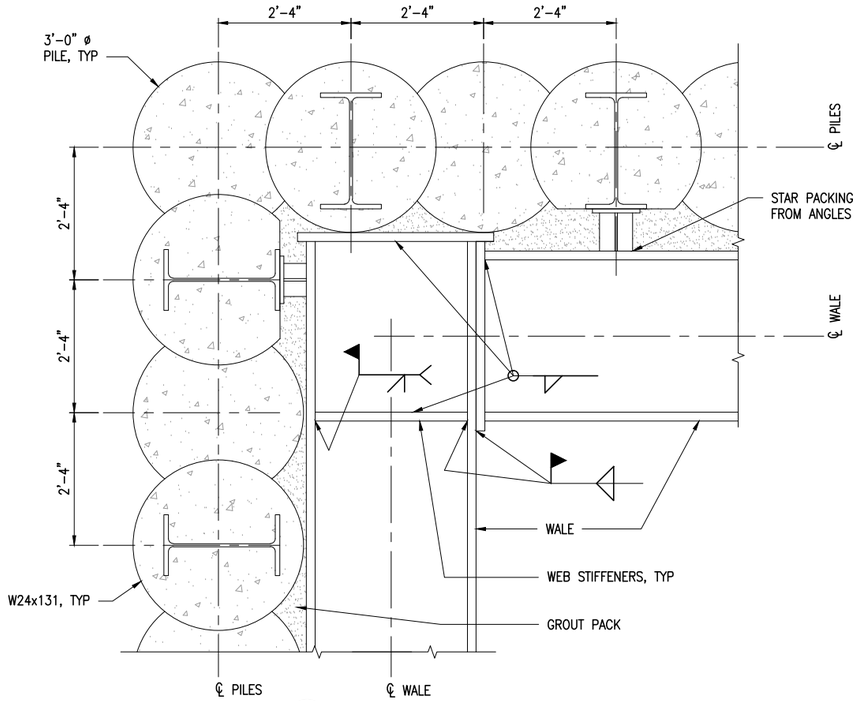
DIRECTOR OF TRANSPORTATION

THIRD STREET LIGHT RAIL PROGRAM
PHASE 2 – CENTRAL SUBWAY
TEMPORARY TBM RETRIEVAL SHAFT

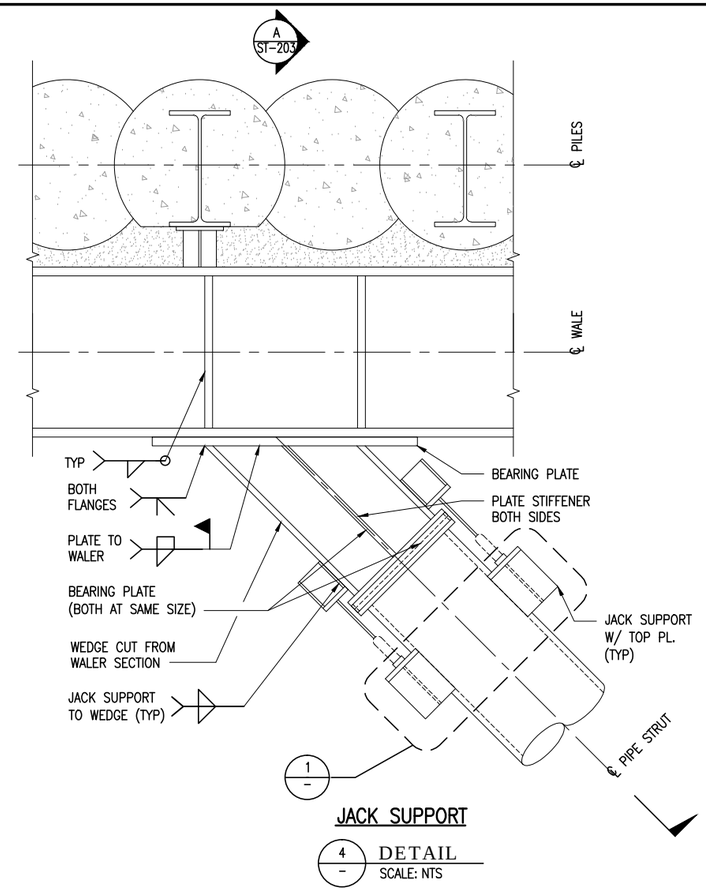
STRUCTURAL
STEEL FRAMING DETAILS
SHEET 1 OF 2

CONTRACT NO. 1278
SFMTA CONTROL NO. CL-24628
DRAWING NO. ST-203
REVISION 0
SHEET NO. 22

T:\13285 CS DP1\CN 1278\Sheet Files\ST - Structural\ ST-203.dwg Llorico Tue May 28,2013 - 8:21 pm ST-203



2 ST-103 DETAIL
SCALE: 3/4"=1'-0"

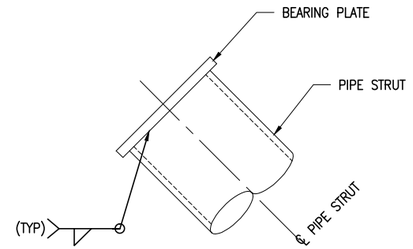


1 – JACK SUPPORT

4 – DETAIL
SCALE: NTS

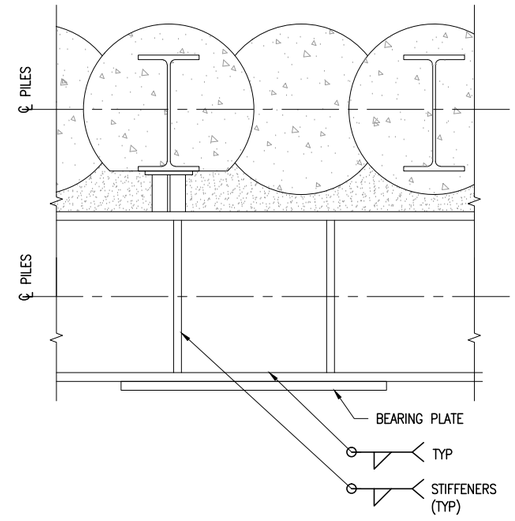
NOTES:

1. FOR GENERAL STRUCTURAL NOTES, SEE DRAWING ST-001.



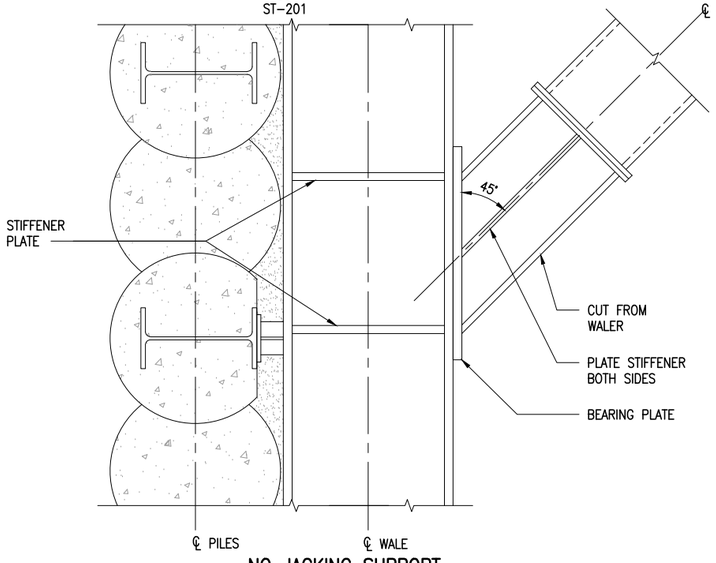
PIPE STRUT WITHOUT JACK SUPPORT (TYP)

DETAIL
NTS



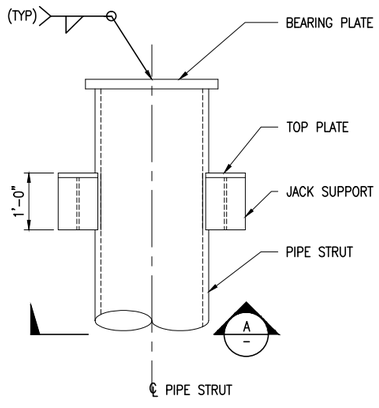
WALER DETAIL AT STRUT LOCATIONS

DETAIL
NTS

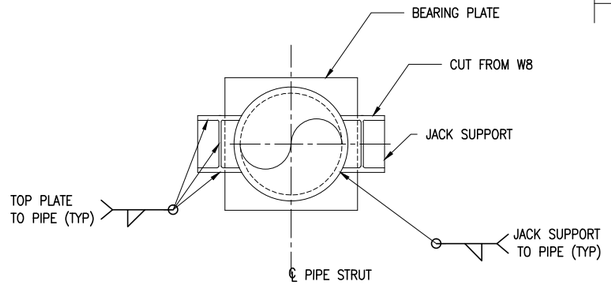


NO JACKING SUPPORT

3 ST-103 DETAIL
SCALE: 3/4"=1'-0"



1 – DETAIL
SCALE: NTS



A – ELEVATION
SCALE: NTS

1' 0 1' 2' 3'
SCALE: 3/4"=1'-0"

DATE	DESCRIPTION	REV. NO.	BY	CHECKED	APPROVED
05/31/2013	ISSUED FOR BID	0			

PB TELAMON
PB PARSONS BRINCKERHOFF

DESIGNED	D. ABRAHAMS
DRAWN	O. KURNOVSKAYA
CHECKED	C. BARRATT
REVIEWED	M. FOWLER
RECOMMENDED	A. READ
APPROVED	R. EDWARDS
DATE	05/31/2013

CITY AND COUNTY OF SAN FRANCISCO
MUNICIPAL TRANSPORTATION AGENCY
APPROVED
DIRECTOR OF TRANSPORTATION

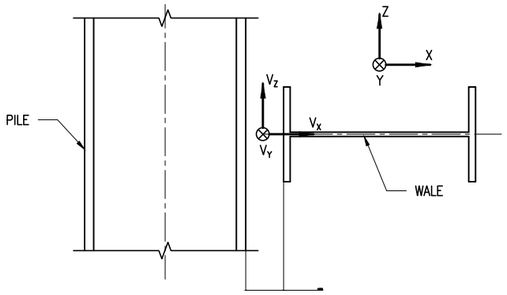
THIRD STREET LIGHT RAIL PROGRAM
PHASE 2 – CENTRAL SUBWAY
TEMPORARY TBM RETRIEVAL SHAFT

STRUCTURAL
STEEL FRAMING DETAILS
SHEET 2 OF 2

CONTRACT NO.	1278
SFMTA CONTROL NO.	CL-24629
DRAWING NO.	ST-204
REVISION	0
SHEET NO.	23

BORDER REVISED 03/25/2011

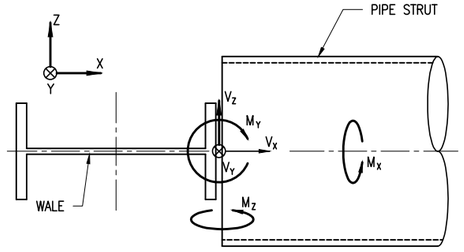
T:\13285 CS DP1\CN 1278\Sheet Files\ST – Structural\ ST-204.dwg Llorico Tue May 28,2013 – 8:22 pm ST-204



CONNECTION TYPE A

NTS

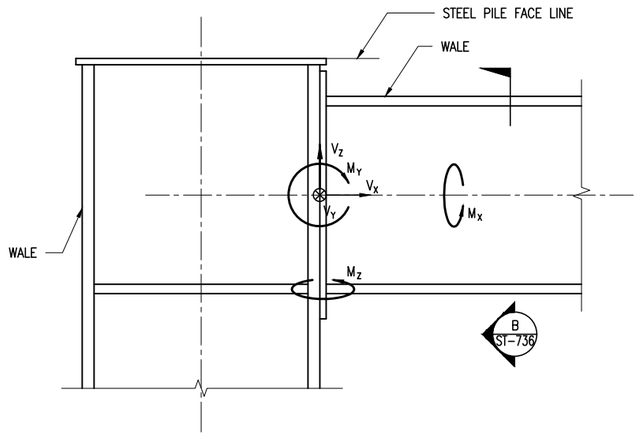
INCLUDES MIRRORED CONFIGURATION ALONG SHAFT ℄
PILE – TO – WALE



CONNECTION TYPE B

NTS

INCLUDES MIRRORED CONFIGURATION ALONG SHAFT ℄
WALE – TO – STRUT



CONNECTION TYPE C

NTS

WALE – TO – WALE CONNECTION

NOTES:

1. FOR GENERAL STRUCTURAL NOTES, SEE DRAWING ST–001.
2. GLOBAL +Y COORDINATE IS DEFINED ALONG STATION ℄ AND IN UPPER STATIONING DIRECTION; GLOBAL +Z COORDINATE IS DEFINED IN THE UPWARD VERTICAL DIRECTION; AND GLOBAL +X COORDINATE IS DEFINED IN SHAFT TRANSVERSE DIRECTION BY RIGHT–HAND RULE.
3. THE LETTER "M" IN THE TABLE ALSO DESIGNATES TORSION AND THE LETTER "V" ALSO DESIGNATES AXIAL LOAD.
4. CONNECTIONS SHALL BE DESIGNED BY FABRICATOR'S ENGINEER BASED ON PROVIDED CONNECTION LOAD TABLE. CONNECTIONS SHALL ALSO BE CHECKED WITH EXCAVATION AND GROUND SUPPORT SHORING LOADS PROVIDED IN DESIGN CRITERIA IN ES DRAWINGS.
5. THE BASIC CODE FOR DESIGN AND FABRICATION OF STRUCTURAL STEEL IS THE CODE OF STANDARD PRACTICE FOR STEEL BUILDINGS AND BRIDGES, AMERICAN INSTITUTE OF STEEL CONSTRUCTION, APRIL14, 2010, UNDER SECTION 3, DESIGN DRAWINGS AND SPECIFICATION, ARTICLE 3.1.2, THE OPTION SPECIFIED FOR THIS CONTRACT IS: (3) IN THE STRUCTURAL DESIGN DRAWINGS OR SPECIFICATIONS, THE CONNECTION SHALL BE DESIGNATED TO BE DESIGNED BY A LICENSED PROFESSIONAL ENGINEER WORKING FOR THE FABRICATOR.
6. FIELD CONNECTIONS SHALL BE BOLTED OR WELDED USING FILLET WELDS ONLY UNLESS OTHERWISE ALLOWED BY THE ENGINEER.
7. MOMENT CONNECTIONS BETWEEN BEAMS AND COLUMNS WILL BE PRE–QUALIFIED CONNECTIONS FOR SEISMIC APPLICATION IN ACCORDANCE WITH ANSI/AISC 358–05, INCLUDING SUBSEQUENT SUPPLEMENTS IN FORCE AT THE TIME OF THE AWARD OF THE CONTRACT.
8. MOMENT CONNECTIONS BETWEEN TWO END TO END BEAMS OR COLUMNS WILL BE FULL STRENGTH MOMENT AND SHEAR CONNECTIONS DESIGNED FOR THE STRENGTH OF THE SMALLER SECTION.

CONNECTION LOAD TABLE

LEVEL	CONNECTION TYPE	ASD LOADS					
		Vx* (K)	Vy (K)	Vz (K)	Mx (K–FT)	My (K–FT)	Mz (K–FT)
LEVEL 1	TYPE A	125	10	–	–	–	–
	TYPE B	500	–	–	–	–	–
	TYPE C	200	–	200	–	400	–
LEVEL 2	TYPE A	550	10	–	–	–	–
	TYPE B	1400	–	–	–	–	–
	TYPE C	550	–	550	–	1000	–
LEVEL 3	TYPE A	550	10	–	–	–	–
	TYPE B	1300	–	–	–	–	–
	TYPE C	550	–	550	–	1000	–

* LOADS IN COMPRESSION

DATE	DESCRIPTION	REV. NO.	BY	CHECKED	APPROVED
05/31/2013	ISSUED FOR BID	0			

BORDER REVISED 03/25/2011

PB TELAMON
PB PARSONS BRINCKERHOFF

DESIGNED D. ABRAHAMS
DRAWN O. KURNOVSKAYA
CHECKED D. YAVORSKY
REVIEWED A. READ
RECOMMENDED M. FOWLER
APPROVED R. EDWARDS
DATE 05/31/2013

CITY AND COUNTY OF SAN FRANCISCO
MUNICIPAL TRANSPORTATION AGENCY

APPROVED

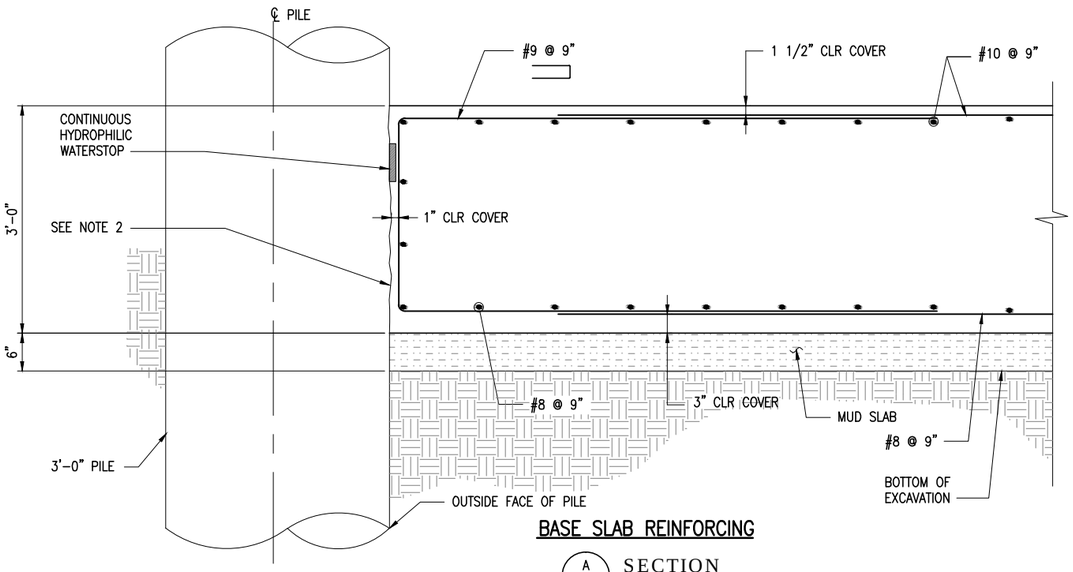
DIRECTOR OF TRANSPORTATION

THIRD STREET LIGHT RAIL PROGRAM
PHASE 2 – CENTRAL SUBWAY
TEMPORARY TBM RETRIEVAL SHAFT

STRUCTURAL
CONNECTION SCHEDULE

CONTRACT NO. 1278
SFMTA CONTROL NO. CL–24630
DRAWING NO. ST–205
REVISION 0
SHEET NO. 24

T:\13285 CS DP1\CN 1278\Sheet Files\ST – Structural\ ST–205.dwg Llorico Wed May 29,2013 – 11:37 am ST–205

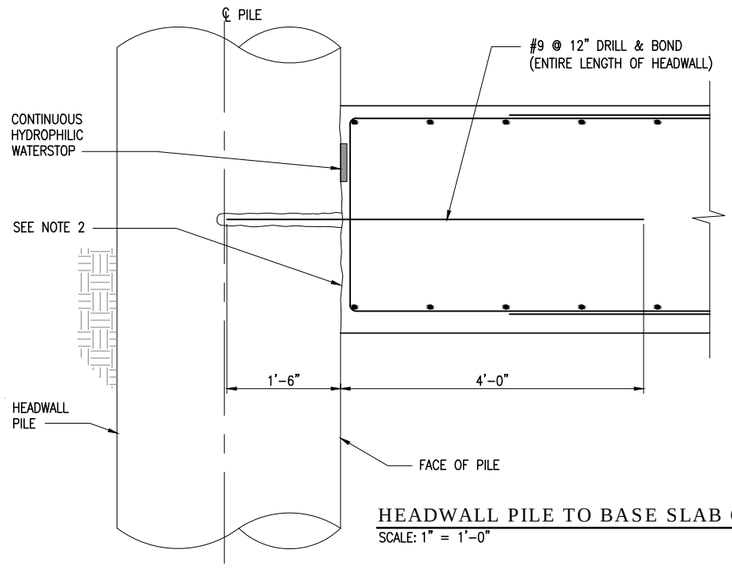


BASE SLAB REINFORCING

A / ST-104 SECTION
SCALE: 1" = 1'-0"

ST-105

(PILE TO SLAB OMITTED FOR CLARITY)

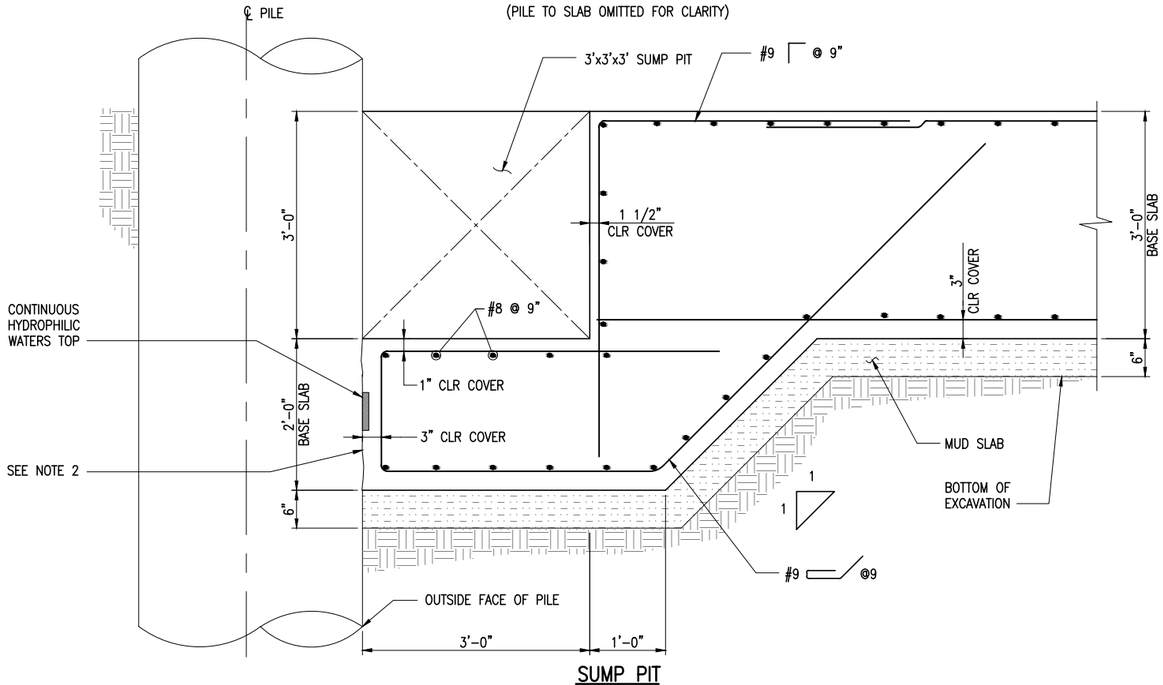


HEADWALL PILE TO BASE SLAB CONNECTION

SCALE: 1" = 1'-0"

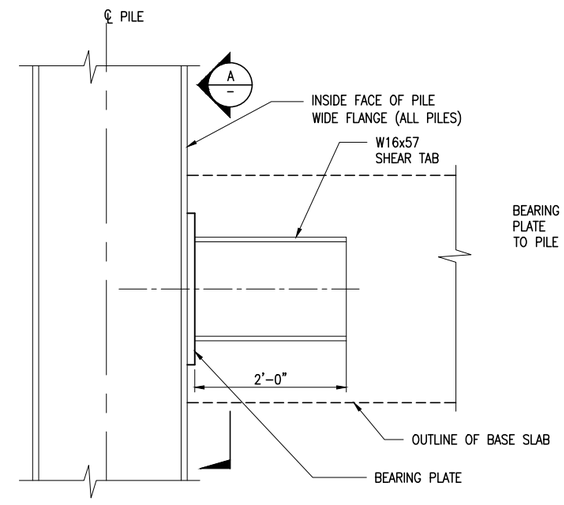
NOTES:

1. FOR GENERAL STRUCTURAL NOTES, SEE DRAWING ST-001.
2. CONSTRUCTION JOINTS SHALL BE THOROUGHLY CLEANED AND REMOVE LAITENANCE FROM ALL SURFACES. ROUGHEN SURFACES TO ± 1/4" AMPLITUDE AND PREPARE SURFACE TO SATURATED DRY BEFORE PROCEEDING WITH NEXT PLACEMENT. KEEP WET FOR FOUR HOURS.
3. PILE WIDE FLANGE TO BASE SLAB CONNECTION SHALL HAVE A 200K LRFD LOAD CAPACITY MIN.



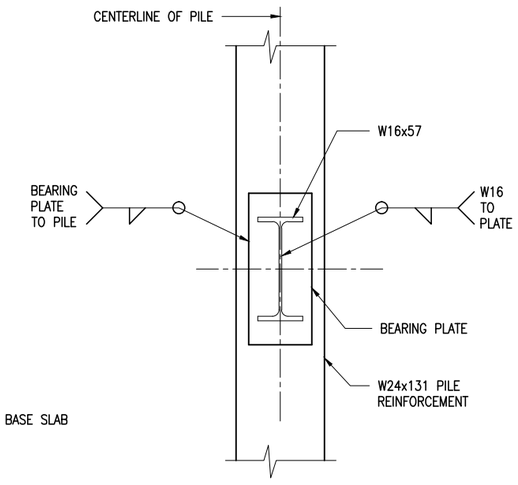
SUMP PIT

B / ST-104 SECTION
SCALE: 1" = 1'-0"



PILE WIDE FLANGE TO BASE SLAB CONNECTION

SCALE: 1" = 1'-0"



A / – SECTION
SCALE: 1" = 1'-0"

1' 0 1' 2'
SCALE: 1"=1'-0"

DATE	DESCRIPTION	REV. NO.	BY	CHECKED	APPROVED
05/31/2013	ISSUED FOR BID	0			

BORDER REVISED 03/25/2011

PB TELAMON
PB PARSONS BRINCKERHOFF

DESIGNED	D. ABRAHAMS
DRAWN	O. KURNOVSKAYA
CHECKED	C. BARRATT
REVIEWED	A. READ
RECOMMENDED	M. FOWLER
APPROVED	R. EDWARDS
DATE	05/31/2013

CITY AND COUNTY OF SAN FRANCISCO
MUNICIPAL TRANSPORTATION AGENCY

APPROVED

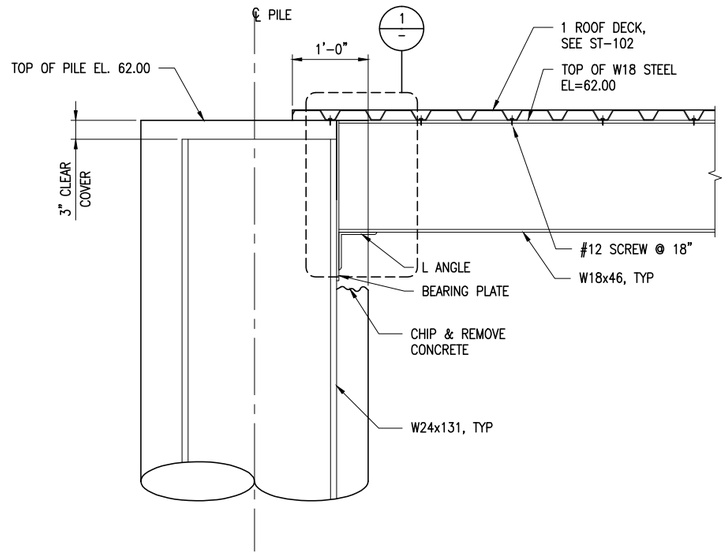
DIRECTOR OF TRANSPORTATION

THIRD STREET LIGHT RAIL PROGRAM
PHASE 2 – CENTRAL SUBWAY
TEMPORARY TBM RETRIEVAL SHAFT

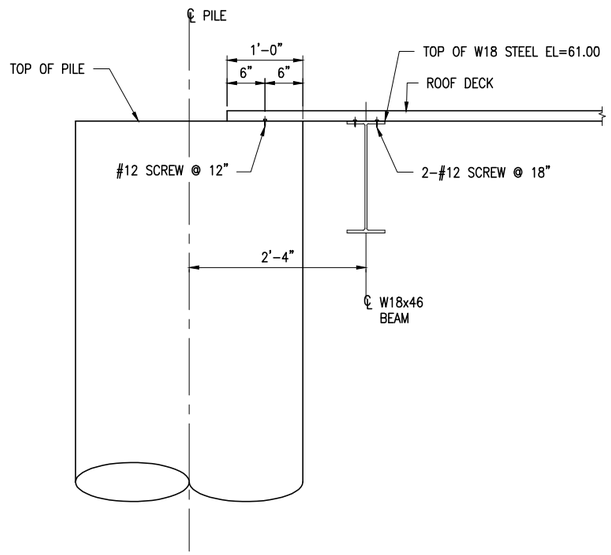
STRUCTURAL
BASE SLAB DETAILS

CONTRACT NO.	1278
SFMTA CONTROL NO.	CL-24631
DRAWING NO.	ST-206
REVISION	0
SHEET NO.	25

T:\13285 CS DP1\CN 1278\Sheet Files\ST – Structural\ ST-206.dwg Llorico Tue May 28,2013 – 8:23 pm ST-206



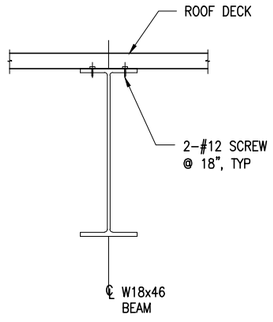
C / ST–102 SECTION
SCALE: 1"=1'–0"



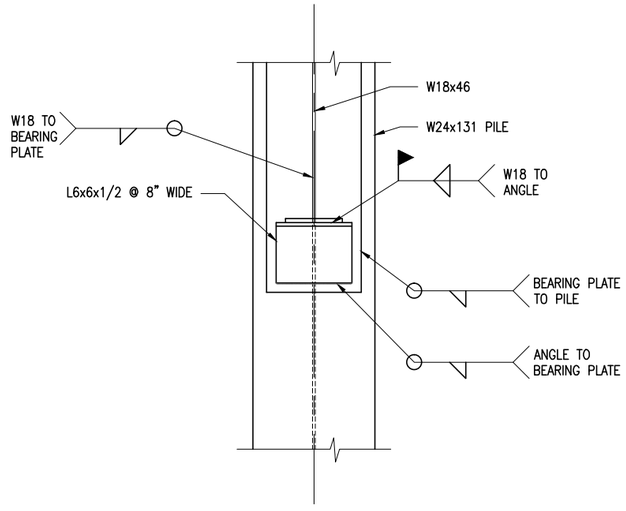
E / ST–102 SECTION
SCALE: 1"=1'–0"

NOTES:

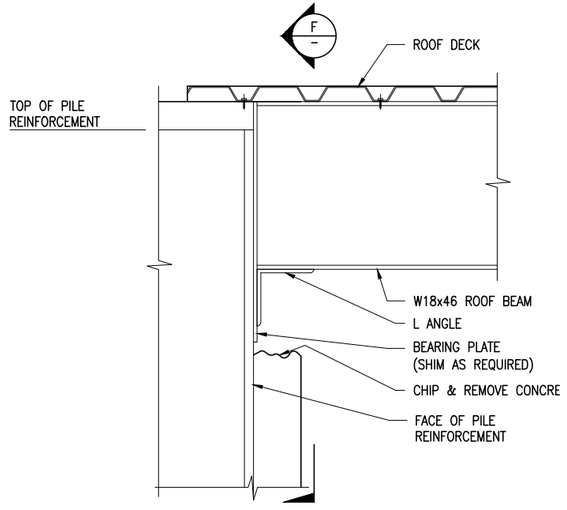
1. FOR GENERAL STRUCTURAL NOTES, SEE DRAWING ST–001.
2. ROOF BEAM TO PILE CONNECTION SHALL HAVE A LRFD SHEAR CAPACITY OF 20 KIPS AND MOMENT CAPACITY OF 100 K–FT.



D / ST–102 SECTION
SCALE: 1 1/2"=1'–0"



F / – SECTION
SCALE: 1 1/2"=1'–0"



1 / – DETAIL
SCALE: 1 1/2"=1'–0"

6" 0 6" 12" 18"
SCALE: 1–1/2"= 1'–0"

1' 0 1' 2'
SCALE: 1"=1'–0"

DATE	DESCRIPTION	REV. NO.	BY	CHECKED	APPROVED
05/31/2013	ISSUED FOR BID	0			

PB TELAMON
PB PARSONS BRINCKERHOFF

DESIGNED D. ABRAHAMS
DRAWN O. KURNOVSKAYA
CHECKED C. BARRATT
REVIEWED A. READ
RECOMMENDED M. FOWLER
APPROVED R. EDWARDS
DATE 05/31/2013

CITY AND COUNTY OF SAN FRANCISCO
MUNICIPAL TRANSPORTATION AGENCY
APPROVED
DIRECTOR OF TRANSPORTATION

THIRD STREET LIGHT RAIL PROGRAM
PHASE 2 – CENTRAL SUBWAY
TEMPORARY TBM RETRIEVAL SHAFT

STRUCTURAL
ROOF DETAILS

CONTRACT NO. 1278
SFMTA CONTROL NO. CL–24632
DRAWING NO. ST–207
REVISION 0
SHEET NO. 26

BORDER REVISED 03/25/2011

T:\13285 CS DP1\CN 1278\Sheet Files\ST – Structural\ ST–207.dwg Llorico Tue May 28,2013 – 8:23 pm ST–207

LEGEND

SYMBOL	ABBREVIATION	DESCRIPTION
	BSP	AUTOMATED BUILDING SETTLEMENT MONITORING PRISM
	MSP	MANUAL BUILDING SETTLEMENT MONITORING POINT
S S	SSP/SSA	SURFACE SETTLEMENT POINT/ARRAY
I	INC	INCLINOMETER
P	PZM	STANDPIPE PIEZOMETER
O	OBW	OBSERVATION WELL
U	UMP	UTILITY MONITORING POINT
VW	VMP	VIBRATION MONITORING POINT (IN-PLACE SEISMOGRAPH)

ABBREVIATIONS

APPROX.	APPROXIMATE	(N)	NEW
AWSS	AUXILIARY WATER SUPPLY SYSTEM	NO.	NUMBER
BLDG	BUILDING	OD	OUTER DIAMETER
DIA, ø	DIAMETER	PSI	POUNDS PER SQUARE INCH
DWG.	DRAWING	PVC	POLYVINYL CHLORIDE
(E)	EXISTING	SCH	SCHEDULE
EL.	ELEVATION	SG	STRAIN GAUGE
F'c	COMPRESSIVE STRENGTH	SS	STAINLESS STEEL
GA	GAUGE	TLT	TILTMETER
ID	INNER DIAMETER OR IDENTIFICATION	TYP.	TYPICAL
MAX	MAXIMUM		
MIN	MINIMUM		

GENERAL NOTES

1. BP-001 THROUGH BP-103 PROVIDE SCHEDULE, DETAIL AND PLAN FOR BUILDING/STRUCTURE/UTILITY INSTRUMENTATION AND COMPENSATION GROUTING.
2. COMPLY WITH THE REQUIREMENTS OF THE PROJECT SPECIFICATIONS FOR INSTRUMENTATION INSTALLATION METHODS, EQUIPMENT, MATERIAL, TOLERANCES, INSTRUMENT INITIALIZATION AND REPORTING OF RESULTS.
3. ALL INSTRUMENTATION LOCATIONS SHOWN ARE APPROXIMATE.
4. CONTRACTOR SHALL COORDINATE ALL INSTRUMENTATION AND COMPENSATION GROUTING WORK WITH ALL OTHER DISCIPLINES, INCLUDING PLANS TO BE PROVIDED BY CONTRACTOR.
5. ADJUST INSTRUMENT AND MONITORING POINT LOCATIONS, ELEVATIONS AND/OR DEPTHS AS REQUIRED AT THE TIME OF INSTALLATION TO AVOID EXISTING UTILITY LOCATIONS. COMPLY WITH EASEMENT REQUIREMENTS, MINIMIZE CONFLICT WITH CONSTRUCTION OPERATIONS AND LOCATE INSTRUMENT AND MONITORING POINTS TO SUIT ACTUAL FIELD CONDITIONS.
6. MAINTAIN AND PROTECT NEW AND EXISTING INSTRUMENTATION. PROVIDE ALL SUCH MAINTENANCE, MARKERS, COVERS, LOCKS, GUARD BOLLARDS, BARRICADES AND OTHER PROVISIONS NECESSARY TO PREVENT DAMAGE, DISTURBANCE, VANDALISM OR DETERIORATION TO NEW OR EXISTING INSTRUMENTATION. REPLACE ALL DAMAGED INSTRUMENTATION IN A TIMELY MANNER AS REQUIRED BY THE ENGINEER.
7. COORDINATE INSTALLATION AND MONITORING OF INSTRUMENTATION WITH THE ENGINEER REGARDING CONDITIONS AND REQUIREMENTS FOR PROPERTY ACCESS.
8. OBTAIN ALL PERMITS AND COMPLY WITH ALL REQUIREMENTS OF AGENCIES, OWNERS, UTILITIES AND OTHER ENTITIES WITH JURISDICTION OVER ACCESS AND INSTALLATION OF THE INSTRUMENTATION. INCLUDE CONSIDERATION OF THE TIME REQUIRED TO OBTAIN PERMITS AND SATISFY JURISDICTIONAL REQUIREMENTS IN THE INSTALLATION SCHEDULE. LACK OF TIMELINESS ON THE PART OF AGENCIES, OWNERS, UTILITIES AND OTHER ENTITIES SHALL NOT BE THE BASIS FOR ANY REQUEST FOR ADDITIONAL COMPENSATION.
9. DO NOT REMOVE, DEMOLISH, BACKFILL, COVER OR RENDER ANY INSTRUMENTATION INACCESSIBLE AT ANY TIME WITHOUT PRIOR APPROVAL OR DIRECTION BY THE ENGINEER.
10. BSP AND MSP ARE TO BE MOUNTED AT EXTERNAL BUILDING FACADES AND/OR ON EXTERIOR OF STRUCTURAL ELEMENTS. CONTRACTOR TO VERIFY LOCATIONS.
11. LOCATIONS AND NUMBERS OF FULLY AUTOMATED MOTORIZED TOTAL STATIONS AND FIXED REFERENCE POINTS ARE NOT SHOWN ON CONTRACT DRAWINGS. LOCATIONS AND NUMBERS TO BE DETERMINED BY CONTRACTOR AND SUBMITTED TO ENGINEER FOR APPROVAL. POTENTIAL AUTOMATED TOTAL STATION INSTALLATION LOCATIONS INCLUDE BUILDING FACADES, POLES AND BUILDING ROOFS.
12. CONTRACTOR SHALL PROVIDE POWER SUPPLY AND CONTINUOUS BACKUP ELECTRICAL POWER FOR ALL INSTRUMENTATION AS REQUIRED.
13. INSTRUMENTATION SHALL BE NUMBERED ACCORDING TO THE FOLLOWING SCHEME:

    AAA3-RS-XX WHERE:
    - (I) AAA=INSTRUMENT TYPE
    - (II) XX=INSTRUMENT UNIT REFERENCE NUMBER

    AAA3-CCCC-DDD-X (FOR BUILDING INSTRUMENTS) WHERE:
    - (I) AAA=INSTRUMENT TYPE
    - (II) CCCC=BLOCK NUMBER
    - (III) DDD=LOT NUMBER
    - (IV) X=INSTRUMENT UNIT REFERENCE NUMBER

14. ADJUST INSTRUMENT MOUNTING DEVICES TO SUIT ACTUAL FIELD CONDITIONS.
15. THE EXISTING STRUCTURES AS SHOWN ON PLANS AND SECTIONS ARE BASED ON SEVERAL SOURCES OF INFORMATION. THE CONTRACTOR SHALL FIELD VERIFY LOCATIONS AND CONDITIONS OF EXISTING STRUCTURES PRIOR TO INSTRUMENT INSTALLATION.
16. INSTRUMENT INSTALLATIONS SHOWN ON THE SECTIONS ARE SCHEMATIC.
17. CONTRACTOR SHALL CONTACT UNDERGROUND SERVICE ALERT (USA) 1-800-227-2600 A MINIMUM OF 48 HOURS PRIOR TO DRILLING OR EXCAVATING FROM SURFACE.
18. CONTRACTOR SHALL VERIFY EXACT LOCATIONS AND DEPTHS OF THE EXISTING UTILITIES IN THE FIELD AND SHALL ACCORDINGLY ADJUST LOCATIONS AND DEPTHS OF THE UTILITY INSTRUMENTS.
19. WHEN WORKING AROUND ENERGIZED EQUIPEMENT, THE UTILITY OWNER SHALL BE NOTIFIED TO SUPPLY THE APPROPRIATE MANPOWER AND SAFETY PRECAUTION AS NEEDED. THE CONTRACTOR IS RESPONSIBLE FOR SAFETY AND TRAFFIC CONTROL MEASURES.
20. CONTRACTOR SHALL MAINTAIN POINTS OF ACCESS THAT ARE AGREEABLE TO ADJACENT LAND USERS AND TENANTS AT ALL TIMES.
21. CONTRACTOR IS REQUIRED TO PLACE TEMPORARY AND PERMANENT PAVING AS NEEDED IN ACCORDANCE WITH SFDPW (SAN FRANCISCO DEPARTMENT OF PUBLIC WORKS) REQUIREMENTS.
22. PROVIDE 12-INCH MINIMUM CLEARANCE AROUND ALL EXISTING AND PROPOSED AWSS LINES, EXCEPT FOR UMP FOR AWSS.
23. INSTRUMENTATION FOR CONTROLLING COMPENSATION GROUTING OPERATION SHALL BE DESIGNED AND INSTALLED BY CONTRACTOR WITH ACCEPTANCE BY ENGINEER. REFER TO SPECIFICATION SECTION 31 43 14.
24. NO WARRANTY AS TO THE ACCURACY OF THE TOPOGRAPHIC SURVEY USED AS THE BASIS FOR THESE DRAWINGS IS GIVEN OR IMPLIED. TOPOGRAPHIC SURVEY FEATURES AND LOT BOUNDARIES ARE APPROXIMATE AND DO NOT REFLECT THE ACTUAL OR LEGAL POSITION OF ANY EXISTING STRUCTURE SHOWN. BUILDING LINES, WHERE SHOWN, DO NOT SHOW ALL BUILDING INFORMATION SUCH AS CANOPIES, OVERHANG, PROJECTIONS OR ACCESS.
25. REQUIREMENTS FOR FREQUENCY OF READINGS ARE SPECIFIED IN SPECIFICATION SECTION 31 09 13, GEOTECHNICAL INSTRUMENTATION AND MONITORING.

DATE	DESCRIPTION	REV. NO.	BY	CHECKED	APPROVED
05/31/2013	ISSUED FOR BID	0			

PB TELAMON

PB PARSONS BRINCKERHOFF

DESIGNED S. KIM
DRAWN O. KURNOVSKAYA
CHECKED K. JOHNSON
REVIEWED D. ABRAHAMS
RECOMMENDED M. FOWLER
APPROVED R. EDWARDS
DATE 05/31/2013

CITY AND COUNTY OF SAN FRANCISCO
MUNICIPAL TRANSPORTATION AGENCY

APPROVED

DIRECTOR OF TRANSPORTATION

THIRD STREET LIGHT RAIL PROGRAM
PHASE 2 – CENTRAL SUBWAY
TEMPORARY TBM RETRIEVAL SHAFT

BUILDING PROTECTION
GENERAL NOTES
LEGEND AND ABBREVIATIONS

CONTRACT NO. 1278
SFMTA CONTROL NO. CL-24633
DRAWING NO. BP-001
REVISION 0
SHEET NO. 27

T:\13285 CS DP1\CN 1278\Sheet Files\BP - Building Protection\ BP-001.dwg Llorico Wed May 29,2013 - 11:47 am BP-001

BORDER REVISED 03/25/2011

BUILDING EXTERIOR INSTRUMENTATION SCHEDULE

BUILDING BLOCK–LOT NO.	ADDRESS	AUTOMATED BUILDING SETTLEMENT MONITORING PRISM (BSP) INSTRUMENT NO.	MANUAL BUILDING SETTLEMENT MONITORING POINT (MSP) INSTRUMENT NO.	CRACK GAUGE (ALLOWANCE IN CONTRACT 1278)
XXXX–XXX		BSPX–XXXX–XXX–X	MSPX–XXXX–XXX–X	EA
0101–005	1717 POWELL STREET	BSP3–0101–005–1	–	8
		BSP3–0101–005–2	MSP3–0101–005–1	
		BSP3–0101–005–3	MSP3–0101–005–2	
		BSP3–0101–005–4	MSP3–0101–005–3	
		BSP3–0101–005–5	MSP3–0101–005–4	
		BSP3–0101–005–6	–	
0101–005A (FRONT)	1701–1709 POWELL STREET	BSP3–0101–005AF–1	MSP3–0101–005AF–1	6
		BSP3–0101–005AF–2	MSP3–0101–005AF–2	
		BSP3–0101–005AF–3	MSP3–0101–005AF–3	
		BSP3–0101–005AF–4	MSP3–0101–005AF–4	
0101–005A (BACK)		BSP3–0101–005AB–1	MSP3–0101–005AB–1	4
		BSP3–0101–005AB–2	MSP3–0101–005AB–2	
		–	MSP3–0101–005AB–3	
		–	MSP3–0101–005AB–4	
0101–006	728–730 UNION STREET	BSP3–0101–006–1	MSP3–0101–006–1	4
		BSP3–0101–006–2	MSP3–0101–006–2	
		–	MSP3–0101–006–3	
		–	MSP3–0101–006–4	
0101–007	732–736 UNION STREET	BSP3–0101–007–1	MSP3–0101–007–1	4
		BSP3–0101–007–2	MSP3–0101–007–2	
		–	MSP3–0101–007–3	
		–	MSP3–0101–007–4	
0101–007 A (FRONT)	738–742 UNION STREET	BSP3–0101–007AF–1	MSP3–0101–007AF–1	4
		BSP3–0101–007AF–2	MSP3–0101–007AF–2	
		–	MSP3–0101–007AF–3	
		–	MSP3–0101–007AF–4	
0101–007 A (BACK)		BSP3–0101–007AB–1	MSP3–0101–007AB–1	6
		BSP3–0101–007AB–2	MSP3–0101–007AB–2	
		BSP3–0101–007AB–3	MSP3–0101–007AB–3	
		BSP3–0101–007AB–4	MSP3–0101–007AB–4	
0101–008	774 UNION STREET	BSP3–0101–008–1	MSP3–0101–008–1	4
		BSP3–0101–008–2	MSP3–0101–008–2	
		BSP3–0101–008–3	MSP3–0101–008–3	
		BSP3–0101–008–4	MSP3–0101–008–4	
0101–031	721–725 FILBERT STREET	BSP3–0101–031–1	–	12
		BSP3–0101–031–2	MSP2–0101–031–1	
		BSP3–0101–031–3	MSP2–0101–031–2	
		BSP3–0101–031–4	MSP2–0101–031–3	
		BSP3–0101–031–5	MSP2–0101–031–4	
		BSP3–0101–031–6	–	
0101–045	659 COLUMBUS AVENUE	BSP3–0101–045–1	MSP3–0101–045–1	8
		BSP3–0101–045–2	MSP3–0101–045–2	
		BSP3–0101–045–3	MSP3–0101–045–3	
		BSP3–0101–045–4	MSP3–0101–045–4	

INCLINOMETER SCHEDULE

INSTRUMENT NO.	WALL	CASING LENGTH	NOTE	LOCATION
INC3–RS–01	EAST	SURFACE TO 10 FT BELOW BOTTOM OF WALL	CASING TO BE LOCATED OUTSIDE AND WITHIN 3 FT OF WALL	AS INDICATED ON BP–101
INC3–RS–02	WEST			
INC3–RS–03	NORTH	SURFACE TO BOTTOM OF WALL	ATTACH CASING TO WEB OF WIDE FLANGE	
INC3–RS–04	SOUTH			

OBSERVATION WELL SCHEDULE

INSTRUMENT NO.	SENSING ZONE	LOCATION
OBW3–RS–1	MINIMUM 20 FT WITHIN Qc (COLMA FORMATION) SEE NOTE 8	AS INDICATED ON BP–101
OBW3–RS–2		

SURFACE SETTLEMENT POINT SCHEDULE

INSTRUMENT NO.	LOCATION	TYPE
SSP3–RS–01	AS INDICATED ON BP–101	B
SSP3–RS–02		B
SSP3–RS–03		B
SSP3–RS–04		B
SSP3–RS–05		B
SSP3–RS–06		B

UTILITY INSTRUMENTATION SCHEDULE

UTILITY TYPE	DESCRIPTION	APPROX. LOCATION	INSTRUMENT NO.
AWSS	16" AWSS LINE ON POWELL STREET	AS INDICATED ON BP–101	UMP3–AWS–01
			UMP3–AWS–02
			UMP3–AWS–03
			UMP3–AWS–04
			UMP3–AWS–05
SEWER	5'x3' BRICK SEWER ON POWELL STREET	AS INDICATED ON BP–101	UMP3–SEW–01
			UMP3–SEW–02
			UMP3–SEW–03
			UMP3–SEW–04
			UMP3–SEW–05

BUILDING INTERIOR INSTRUMENTATION SCHEDULE

BLOCK	LOT	ADDRESS	MIN NO. OF LLS MEASURING PT.	MIN NO. OF TLT	VMP	LOCATION
			EA	EA	EA	
0101	005	1717 POWELL STREET	6	2	1	LOCATIONS TO BE DETERMINED BY CONTRACTOR IN THE FIELD SUBJECT TO ACCEPTANCE BY ENGINEER.
	031	721–725 FILBERT STREET	6	2	1	
	045	659 COLUMBUS AVENUE	4	2	1	
		TOTAL	16	6	3	

NOTES:

1. CONTRACTOR SHALL INSTALL AND MONITOR ALL CONTRACT 1278 INSTRUMENTATION AS SHOWN IN SCHEDULE.
2. FOR ALL OTHER INSTRUMENTATION NOT SHOWN ON THE DRAWINGS (I.E. CRG, LLS, MSP, TLT, SG, BENCHMARK AND PORTABLE SEISMOGRAPH, ETC.), COMPLY WITH THE REQUIREMENTS OF SPECIFICATION SECTION 31 09 13, GEOTECHNICAL INSTRUMENTATION AND MONITORING, FOR LOCATIONS AND QUANTITY.
3. THE LOCATIONS OF INSTRUMENTATION DEVICES ON PLAN ARE SHOWN GRAPHICALLY. EXACT LOCATIONS AND ELEVATIONS SHALL BE DETERMINED AND CONFIRMED BY THE CONTRACTOR IN THE FIELD SUBJECT TO APPROVAL BY THE ENGINEER.
4. MANUAL BUILDING SETTLEMENT MONITORING POINT LOCATIONS ARE NOT SHOWN ON PLAN AND WILL BE DETERMINED BY CONTRACTOR WITH ACCEPTANCE BY THE ENGINEER.
5. LOCATIONS OF BUILDING INTERIOR INSTRUMENTATION POINTS SHALL BE DETERMINED BY CONTRACTOR SUBJECT TO ACCEPTANCE BY THE ENGINEER.
6. CRACK GAUGES ARE TO BE USED TO MONITOR EXISTING CRACKS OBSERVED DURING PRE–CONSTRUCTION SURVEY. SURVEYS AND LOCATIONS TO BE DETERMINED IN THE FIELD AND RECORDED ON DRAWINGS PRIOR TO CONSTRUCTION.
7. FOR CONTRACT INTERFACE, REFER TO SPECIFICATION SECTION 01 12 19.
8. OBSERVATION WELL SENSING ZONE TO BE APPROVED BY THE ENGINEER IN THE FIELD AT TIME OF INSTALLATION.
9. MAINTAIN ACCESS TO INCLINOMETER CASING AT ALL TIMES, IF CUT OR COVERED, PROVIDE MEANS AND METHODS FOR RESTORATION OF ACCESS.

T:\13285 CS DP1\CN 1278\Sheet Files\BP – Building Protection\ BP–011.dwg Llorico Wed May 29,2013 – 11:05 am BP–011

DATE	DESCRIPTION	REV. NO.	BY	CHECKED	APPROVED
05/31/2013	ISSUED FOR BID	0			

BORDER REVISED 03/25/2011

PB TELAMON
PB PARSONS BRINCKERHOFF

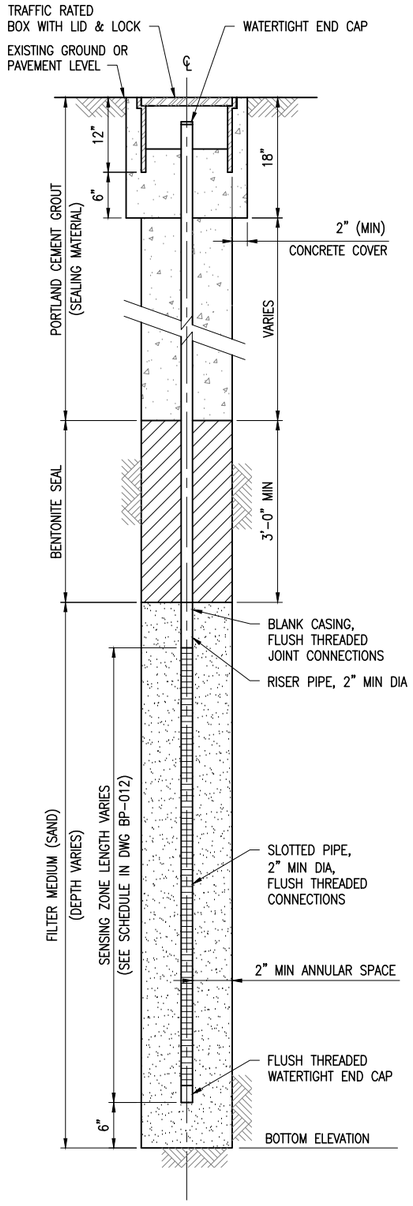
DESIGNED S. KIM
DRAWN O. KURNOVSKAYA
CHECKED K. JOHNSON
REVIEWED D. ABRAHAMS
RECOMMENDED M. FOWLER
APPROVED R. EDWARDS
DATE 05/31/2013

CITY AND COUNTY OF SAN FRANCISCO
MUNICIPAL TRANSPORTATION AGENCY
APPROVED
DIRECTOR OF TRANSPORTATION

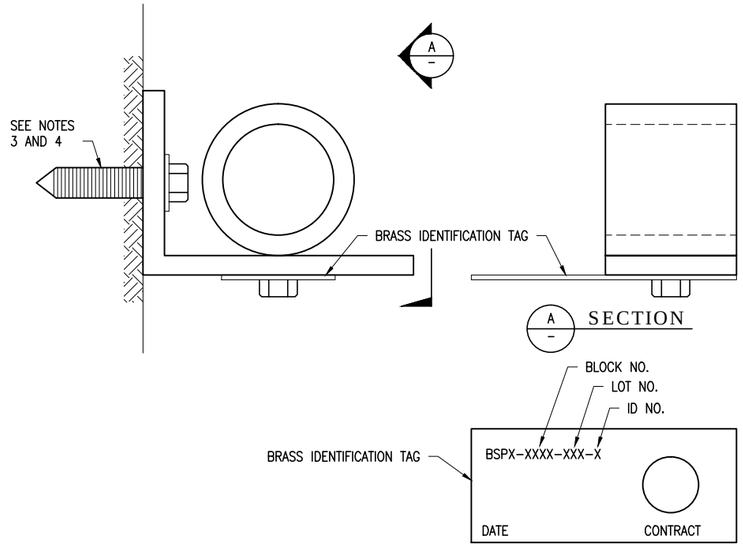
THIRD STREET LIGHT RAIL PROGRAM
PHASE 2 – CENTRAL SUBWAY
TEMPORARY TBM RETRIEVAL SHAFT

BUILDING PROTECTION
INSTRUMENTATION SCHEDULE

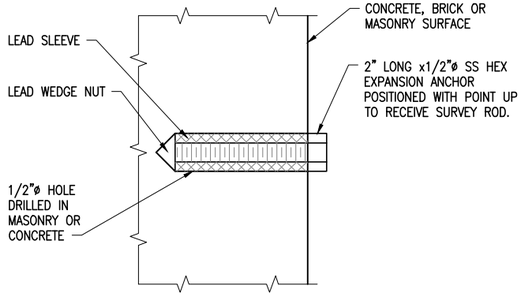
CONTRACT NO. 1278
SFMTA CONTROL NO. CL–24634
DRAWING NO. BP–011
REVISION 0
SHEET NO. 28



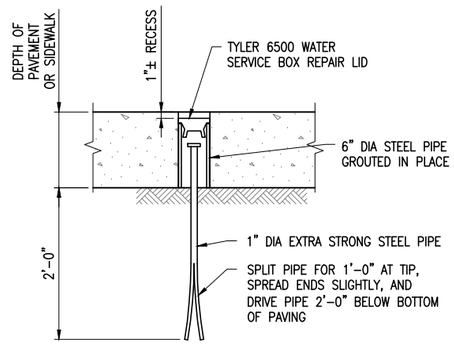
◇0 OBSERVATION WELL (OBW) /
◇P PIEZOMETER (PZM)



△● AUTOMATED BUILDING SETTLEMENT
MONITORING PRISM (BSP)



● MANUAL BUILDING SETTLEMENT
MONITORING POINT (MSP)
SEE NOTES 1 AND 2



S TYPE B
SURFACE SETTLEMENT POINT (SSP)

NOTES:

1. PLACE IN VERTICAL POSITION FOR HORIZONTAL SURFACES (USE ROUNDED HEAD)
2. FOR SURFACE OTHER THAN CONCRETE, BRICK OR MASONRY, GLUE TO SURFACE.
3. ANCHOR WITH A WASHER EITHER INTO SOUND CONCRETE ENCASEMENT OR INTO STEEL MEMBERS. AT BUILDING FACADES ANCHOR WITH A WASHER INTO STRUCTURAL ELEMENTS.
4. SHIM AS REQUIRED FOR LEVELING/PLUMBING OF THE DEVICE.

DATE	DESCRIPTION	REV. NO.	BY	CHECKED	APPROVED
05/31/2013	ISSUED FOR BID	0			

BORDER REVISED 03/25/2011

PB TELAMON
PB PARSONS BRINCKERHOFF

DESIGNED S. KIM
DRAWN O. KURNOVSKAYA
CHECKED K. JOHNSON
REVIEWED D. ABRAHAMS
RECOMMENDED M. FOWLER
APPROVED R. EDWARDS
DATE 05/31/2013

CITY AND COUNTY OF SAN FRANCISCO
MUNICIPAL TRANSPORTATION AGENCY

APPROVED

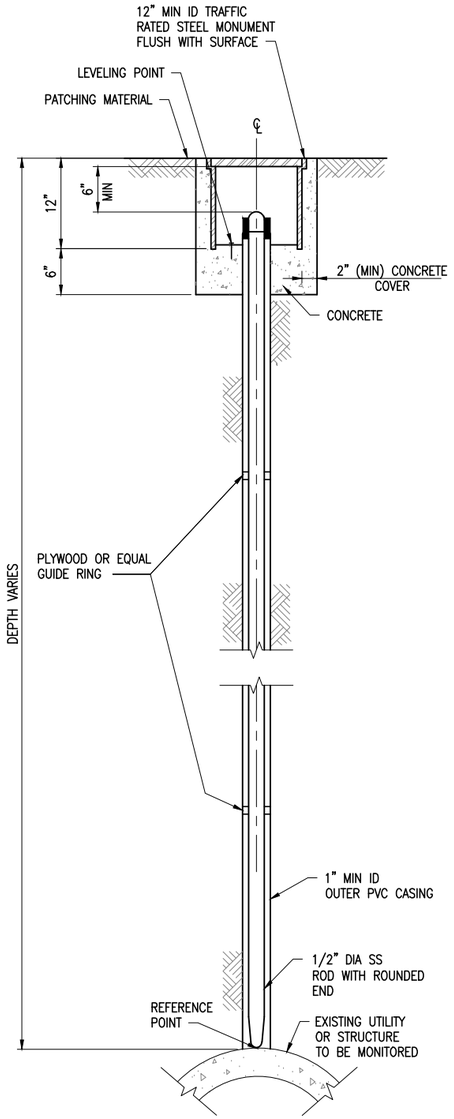
DIRECTOR OF TRANSPORTATION

THIRD STREET LIGHT RAIL PROGRAM
PHASE 2 – CENTRAL SUBWAY
TEMPORARY TBM RETRIEVAL SHAFT

BUILDING PROTECTION
INSTRUMENTATION DETAILS
SHEET 1 OF 3

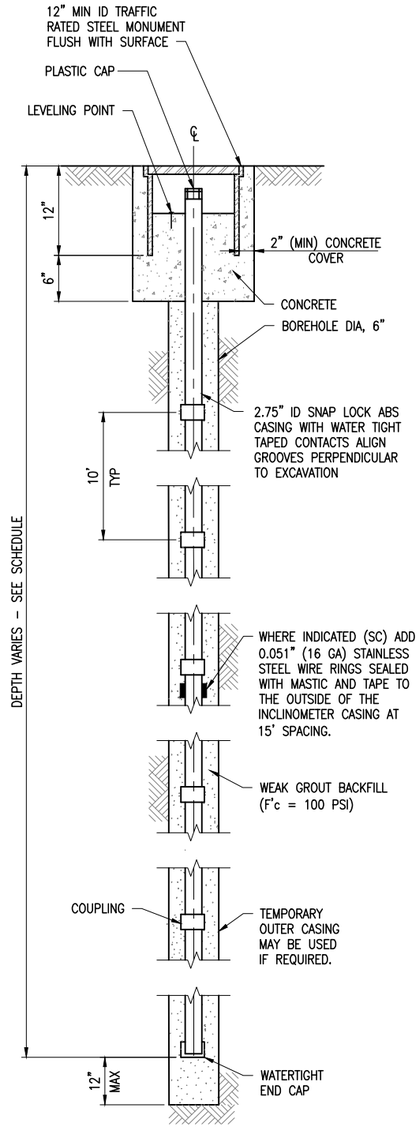
CONTRACT NO. 1278
SFMTA CONTROL NO. CL-24635
DRAWING NO. BP-021
REVISION 0
SHEET NO. 29

T:\13285 CS DP1\CN 1278\Sheet Files\BP – Building Protection\ BP-021.dwg Llorico Tue May 28,2013 – 8:02 pm BP-021



Ⓤ UTILITY MONITORING POINT (UMP)

SEE NOTES 4–7

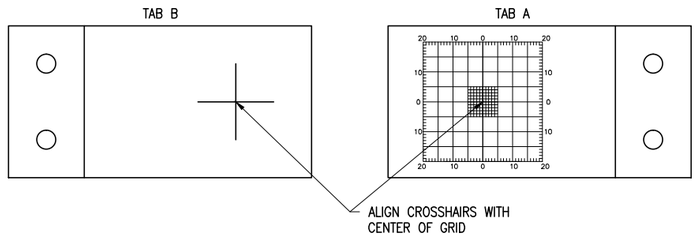


Ⓘ INCLINOMETER (INC)

SEE NOTE 6

NOTES:

1. ATTACH TAB A ON ONE SIDE OF CRACK USING GLUE OR ANCHOR BOLTS.
2. ALIGN CROSSHAIRS ON TAB B WITH CENTER OF GRID ON TAB A. ATTACH TAB B WITH GLUE OR ANCHOR BOLTS ON OTHER SIDE OF CRACK.
3. CRACK GAUGES TO BE USED TO MONITOR EXTERNAL CRACKS OBSERVED DURING PRE–CONSTRUCTION SURVEYS. LOCATIONS TO BE DETERMINED IN FIELD AND RECORDED ON DRAWINGS BEFORE START OF EXCAVATION OF THE STATION.
4. THE CONTRACTOR SHALL REPORT THE LENGTH OF THE ROD TO THE NEAREST HUNDREDTH OF A FOOT TO THE ENGINEER.
5. PLYWOOD OR EQUAL SHALL BE A PRESS FIT TO THE 1/2"ø SS ROD AND SHALL FLOAT IN THE GUIDE PIPE.
6. MONITORING HOLE COVER AND FRAME ASSEMBLIES SHALL BE RATED FOR H–20 LOADING.
7. CONTRACTOR SHALL RESTORE ROADWAY TO (E) CONDITIONS UPON COMPLETION OF SURVEY WORK.



CG CRACK GAUGE (CRG)

SEE NOTES 1–3

DATE	DESCRIPTION	REV. NO.	BY	CHECKED	APPROVED
05/31/2013	ISSUED FOR BID	0			

BORDER REVISED 03/25/2011

PB TELAMON

PB PARSONS BRINCKERHOFF

DESIGNED	S. KIM
DRAWN	O. KURNOVSKAYA
CHECKED	K. JOHNSON
REVIEWED	D. ABRAHAMS
RECOMMENDED	M. FOWLER
APPROVED	R. EDWARDS
DATE	05/31/2013

CITY AND COUNTY OF SAN FRANCISCO
MUNICIPAL TRANSPORTATION AGENCY

APPROVED

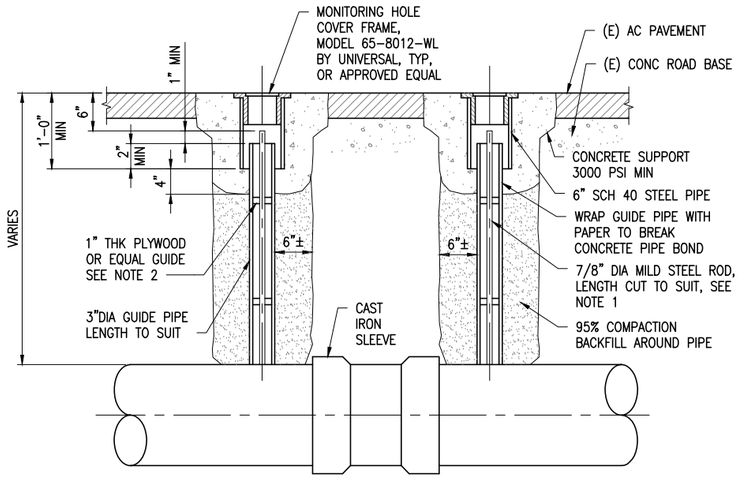
DIRECTOR OF TRANSPORTATION

THIRD STREET LIGHT RAIL PROGRAM
PHASE 2 – CENTRAL SUBWAY
TEMPORARY TBM RETRIEVAL SHAFT

BUILDING PROTECTION
INSTRUMENTATION DETAILS
SHEET 2 OF 3

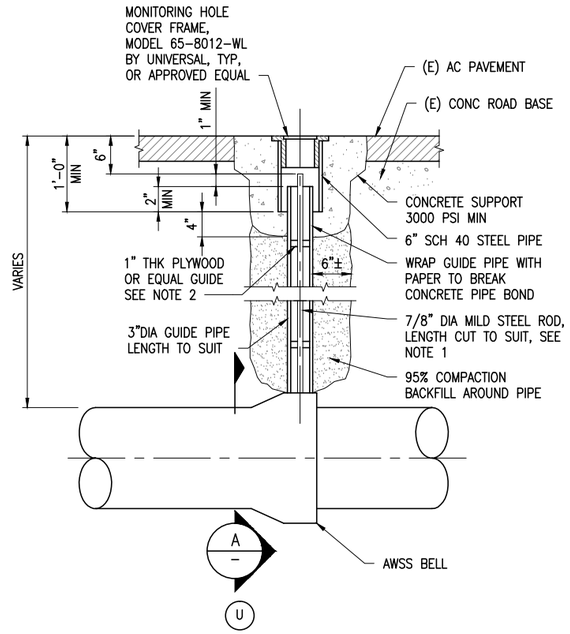
CONTRACT NO.	1278
SFMTA CONTROL NO.	CL–24636
DRAWING NO.	BP–022
REVISION	0
SHEET NO.	30

T:\13285 CS DP1\CN 1278\Sheet Files\BP – Building Protection\ BP–022.dwg Llorico Tue May 28,2013 – 8:02 pm BP–022



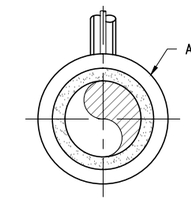
(U)

UTILITY MONITORING POINT
FOR AWSS DOUBLE SPIGOT PIPE
SEE NOTES 1-4



(U)

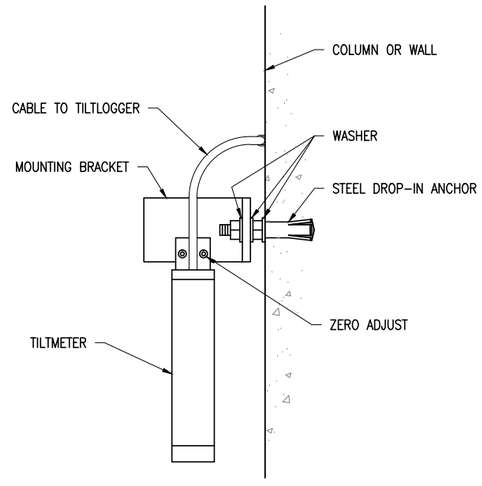
UTILITY MONITORING POINT
FOR AWSS BELL AND SPIGOT PIPE
SEE NOTES 1-4



(A) SECTION

NOTES:

1. THE CONTRACTOR SHALL REPORT THE LENGTH OF THE ROD TO THE NEAREST HUNDREDTH OF A FOOT TO THE ENGINEER.
2. PLYWOOD OR EQUAL SHALL BE A PRESS FIT TO THE 7/8"ø STEEL ROD AND SHALL FLOAT FREELY IN THE GUIDE PIPE.
3. MONITORING HOLE COVER AND FRAME ASSEMBLIES SHALL BE RATED FOR H-20 LOADING.
4. CONTRACTOR SHALL RESTORE ROADWAY TO (E) CONDITIONS UPON COMPLETION OF SURVEY WORK.



TILTMETER

DATE	DESCRIPTION	REV. NO.	BY	CHECKED	APPROVED
05/31/2013	ISSUED FOR BID	0			

BORDER REVISED 03/25/2011

PB TELAMON
PB PARSONS BRINCKERHOFF

DESIGNED S. KIM
DRAWN O. KURNOVSKAYA
CHECKED K. JOHNSON
REVIEWED D. ABRAHAMS
RECOMMENDED M. FOWLER
APPROVED R. EDWARDS
DATE 05/31/2013

CITY AND COUNTY OF SAN FRANCISCO
MUNICIPAL TRANSPORTATION AGENCY

APPROVED

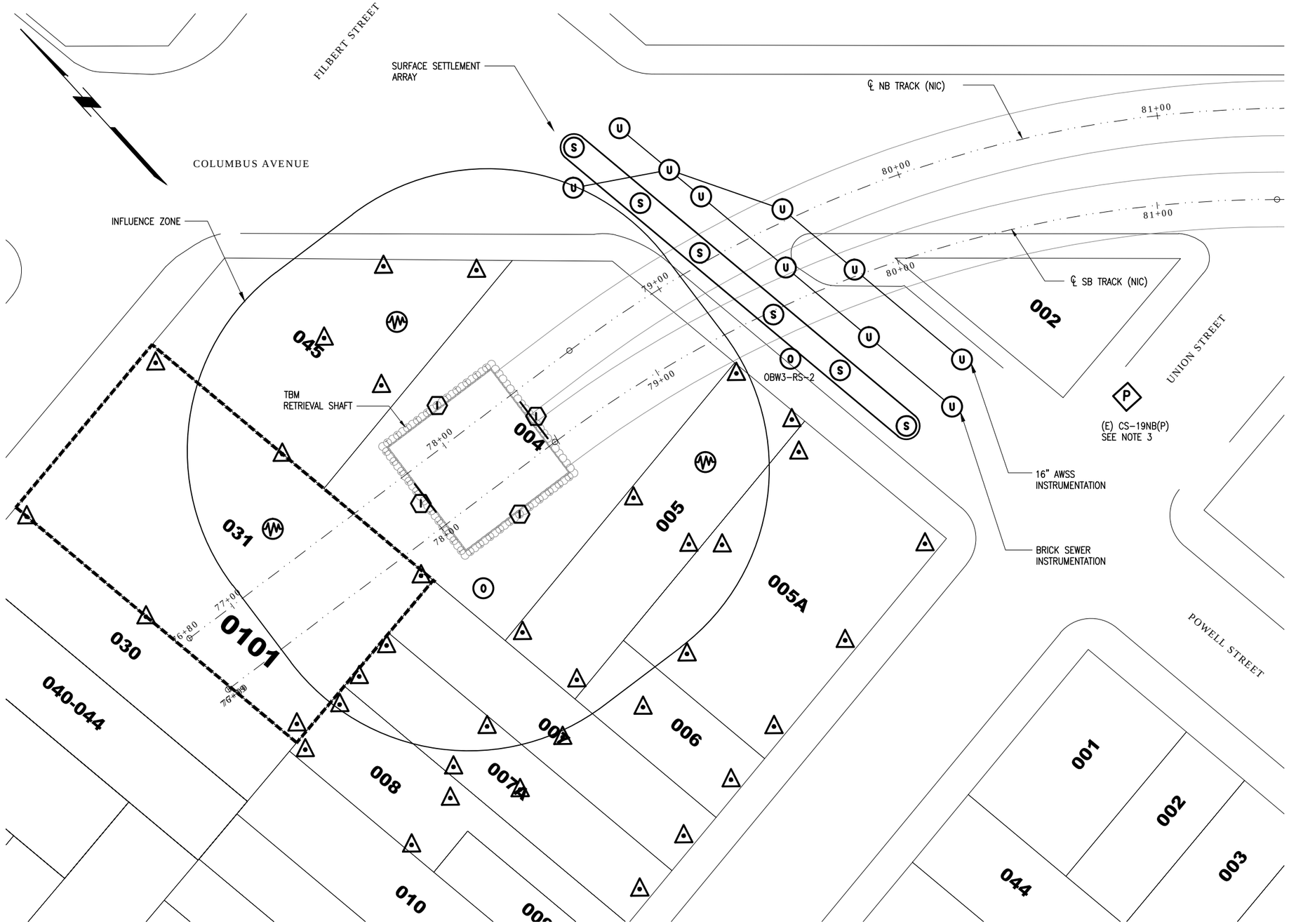
DIRECTOR OF TRANSPORTATION

THIRD STREET LIGHT RAIL PROGRAM
PHASE 2 – CENTRAL SUBWAY
TEMPORARY TBM RETRIEVAL SHAFT

BUILDING PROTECTION
INSTRUMENTATION DETAILS
SHEET 3 OF 3

CONTRACT NO. 1278
SFMTA CONTROL NO. CL-24637
DRAWING NO. BP-023
REVISION 0
SHEET NO. 31

T:\13285 CS DP1\CN 1278\Sheet Files\BP - Building Protection\ BP-023.dwg Llorico Tue May 28,2013 - 8:03 pm BP-023



INSTRUMENTATION INSTALLATION SUMMARY TABLE (THIS DRAWING ONLY)		
SYMBOL	INSTRUMENT TYPE	QUANTITY (THIS DRAWING)
△	AUTOMATED BUILDING SETTLEMENT POINT (PRISM ON BUILDING ROOF TOP OR WALL FOR TOTAL STATION MONITORING)	36
S	SURFACE SETTLEMENT POINT (TYPE B)	6
U	UTILITY MONITORING POINT (SUBSURFACE ROD ON UTILITY FOR OPTICAL LEVELING MONITORING)	10
I	INCLINOMETER	4
P	(E) PIEZOMETER	1
O	OBSERVATION WELL	2
	VIBRATION MONITORING POINT (IN-PLACE SEISMOGRAPH)	3

NOTE:

1. LOCATIONS OF INSTRUMENT POINTS ARE SHOWN AS APPROXIMATE ONLY. UMP FOR UTILITY MONITORING SHALL BE INSTALLED DIRECTLY ABOVE CORRESPONDING UTILITY. ACTUAL LOCATIONS TO BE DETERMINED IN THE FIELD BY CONTRACTOR IN ACCORDANCE WITH SCHEDULE IN DWG BP-011, SPECIFICATION SECTION 31 09 13, GEOTECHNICAL INSTRUMENTATION AND MONITORING, AND SECTION 31 09 15, STRUCTURAL INSTRUMENTATION AND MONITORING, SUBJECT TO APPROVAL BY THE ENGINEER.
2. SEE NOTES ON DWG BP-011.
3. (E) CS-19NB(P) PIEZOMETER TO BE MONITORED IN ADDITION TO OBSERVATION WELLS INSTALLED DURING THIS CONTRACT.

LEGEND:

HISTORIC BUILDING. SEE SPECIFICATION SECTION 01 57 19 ENVIRONMENTAL MITIGATION AND MEASURES.

20' 0 20' 40'

SCALE = 1"=20'

DATE	DESCRIPTION	REV. NO.	BY	CHECKED	APPROVED
05/31/2013	ISSUED FOR BID	0			

PB TELAMON
PB PARSONS BRINCKERHOFF

DESIGNED S. KIM
DRAWN O. KURNOVSKAYA
CHECKED K. JOHNSON
REVIEWED D. ABRAHAMS
RECOMMENDED M. FOWLER
APPROVED R. EDWARDS
DATE 05/31/2013

CITY AND COUNTY OF SAN FRANCISCO
MUNICIPAL TRANSPORTATION AGENCY
APPROVED
DIRECTOR OF TRANSPORTATION

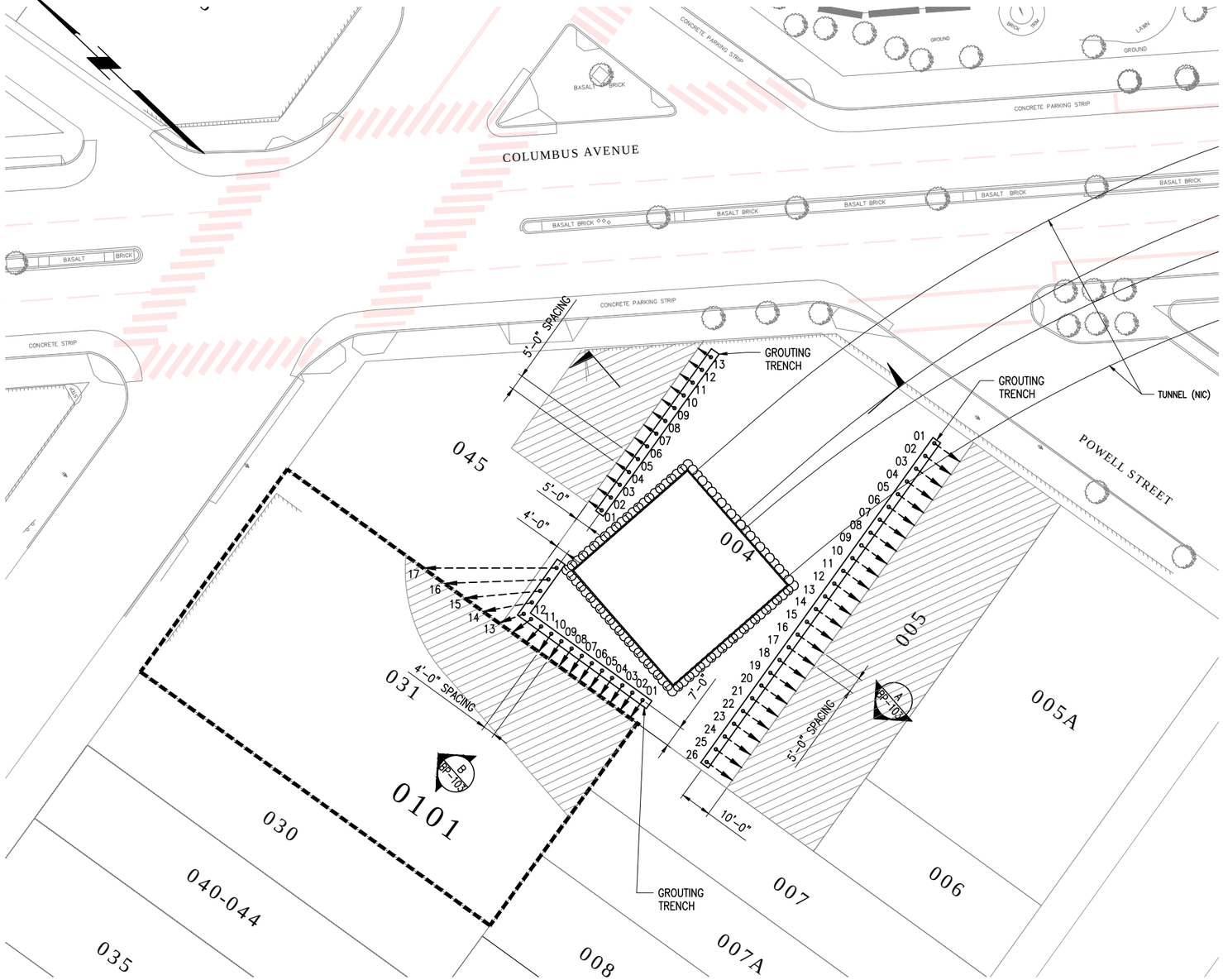
THIRD STREET LIGHT RAIL PROGRAM
PHASE 2 – CENTRAL SUBWAY
TEMPORARY TBM RETRIEVAL SHAFT

BUILDING PROTECTION INSTRUMENTATION PLAN

CONTRACT NO. 1278
SFMTA CONTROL NO. CL-24638
DRAWING NO. BP-101
REVISION 0
SHEET NO. 32

BORDER REVISED 03/25/2011

T:\13285 CS DP1\CN 1278\Sheet Files\BP – Building Protection\ BP-101.dwg Llorico Wed May 29,2013 – 11:09 am BP-101



PLAN

NOTES:

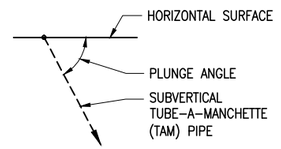
1. MITIGATION REQUIRED BUILDINGS SHALL BE SUBJECT TO COMPENSATION GROUTING OPERATION REQUIREMENTS SPECIFIED IN THE SPECIFICATION SECTION 31 43 14.
2. CONTRACTOR SHALL PERFORM PRE-CONSTRUCTION SURVEY OF THE EXISTING BUILDINGS AND UTILITIES IN ACCORDANCE WITH SPECIFICATION SECTION 31 09 13 AND SECTION 31 09 15.
3. SETTLEMENT AND ANGULAR DISTORTION OF BUILDINGS SHALL BE LIMITED TO THE REQUIREMENTS SPECIFIED IN THE SPECIFICATION SECTION 31 09 15. STRUCTURAL INSTRUMENTATION AND MONITORING.

   A. FOR MITIGATION REQUIRED BUILDINGS, COMPLY WITH REQUIREMENTS FOR "GROUP A BUILDINGS."
4. GROUTING PRESSURE AND VOLUME OF GROUT PER INJECTION SHALL BE DETERMINED BY THE CONTRACTOR SUBJECT TO APPROVAL BY THE ENGINEER. GROUTING METHOD SHALL BE DESIGNED TO CAUSE NO DAMAGE TO EXISTING BUILDINGS FOUNDATION SYSTEM.

LEGEND:

MINIMUM BUILDING FOOTPRINT TO BE STABILIZED WITH COMPENSATION GROUTING

HISTORIC BUILDING



COMPENSATION GROUTING ARRAY SCHEDULE

HOLE ID	DIRECTION	PLUNGE ANGLE (DEGREE)	PIPE LENGTH (FT)
005-01 TO 005-04	PERPENDICULAR TO PROPERTY LINE	71	28
005-05 TO 005-26		72.5	30.5
031-01 TO 031-11		81	40
031-12	AS INDICATED ON THIS DRAWING	81	40
031-13		81	40
031-14		64	34
031-15		51.5	37
031-16		39	42
031-17		33	46.5
045-01 TO 045-07	PERPENDICULAR TO PROPERTY LINE	85	52
045-08 TO 045-13		82.5	34.5

20' 0 20' 40'

SCALE = 1"=20'

DATE	DESCRIPTION	REV. NO.	BY	CHECKED	APPROVED
05/31/2013	ISSUED FOR BID	0			

BORDER REVISED 03/25/2011

PB TELAMON

PB PARSONS BRINCKERHOFF

DESIGNED	S. KIM
DRAWN	O. KURNOVSKAYA
CHECKED	K. JOHNSON
REVIEWED	D. ABRAHAMS
RECOMMENDED	M. FOWLER
APPROVED	R. EDWARDS
DATE	05/31/2013

CITY AND COUNTY OF SAN FRANCISCO
MUNICIPAL TRANSPORTATION AGENCY

APPROVED

DIRECTOR OF TRANSPORTATION

THIRD STREET LIGHT RAIL PROGRAM
PHASE 2 – CENTRAL SUBWAY
TEMPORARY TBM RETRIEVAL SHAFT

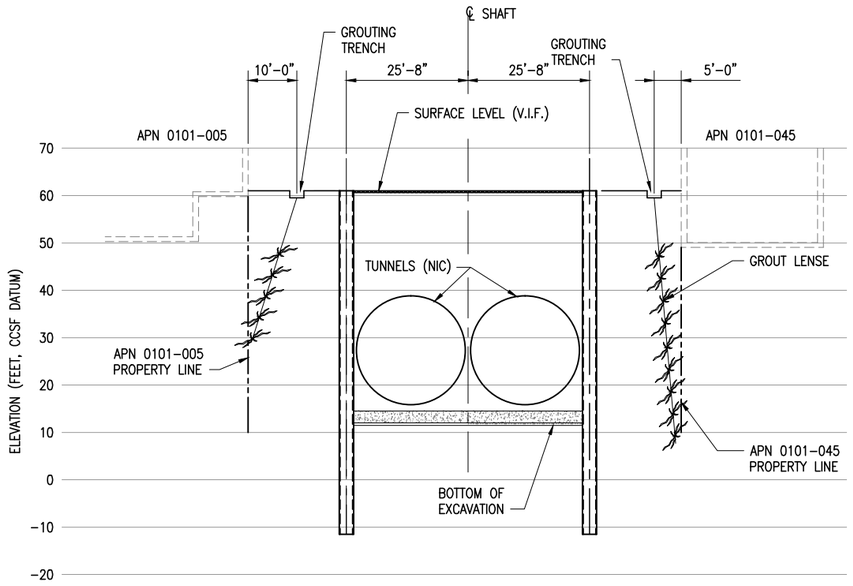
BUILDING PROTECTION
COMPENSATION GROUTING
SHEET 1 OF 2

CONTRACT NO.	1278
SFMTA CONTROL NO.	CL-24639
DRAWING NO.	BP-102
REVISION	0
SHEET NO.	33

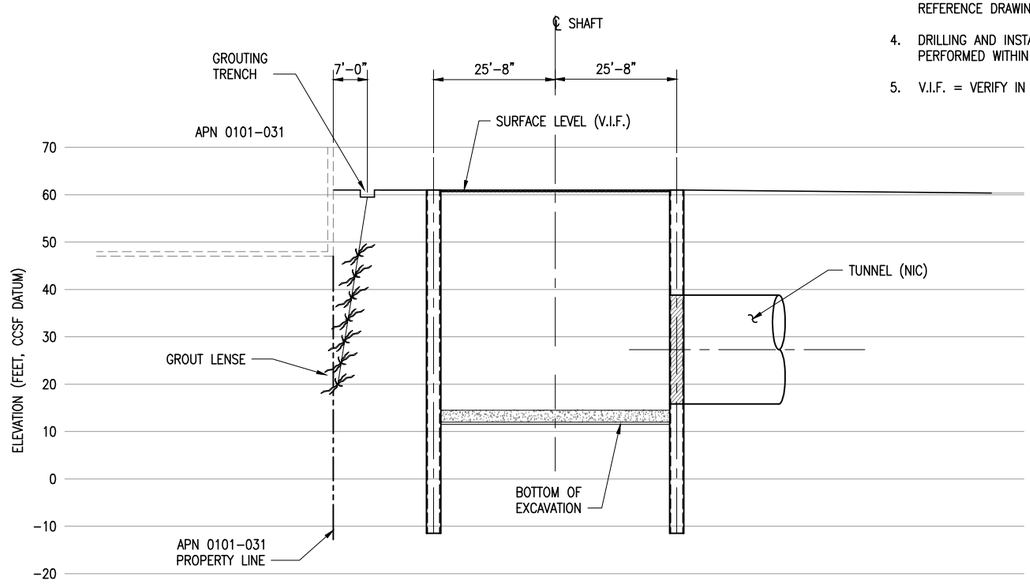
T:\13285 CS DP1\CN 1278\Sheet Files\BP – Building Protection\ BP-102.dwg Llorico Wed May 29,2013 – 11:10 am BP-102

NOTES:

1. INDICATED GROUT LENSE SHAPE AND EXTENT ARE FOR ILLUSTRATION PURPOSES ONLY. CONTRACTOR SHALL DETERMINE PRESSURES AND FLOW RATES TO ACHIEVE REQUIRED VOID FILLING AND SETTLEMENT CONTROL.
2. LIMITS AND EXTENTS OF EXISTING BUILDINGS ARE APPROXIMATE AND DO NOT REFLECT THE ACTUAL POSITION. CONTRACTOR SHALL FIELD VERIFY ALL EXISTING DIMENSIONS OF BUILDINGS PRIOR TO COMPENSATION GROUTING.
3. CONTRACTOR TO BUILD GROUTING TRENCHES SO THAT GROUT INJECTION PIPE END IS BELOW WORKING SURFACE. TRENCH SHALL BE RECTANGULAR WITH NEAT SIDES. PLACE STEEL PLATE OVER TRENCH WHEN NOT IN USE. SIZE OF TRENCH SHALL BE DETERMINED BY CONTRACTOR. CUT AND REMOVE PARTS OF EXISTING BASEMENT SLAB AND FOUNDATION AS REQUIRED FOR TRENCHING AND DRILLING. SEE REFERENCE DRAWINGS.
4. DRILLING AND INSTALLATION OF TAM PIPE SHALL BE PERFORMED WITHIN PROJECT SITE LIMIT.
5. V.I.F. = VERIFY IN THE FIELD.



A BP–102 SECTION



B BP–102 SECTION

16' 0 8' 16' 24' 32'

SCALE: 1/16"=1'–0"

DATE	DESCRIPTION	REV. NO.	BY	CHECKED	APPROVED
05/31/2013	ISSUED FOR BID	0			

PB TELAMON

PB PARSONS BRINCKERHOFF

DESIGNED S. KIM
DRAWN O. KURNOVSKAYA
CHECKED K. JOHNSON
REVIEWED D. ABRAHAMS
RECOMMENDED M. FOWLER
APPROVED R. EDWARDS
DATE 05/31/2013

CITY AND COUNTY OF SAN FRANCISCO
MUNICIPAL TRANSPORTATION AGENCY

APPROVED

DIRECTOR OF TRANSPORTATION

THIRD STREET LIGHT RAIL PROGRAM
PHASE 2 – CENTRAL SUBWAY
TEMPORARY TBM RETRIEVAL SHAFT

BUILDING PROTECTION
COMPENSATION GROUTING
SHEET 2 OF 2

CONTRACT NO. 1278
SFMTA CONTROL NO. CL–24640
DRAWING NO. BP–103
REVISION 0
SHEET NO. 34

BORDER REVISED 03/25/2011

T:\13285 CS DP1\CN 1278\Sheet Files\BP – Building Protection\ BP–103.dwg Llorico Wed May 29,2013 – 11:10 am BP–103