SECTION 5 BOXES AND VAULTS CONTENTS

10"X15" BOX CONCRETE NON-TRAFFIC - VB0050U

17"X30" BOX CONCRETE H-10 TRAFFIC - VB0052U

17"X30" BOX CONCRETE H-20 TRAFFIC - VB0057U

30"X48" BOX NON-CONCRETE H-10 TRAFFIC - VB0060U

504 VAULT CONCRETE SECONDARY & 1ØPRIMARY - VB0065U

573 VAULT CONCRETE MAINTENANCE ONLY - VB0067U

557 VAULT CONCRETE PRIMARY - VB0071U

612 VAULT CONCRETE PRIMARY - VB0085U

814 VAULT CONCRETE PRIMARY - VB0090U

818 VAULT CONCRETE PRIMARY - VB0095U

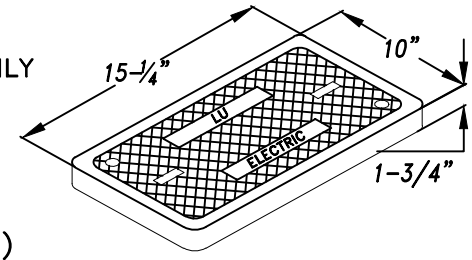
DESIGN GUIDE FOR CUSTOMER OWNED TRANSFORMER VAULTS - VB0100U

LADDER, LADDER-UP, STEP RUNG & MANHOLE RISERS & COVER - VB0105U

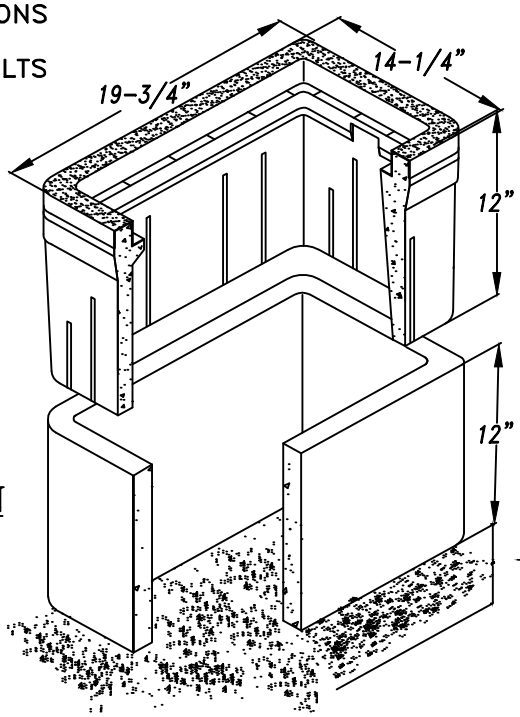
ALTERNATE VAULT GROUNDING DETAIL - VB0115U

10" x 15" BOX
NON-TRAFFIC CONCRETE
ISOMETRIC DETAIL

STREET LIGHTS ONLY



LID A
8800–241182
(INCIDENTAL/ NON)
TRAFFIC APPLICATIONS
FIBRELYTE LID
W/HOLD DOWN BOLTS



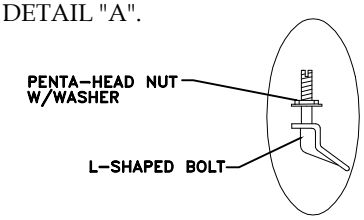
N–9 BOX
8800–240020

EXTENSION
8800–240470

APPLICATIONS:
NON/INCIDENTAL TRAFFIC
6" 3/4" DRAIN ROCK

CONSTRUCTION NOTES

1. BOX TO BE USED IN NON/ INCIDENTAL TRAFFIC APPLICATIONS ONLY ONLY. SEE TE0001U, SECTION 2.
2. BOX TO BE PLACED ON 6" OF 3/ 4" DRAIN ROCK. SEE TE0020U, BOX PLAN VIEW.
3. BOX REQUIRES 1 EXTENSION.
4. ALL LIDS/COVERS TO BE MARKED "LU ELECTRIC".
5. CONCRETE LIDS NOT APPROVED.
6. LID TO BE SECURED W/2 L-SHAPED BOLTS WITH PENTA HEAD NUTS. SEE DETAIL "A".



DETAIL A

STK#	DESCRIPTION	WEIGHT (LBS)
8800-240020	CONCRETE ST LIGHT BOX	85
8800-240470	12" CONCRETE EXTENSION	82
8800-241182	FIBERLYTE LID WITH HOLD DOWN NOLTS LID A	21

MAXIMUM CONDUCTORS	
N-9 BOX	SECONDARY
	2 RUNS OF #2TX AND 1 SET OF #10 ST LIGHT WIRES
NOTE: REFER TO CAB09U UNDERGROUND FOR COMPLETE APPLICATION	

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DRAWN	DESIGN	SUPR	DATE	REV
LL	ET	JM	08/17	04

ENGINEERING & CONSTRUCTION STANDARD

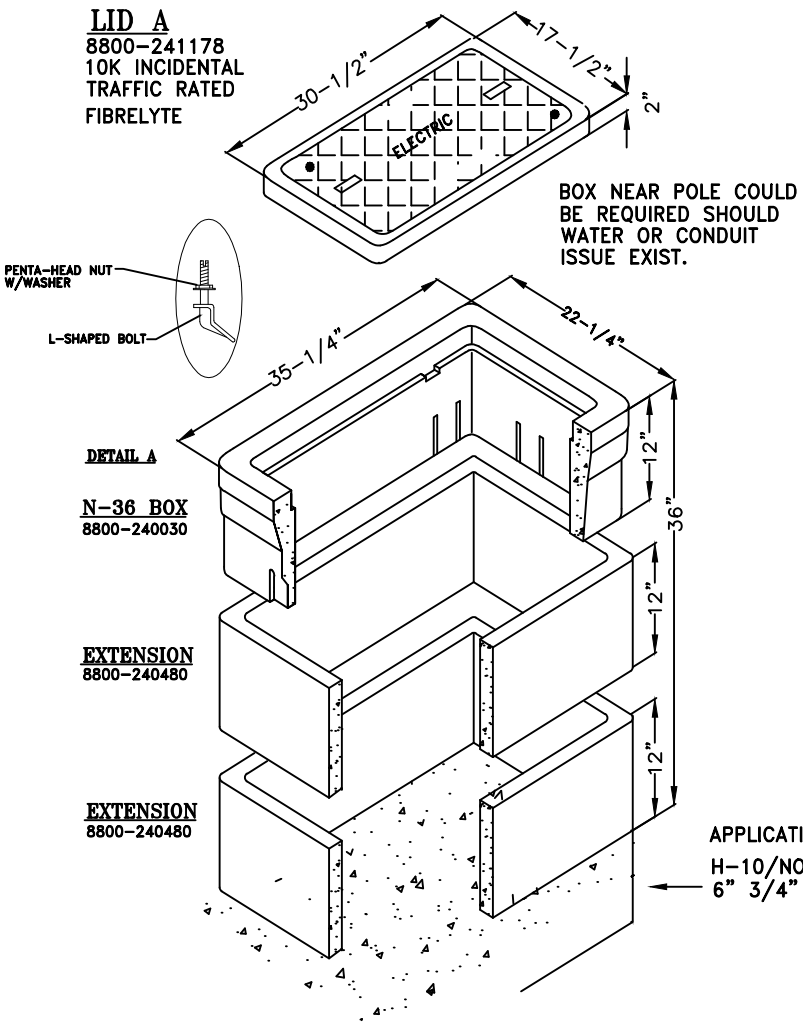
10" X 15" BOX
NON-TRAFFIC CONCRETE
15-1/4" X 10" I.D.

5.2.3 OF 40

SUBSTRUCTURE

DRAWING NUMBER
VB0050U

17" X 30" BOX CONCRETE
H-10 TRAFFIC RATED
ISOMETRIC DETAIL



CONSTRUCTION NOTES

1. BOX TO BE USED IN H-10, NON AND INCIDENTAL TRAFFIC APPLICATIONS. 10KLID (LID A) IS NO TRAFFIC 20KLID IS OCCASIONAL RESIDENTIAL DRIVEWAY TRAFFIC SEE TE0001U, SECTION 3.
2. INSTALLATION:
   BOX TO BE PLACED ON 6" OF 3/4" DRAINROCK. SEE TE0020U 3.9.43 - 3.9.45
3. BOX REQUIRES 2 EXTENSIONS.
4. ALL LIDS/COVERS TO BE MARKED "LU ELECTRIC".
5. LID TO BE SECURED W/2 L-SHAPED BOLTS WITH PENTA HEAD NUTS. SEE DETAIL "A"
6. AT INSPECTORS DISCRETION, THE USE OF THE SECOND EXTENSION COULD BE ELIMINATED.

STK#	DESCRIPTION	WEIGHT (LBS)
8800-240460	TRAFFIC A-10 RATED N48	376
8800-240060	EXTENSION 30"X48" H-10	376
8800-241190	LID: 2PC,FOR 30"X48" SPLICE BOX	396

MAXIMUM CONDUCTORS			
N-48 BOX	MAX RUNS	≤ 750 TX OR QX	≤ 350 TX OR QX
1 PHASE	6	2	4
3 PHASE	6	2	4
NOTE: REFER TO CAB 09U UNDERGROUND FOR COMPLETE APPLICATION			

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ENGINEERING & CONSTRUCTION STANDARD

17" X 30" BOX H-10 TRAFFIC CONCRETE

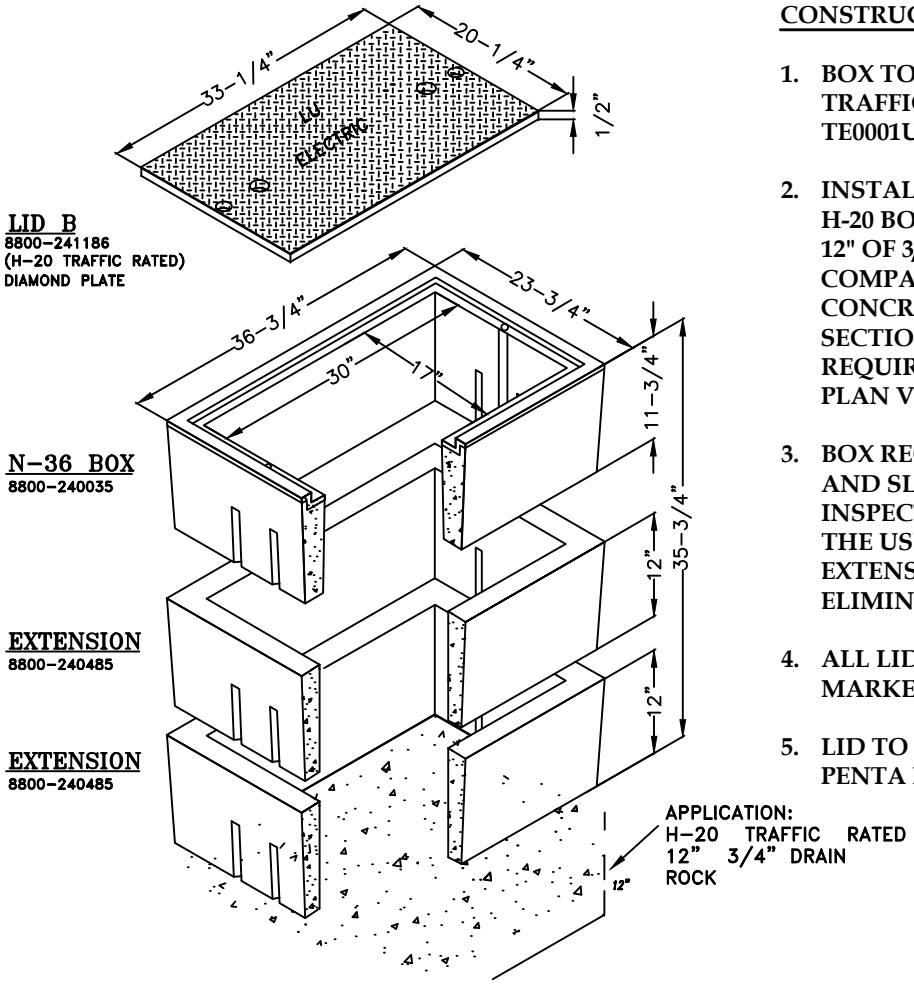
5.3.4 OF 40

SUBSTRUCTURE

DRAWING NUMBER

VB0052U

17" X 30" BOX H-20 TRAFFIC RATED CONCRETE ISOMETRIC DETAIL



CONSTRUCTION NOTES

1. BOX TO BE USED IN H-20 TRAFFIC APPLICATIONS. SEE TE0001U, SECTION 2.
2. INSTALLATION:
   H-20 BOX TO BE PLACED ON 12" OF 3/4" DRAINROCK, COMPACTED TO 95%. A FULL CONCRETE WRAP OF THE TOP SECTION OF BOX WILL BE REQUIRED. SEE TE0020U, "BOX PLAN VIEW"
3. BOX REQUIRES 2 EXTENSIONS AND SLAB BASE. AT INSPECTORS DISCRETION THE USE OF THE SECOND EXTENSION COULD BE ELIMINATED.
4. ALL LIDS/COVERS TO BE MARKED "LU ELECTRIC".
5. LID TO BE SECURED WITH 2 PENTA HEAD BOLTS.

STK#	DESCRIPTION	WEIGHT (LBS)
8800-240035	CONCRETE H-20 BOX WITH SLAB BASE	318 113
8800-240485	12" CONC. EXTN H-20	244
8800-241186	LID B H-20 RATED PLATE	111

MAXIMUM CONDUCTORS			
N-36 BOX	MAX RUNS	≤ 350 TX OR QX	≤ 4/0 TX OR QX
1 PHASE	6	3	4
3 PHASE	4	3	4
NOTE: REFER TO CAB 09U UNDERGROUND FOR COMPLETE APPLICATION			

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LL	ET	JM	08/17	04

ENGINEERING & CONSTRUCTION STANDARD

17" X 30" BOX H-20 TRAFFIC RATED CONCRETE

5.4.5 OF 40

SUBSTRUCTURE

DRAWING NUMBER

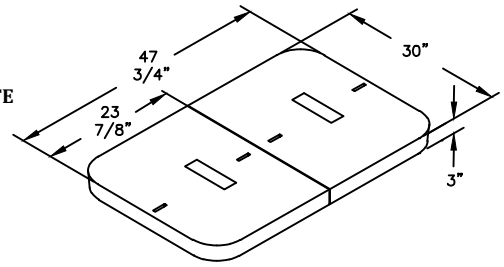
VB0057U

N48 BOX CONCRETE TRAFFIC RATED ISOMETRIC DETAIL

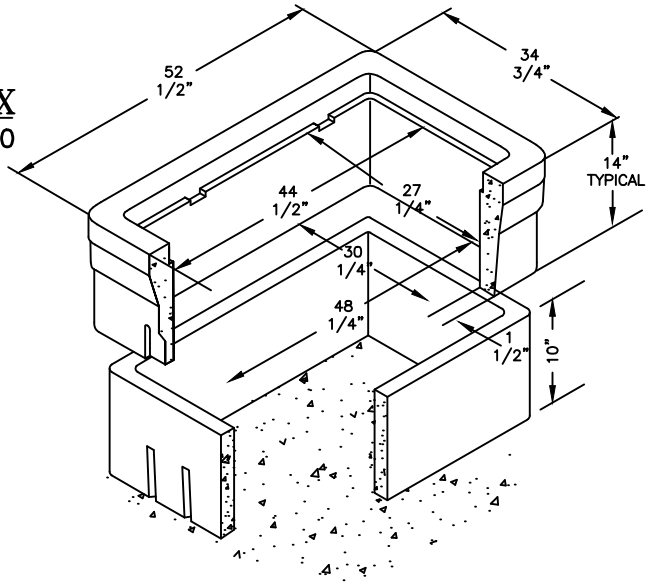
COVER
MATERIAL: REINFORCED CONCRETE
MODEL: 30" X 46"
WEIGHT: 396LBS
OPTIONS: SPECIAL MARKINGS

BODY
MATERIAL: REINFORCED CONCRETE
W/COMPOSITE CAP
WEIGHT: 376LB

EXTENSION
MATERIAL: REINFORCED CONCRETE
DEPTH: 10"
WEIGHT: 376LB



N-48 BOX
8800-240060



CONSTRUCTION NOTES

1. BOX TO BE USED IN H-10, NON AND INCIDENTAL TRAFFIC APPLICATIONS. 10KLID (LID A) IS NO TRAFFIC 20KLID IS OCCASIONAL RESIDENTIAL DRIVEWAY TRAFFIC SEE TE0001U, SECTION 3.
2. INSTALLATION:
   BOX TO BE PLACED ON 6" OF 3/4" DRAINROCK. SEE TE0020U 3.9.43 - 3.9.45
3. BOX REQUIRES 2 EXTENSIONS.
4. ALL LIDS/COVERS TO BE MARKED "LU ELECTRIC".
5. LID TO BE SECURED W/2 L-SHAPED BOLTS WITH PENTA HEAD NUTS. SEE DETAIL "A"

STK#	DESCRIPTION	WEIGHT (LBS)
8800-240460	TRAFFIC A-10 RATED N48	376
8800-240060	EXTENSION 30"X48" H-10	376
8800-241190	LID: 2PC,FOR 30"X48" SPLICE BOX	396

MAXIMUM CONDUCTORS			
N-48 BOX	MAX RUNS	≤ 750 TX OR QX	≤ 350 TX OR QX
1 PHASE	6	2	4
3 PHASE	6	2	4
NOTE: REFER TO CAB 09U UNDERGROUND FOR COMPLETE APPLICATION			

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DRAWN	DESIGN	SUPR	DATE	REV
LL	ET	JM	08/17	01

ENGINEERING & CONSTRUCTION STANDARD

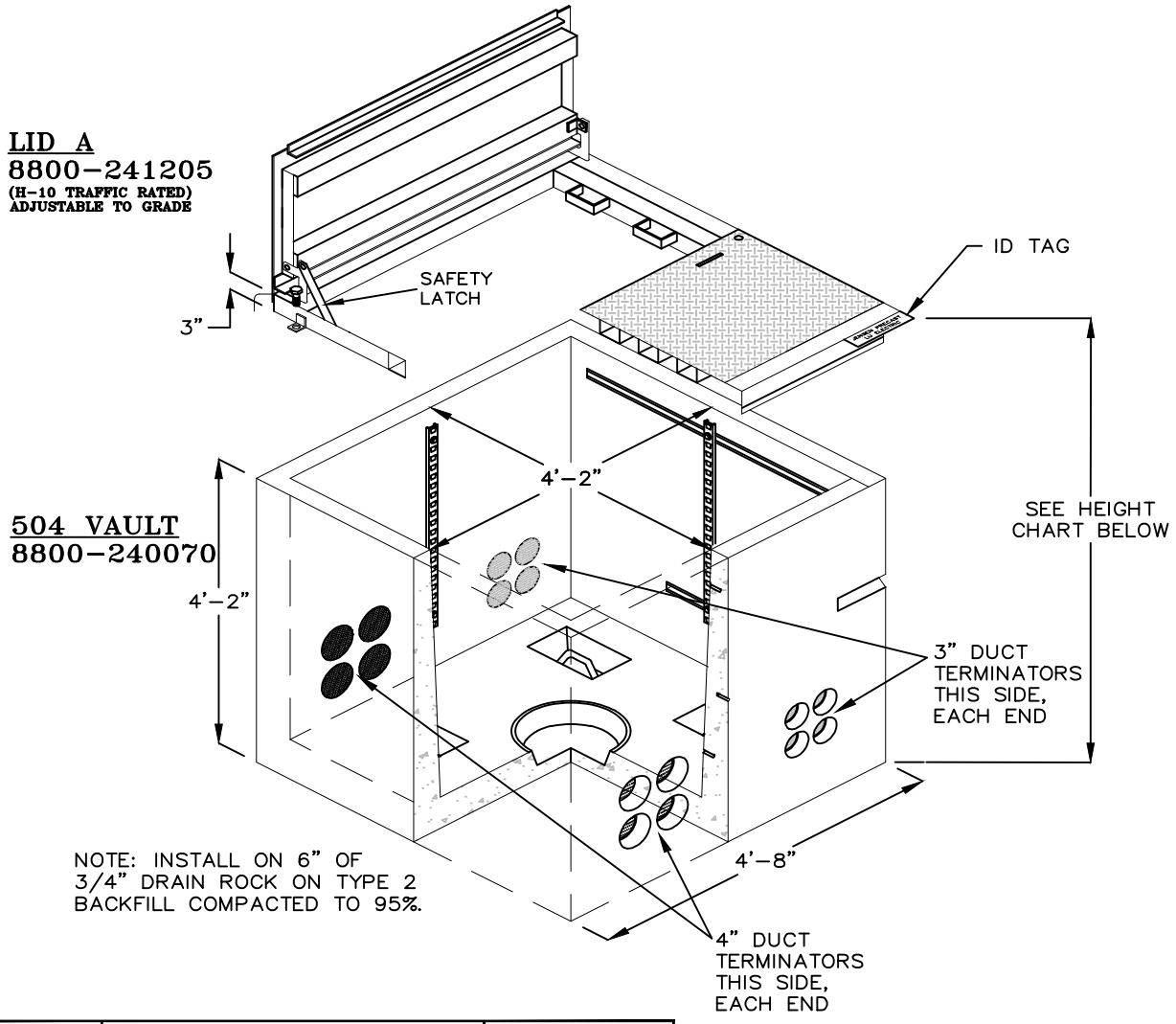
30" X 48" BOX H-10 TRAFFIC NON-CONCRETE

5.5.6 OF 40

SUBSTRUCTURE

DRAWING NUMBER
VB0060U

504 VAULT ISOMETRIC DETAIL



STK#	DESCRIPTION	WEIGHT (LBS)
8800-240070	504 VAULT	3501
8800-240450	6" EXTENSION optional	467
8800-241205	LID A H-10 spring assisted	466
8800-241212	LID B H-20	2967
8800-241220	LID B2 H-20 grate	2950
8800-241200	LID D MAINT-ONLY	1285

HEIGHT OF VAULT WITH CORRESPONDING LIDS
4' - 5" WITH LID A
4' - 10" WITH LID B
4' - 10" WITH LID B2
4' - 8" WITH LID D

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DRAWN	DESIGN	SUPR	DATE	REV
LL	ET	JM	08/17	04

ENGINEERING & CONSTRUCTION STANDARD

504 VAULT CONCRETE SECONDARY & 1Ø PRIMARY 50" X 50" X 44-1/2" I.D.

5.6.7 OF 40

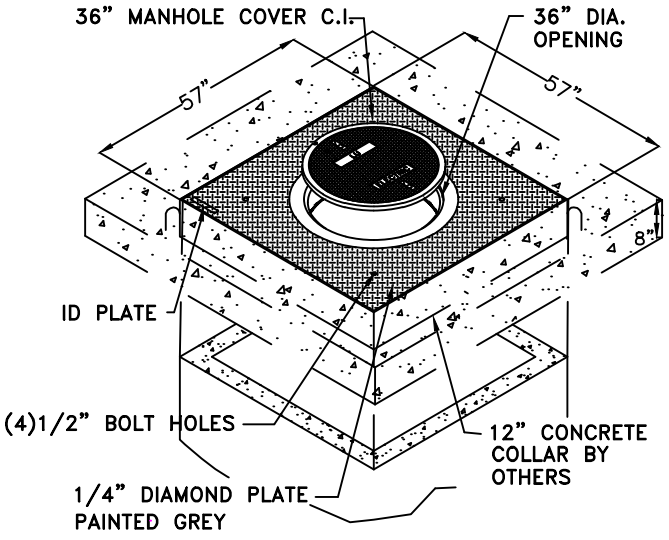
SUBSTRUCTURE

DRAWING NUMBER

VB0065U

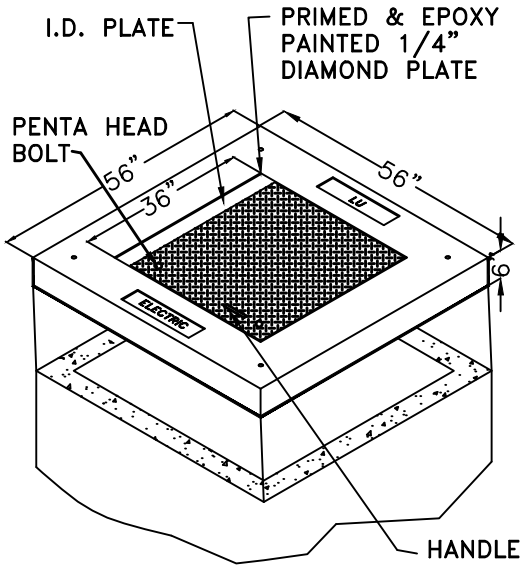
504 VAULT CONSTRUCTION NOTES:

- Vault to be used for H-20 traffic design loading. All live loads shall be for HS-20 - 44 (MS-18) as per AASHTO Standard Specification, Div 1, Sec.3.
- Vault excavation and backfill to conform to LU Specification SUB01X.
- Butyl rubber or neoprene gasket seal required between vault sections and/or extensions.
- Additional 6" extension needed if vault is placed in or adjacent to collector or major street right of way.
- Uni-strut or 1/2" inserts will be cast into vault. (See Details A/B).
- Lids to be marked "LU Electric"
- All weights to be clearly marked
- Cable steps: 4 -12" steps are supplied with vault. Optional 15" steps STK # 8800-253600
- Grounding: See expanded view for grounding applications and inserts.
- Ladder not supplied with vault but required for access

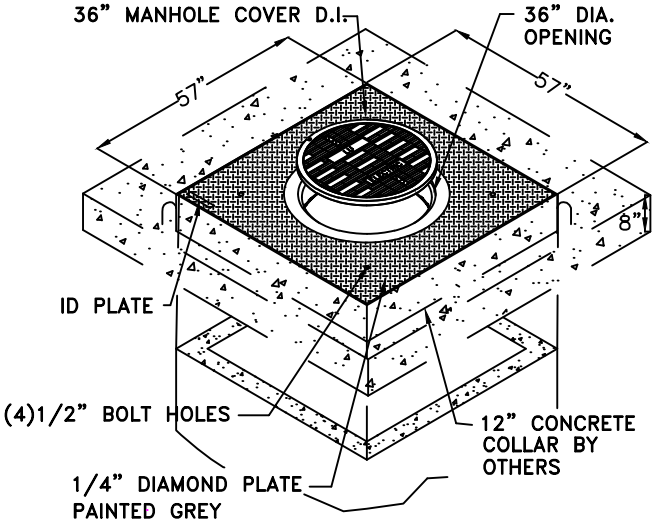


Tahoe application:
Upon setting lid, install 1/4" below grade to ensure proper protection from snowplows.

LID B
8800-241212
(H-20 TRAFFIC RATED)



LID D
8800-241200
(H-10 TRAFFIC RATED)
OBSOLETE-MAINTENANCE ONLY



Tahoe application:
Upon setting lid, install 1/4" below grade to ensure proper protection from snowplows.

LID B2
8800-241220
(H-20 TRAFFIC RATED)
GRATED MANHOLE

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DRAWN	DESIGN	SUPR	DATE	REV
LL	ET	JM	08/17	04

ENGINEERING & CONSTRUCTION STANDARD

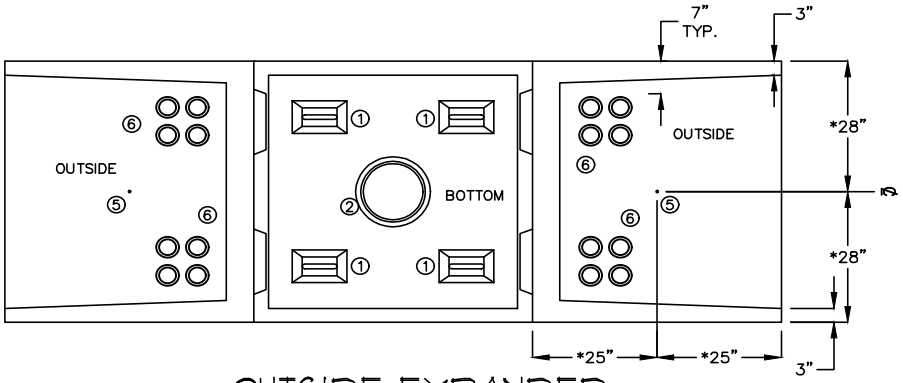
504 VAULT CONCRETE SECONDARY & 1Ø PRIMARY 50" X 50" X 44-1/2" I.D.

5.6.8 OF 40

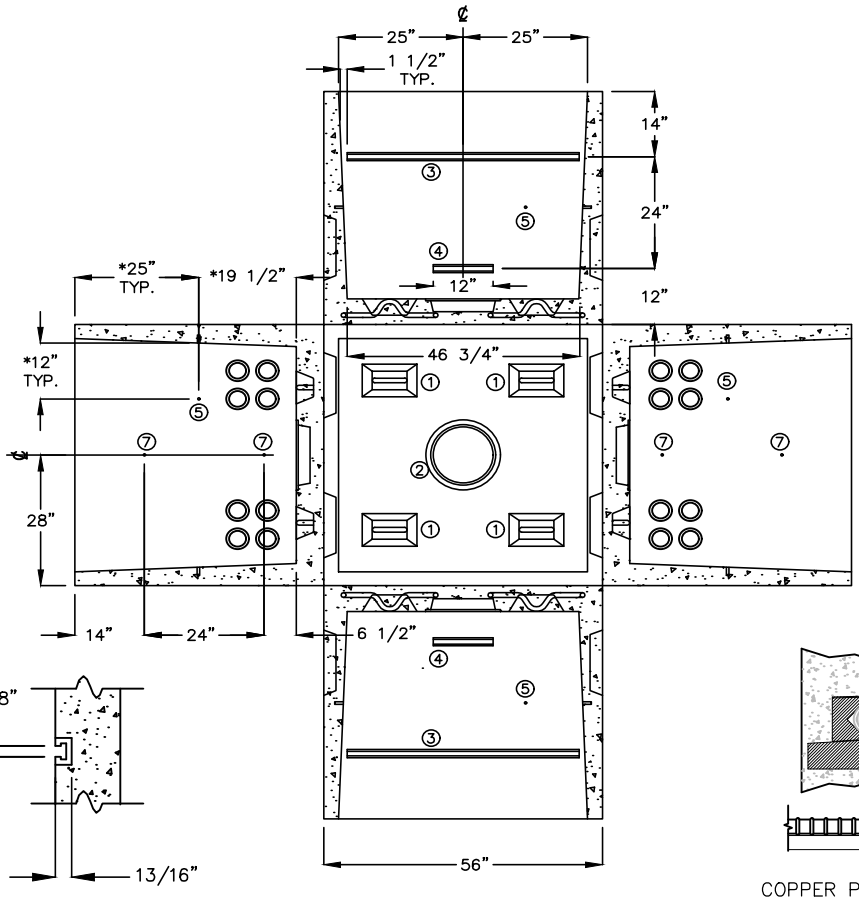
SUBSTRUCTURE

DRAWING NUMBER
VB0065U

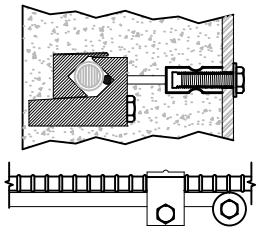
504 VAULT EXPANDED VIEWS



OUTSIDE EXPANDED



INSIDE EXPANDED



COPPER PIGTAIL TO BE SECURED TIGHTLY TO REINFORCING BAR WITH CLAMP BEFORE POURING CONCRETE.

UNISTRUT DETAIL "A"

GROUND INSERT DETAIL "B"

DRAWN	DESIGN	SUPR	DATE	REV
LL	ET	JM	08/17	04

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ENGINEERING & CONSTRUCTION STANDARD

504 VAULT CONCRETE SECONDARY & 1Ø PRIMARY 50" X 50" X 44-1/2" I.D.

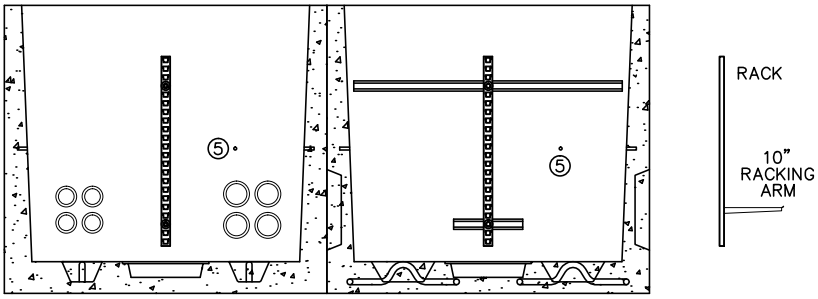
5.6.9 OF 40

SUBSTRUCTURE

DRAWING NUMBER

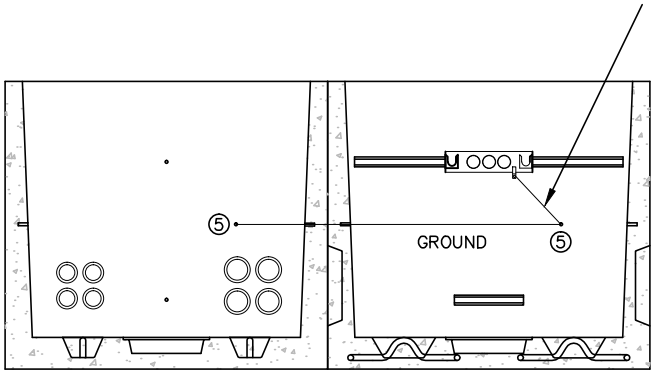
VB0065U

GROUNDING GRID INSTALLATION DETAIL



INSIDE EXPANDED SIDE & END WALL
RACK APPLICATIONS WITH ARMS

INSTALL A MINIMUM OF 84" OF #2 STR COPPER TO TWO GROUNDING LUGS ATTACHED TO TWO 1/2" GROUND INSERTS AND BUSED TO CONCENTRIC NEUTRAL, J–BAR OR BRACKET



INSIDE EXPANDED SIDE & END WALL
GROUNDING APPLICATIONS AND INSERTS

MAXIMUM CONDUCTORS AND J-BARS					
VAULT 504	200 AMP 1Ø PRIMARY	600 AMP PRIMARY	SECONDARY	3-WAY J-BAR	4-WAY J-BAR
	4 WIRES Y 6 WIRES DELTA	N/A	8 SETS ≤ 750 QX OR TX	2	1
NOTE: REFER TO CAB09U UNDERGROUND FOR COMPLETE APPLICATION					

MATERIAL LIST *supplied by Vault Manufacturer*		
	DESCRIPTION	QTY
1.	PULLING IRON	4
2.	12" DIAMETER SUMP	1
3.	46 1/2 " LONG UNISTRUT	2
4.	12" LONG UNISTRUT	2
5.	1/2" GROUNDING INSERT, 4 inside - 2 outside	6
6.	3" & 4" DUCT TERMINATOR (8 each end)	16
7.	1/2" RACKING INSERT	4
8.	18 HOLE RACK (26 3/ 4" LONG)	4
9.	SPRING NUT	4
10.	1/2" X 1 1/2" BOLT	9
11.	1/2" WASHER	8
12.	1/2" BRASS GROUND WASHER, (1 outside)	1
13.	10" ARM	4
14.	12" X 12" KNOCKOUT	2
15.	12" X 3-1/2" KNOCKOUT	2

Liberty Utilities®

DRAWN	DESIGN	SUPR	DATE	REV
LL	ET	JM	08/17	04

ENGINEERING & CONSTRUCTION STANDARD

504 VAULT CONCRETE SECONDARY & 1Ø PRIMARY 50" X 50" X 44-1/2" I.D.

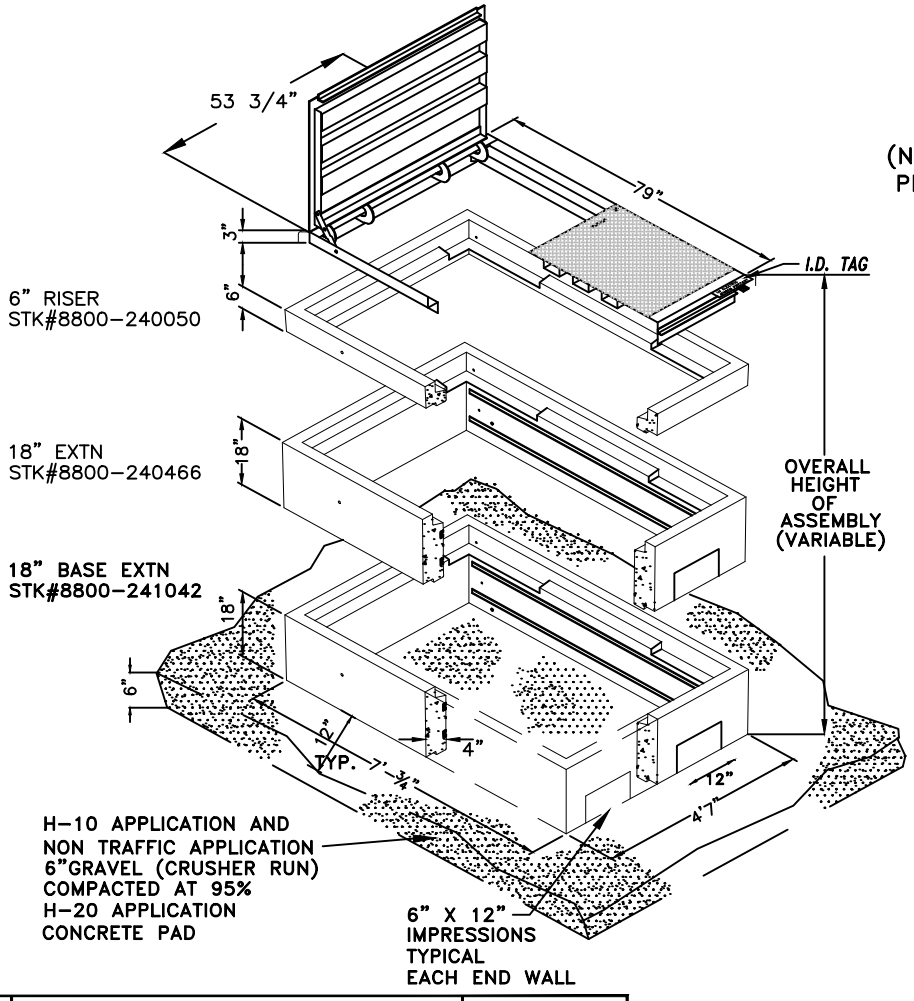
5.6.10 OF 40

SUBSTRUCTURE

DRAWING NUMBER
VB0065U

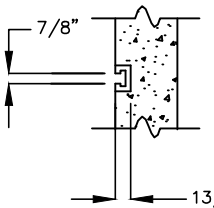
573 VAULT ISOMETRIC DETAILS

FOR MAINTENANCE ONLY

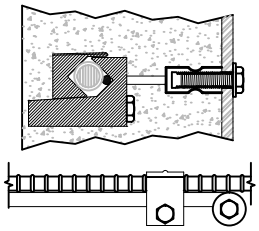


LID "C"
8800-241166
(NON-TRAFFIC STEEL
PEDESTRIAN RATED)

STK#	DESCRIPTION	WEIGHT (LBS)
8800-240050	6" CONCRETE EXTENSION	475
8800-240466	18" CONCRETE EXTENSION / IMPRESSIONS AT BOTH ENDS	1407
8800-241167	LID A H-10 full opening spring assisted	794
8800-241295	LID B H-20 full opening lift out	4086
8800-241166	LID C NON-TRAFFIC RATED STEEL full opening spring assisted	600
8800-241169	LID C-1 FIBERGLASS HYBRID NON TRAFFIC RATED clam shell opening NOT AVAILABLE-FOR REFERENCE ONLY	80



UNISTRUT
DETAIL "A"



COPPER PIGTAIL TO BE SECURED TIGHTLY TO REINFORCING BAR WITH CLAMP BEFORE POURING CONCRETE.

GROUND INSERT
DETAIL "B"

Liberty Utilities®

DRAWN	DESIGN	SUPR	DATE	REV
LL	ET	JM	08/17	04

ENGINEERING & CONSTRUCTION STANDARD

573 VAULT CONCRETE MAINTENANCE ONLY (REPLACED WITH 557) 49" X 79" X 45" I.D.

5.7.11 OF 40

SUBSTRUCTURE

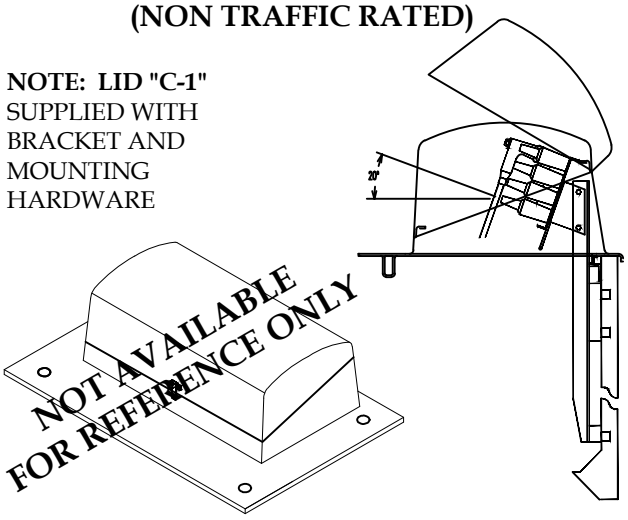
DRAWING NUMBER
VB0067U

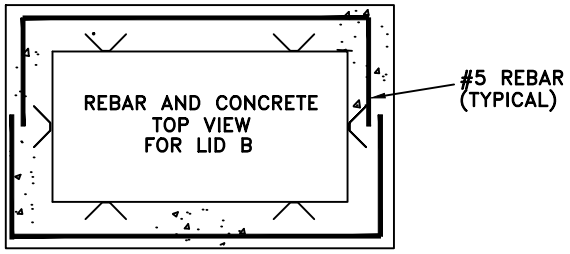
573 VAULT CONSTRUCTION NOTES:

- H-10 and NON TRAFFIC: Installed on 6" of 3/4" crusher run or type 2 backfill compacted at 95%.
- H-20: Vault installed on a concrete base extending 12" beyond vault walls, lid wrapped as shown in Details B and C.
- Height of vault varies depending on height of each extension and lid.
- Vault excavation and backfill to conform to LU Specification SUB01X.
- Butyl rubber or neoprene gasket seal required between vault sections and/or extensions.
- Unistrut or 1/2" inserts will be cast into vault. (See Detail A)
- Lids to be marked "LU Electric"
- All weights to be clearly marked.
- Cable steps: Are not supplied with this vault, see LU Standard CBR02U, Underground.
- Existing cable dictates location of cable racks and entrance.
- Ladder not supplied with vault but will be required for access.

LID "C-1"
8800-241169
(NON TRAFFIC RATED)

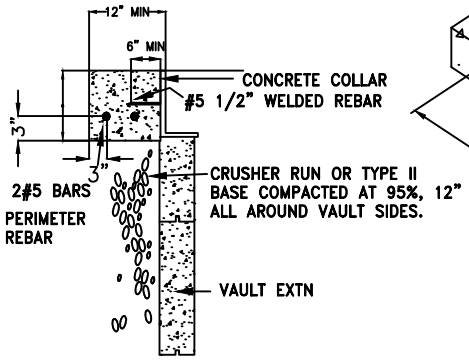
NOTE: LID "C-1" SUPPLIED WITH BRACKET AND MOUNTING HARDWARE

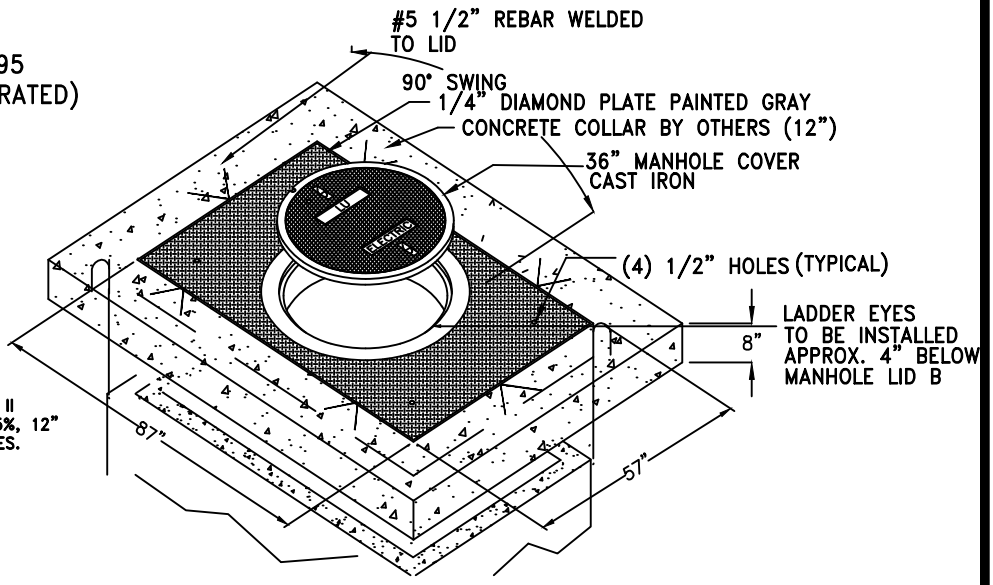




LID B
8800-241295
(H-20 TRAFFIC RATED)

REBAR AND CONCRETE
CUTAWAY VIEW
FOR LID B





Liberty Utilities®

DRAWN	DESIGN	SUPR	DATE	REV
LL	ET	JM	08/17	04

ENGINEERING & CONSTRUCTION STANDARD

573 VAULT CONCRETE MAINTENANCE ONLY (REPLACED WITH 557) 49" X 79" X 45" I.D.

5.7.12 OF 40

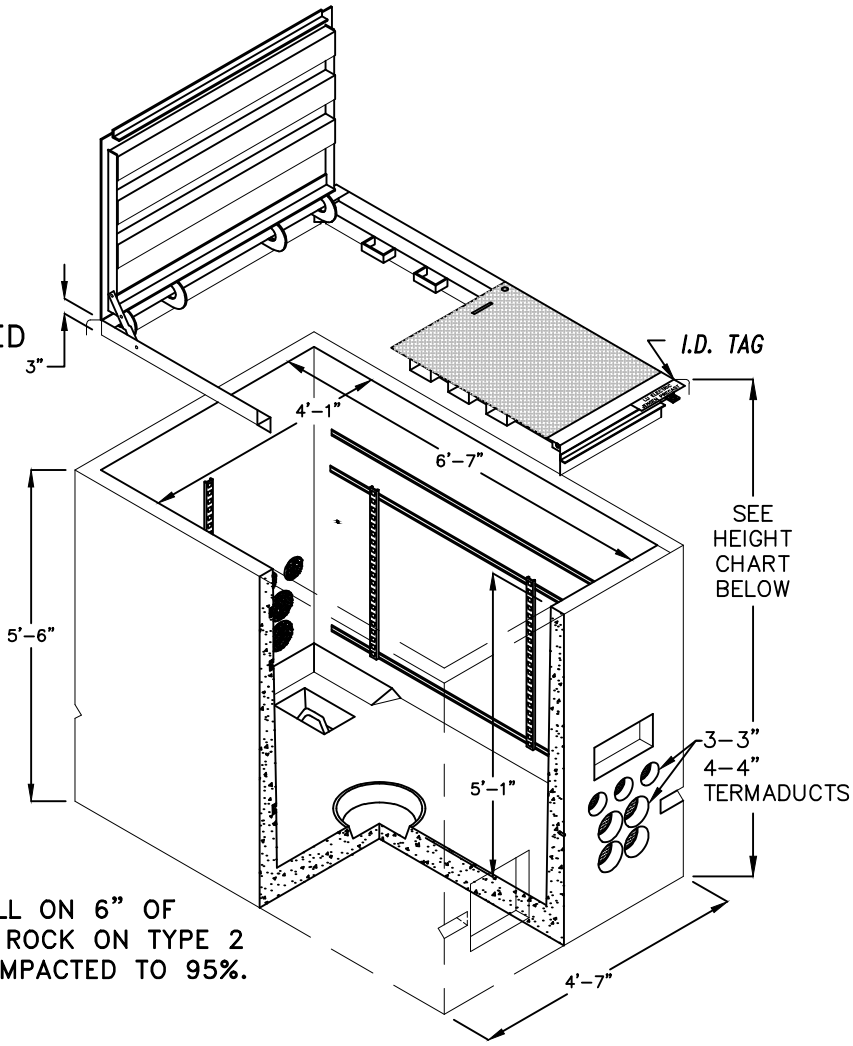
SUBSTRUCTURE

DRAWING NUMBER
VB0067U

557 VAULT ISOMETRIC DETAIL

LID "C"
8800-241166
NON-TRAFFIC RATED

557 VAULT
8800-241045



NOTE: INSTALL ON 6" OF 3/4" DRAIN ROCK ON TYPE 2 BACKFILL COMPACTED TO 95%.

STK#	DESCRIPTION	WEIGHT (LBS)
8800-241045	557 VAULT	7500
8800-240050	6" EXTENSION optional	787
8800-240466	18" EXTENSION optional	1407
8800-241167	LID "A" H-10 full opening spring assisted	794
8800-241295	LID "B" H-20 full opening lift out	4086
8800-241290 8800-240466	LID "B-1" 3' manhole comes w/18" ext. operated non loadbreak	1285 1407
8800-241166	LID "C" NON TRAFFIC RATED STEEL full opening spring assisted	600

HEIGHT OF VAULT WITH CORRESPONDING LIDS	LADDER LENGTH	HEIGHT W/ 6" EXTENSION	LADDER LENGTH W/ 6" EXT
5'-9" WITH LID A and C	5'-2"	6'-5"	5'-8"
6'-2" WITH LID B	5'-6"	6'-8"	6'
8'-5" WITH LID B-1 & 18" EXT	7'	8'-11"	STEP RUN
5'79" WITH LID C-1	N/A	N/A	N/A

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DRAWN	DESIGN	SUPR	DATE	REV
LL	ET	JM	08/17	04

ENGINEERING & CONSTRUCTION STANDARD

557 VAULT
CONCRETE PRIMARY
49" X 79" X 61" I.D.

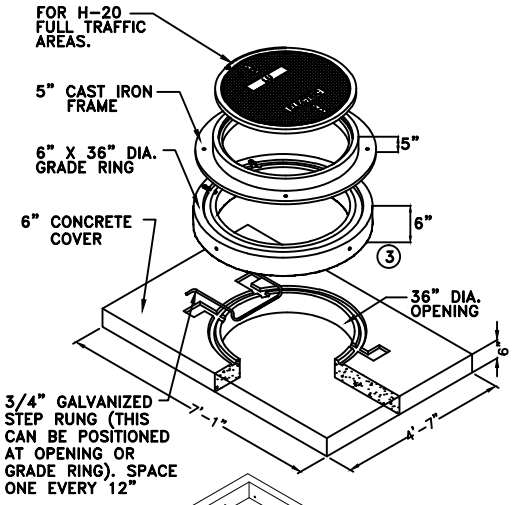
5.8.13 OF 40

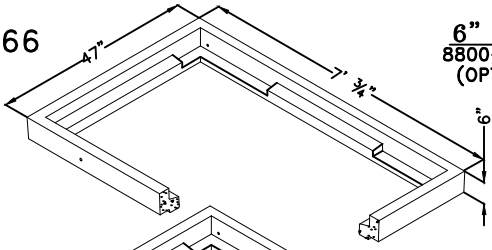
SUBSTRUCTURE

DRAWING NUMBER
VB0071U

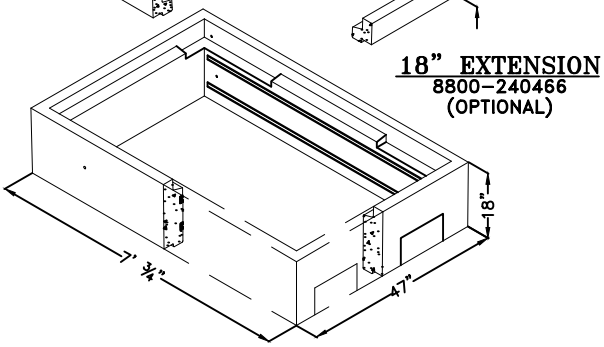
LID B-1

8800-241290 & 18" EXT 8800-240466
(FOR AREAS TO BE PAVED)
(H-20 RATED)

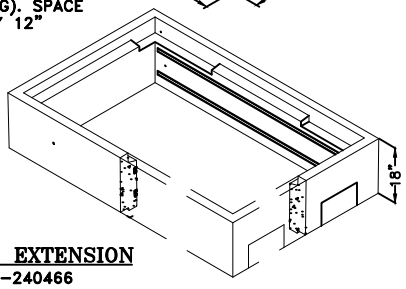




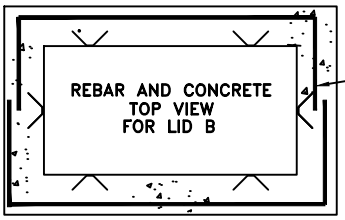
6" RISER
8800-240050
(OPTIONAL)



18" EXTENSION
8800-240466
(OPTIONAL)



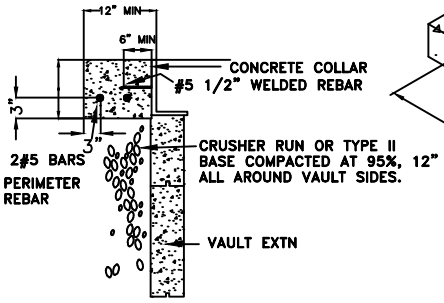
18" EXTENSION
8800-240466
NOTE: 18" EXTENSION COMES WITH LID "B-1"

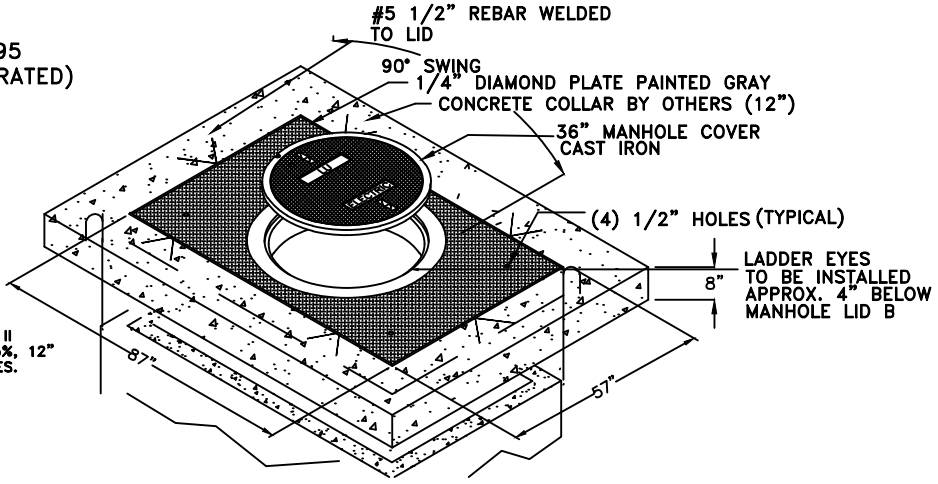


LID B

8800-241295
(H-20 TRAFFIC RATED)

REBAR AND CONCRETE
CUTAWAY VIEW
FOR LID B





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DRAWN	DESIGN	SUPR	DATE	REV
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ENGINEERING & CONSTRUCTION STANDARD

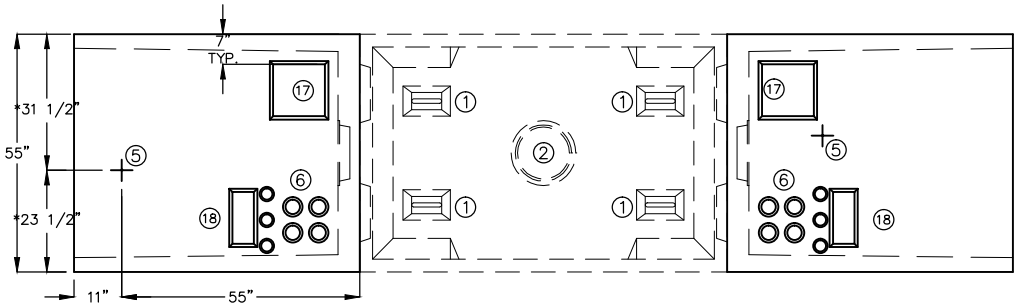
557 VAULT
CONCRETE PRIMARY
49" X 79" X 61" I.D.

5.8.14 OF 40

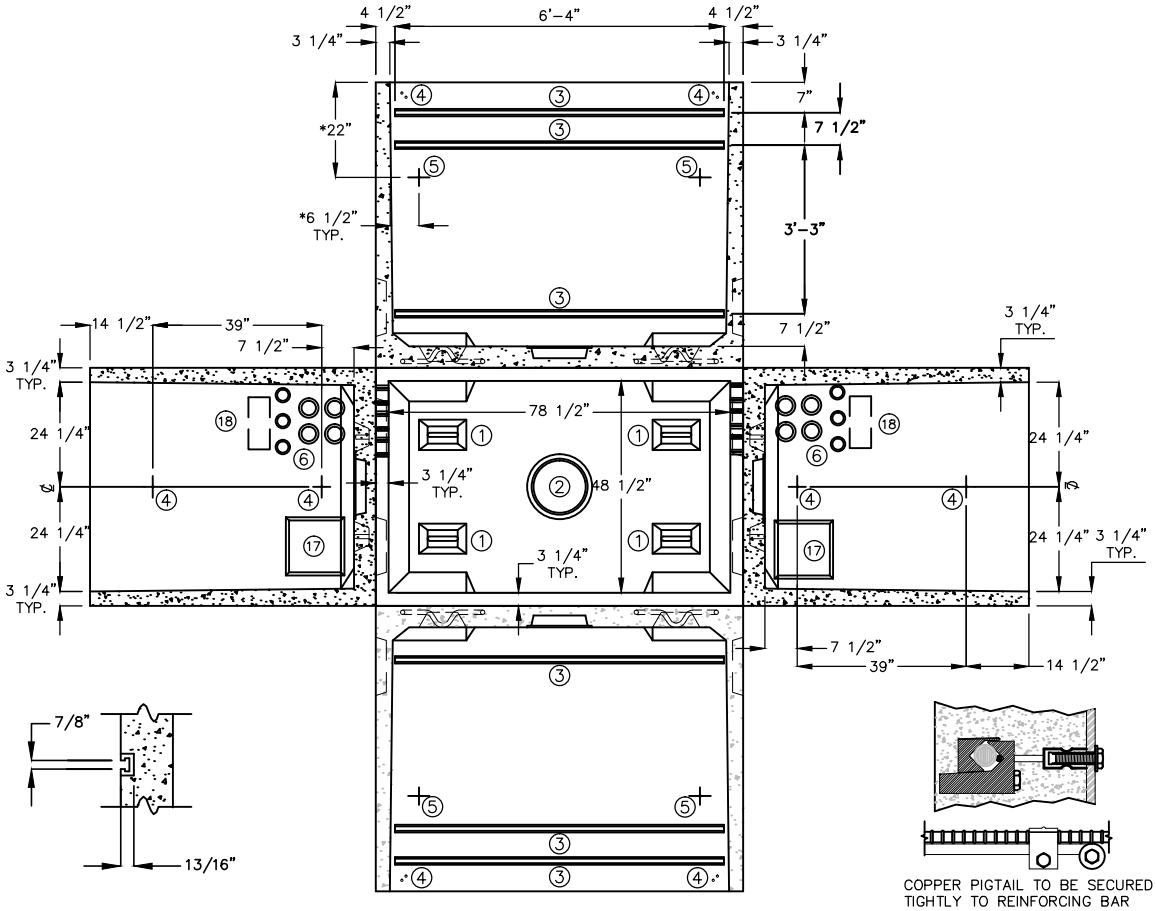
SUBSTRUCTURE

DRAWING NUMBER
VB0071U

557 VAULT EXPANDED VIEWS



OUTSIDE EXPANDED



UNISTRUT DETAIL "A"

INSIDE EXPANDED

COPPER PIGTAIL TO BE SECURED TIGHTLY TO REINFORCING BAR WITH CLAMP BEFORE POURING CONCRETE.

GROUND INSERT DETAIL "B"

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DRAWN	DESIGN	SUPR	DATE	REV
LL	ET	JM	08/17	04

ENGINEERING & CONSTRUCTION STANDARD

557 VAULT CONCRETE PRIMARY 49" X 79" X 61" I.D.

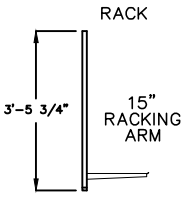
5.8.15 OF 40

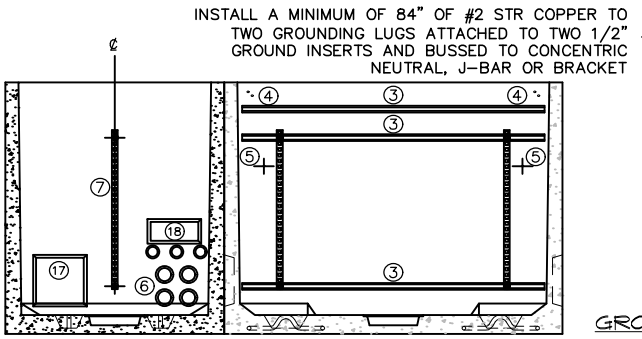
SUBSTRUCTURE

DRAWING NUMBER

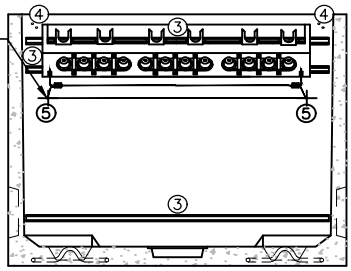
VB0071U

GROUNDING GRID INSTALLATION DETAILS





INSIDE EXPANDED SIDE & END WALLS
RACK APPLICATIONS WITH ARMS



INSIDE EXPANDED SIDE WALL
GROUNDING APPLICATIONS AND INSERTS

MAXIMUM CONDUCTORS AND J-BARS				
VAULT 557	200 AMP 1Ø PRIMARY	600 AMP PRIMARY	SECONDARY	J-BARS 3, 4 OR 5 WAY
	LID C-1 12 WIRES LIDS A, B, B-1, & C 14 WIRES	N/A	8 SETS ≤ 750 QX OR TX	3 TOTAL
NOTE: REFER TO CAB09U UNDERGROUND FOR COMPLETE APPLICATION				

MATERIAL LIST *supplied by Vault Manufacturer*

	DESCRIPTION	QTY
1.	PULLING IRON	4
2.	12" DIAMETER SUMP	1
3.	76" LONG UNISTRUT	6
4.	1/2" RACKING INSERT	12
5.	1/ 2" GROUNDING INSERT, 4 inside - 2 outside	6
6.	3" DUCT TERMINATOR (each end) 4" DUCT TERMINATOR	4 8
7.	28 HOLE RACK (41 3/4" LONG	6
8.	SPRING NUT	8
9.	1/2 X 1/2" BOLT	13
10.	1/2" WASHER	12
11.	1/ 2" BRASS GROUND WASHER, 1 top outside	1
12.	15" ARM	6
13.	LADDER UP	1
14.	LADDER size options on sheet one	1
15.	MOUNTING BRACKETS WITH LID "C-1"	4
16.	ADJUSTABLE BRACKET CLIPS WITH LID "B-1"	2
17.	12" X 12" KNOCKOUT	2
18.	6" X 12" KNOCKOUT	2

557 VAULT CONSTRUCTION NOTES:

- Vault to be used for H-20 traffic design loading. All live loads shall be for HS-20 -44 (MS-18) as per AASHTO Standard Specification, Div 1, Sec.3 Note: If lid B-1 is used a minimum of 12 inches of vault cover is required.
- Vault excavation and backfill to conform to LU. Specification SUB01X.
- Butyl rubber or neoprene gasket seal required between vault sections and/or extensions.
- Additional 6" extension needed if vault is placed in or adjacent to collector or major street right of way.
- Unistrut (See detail A) or 1/2" inserts will be cast into vault.
- Lids to be marked "LU Electric"
- All weights to be clearly marked
- Cable steps: 6-15" steps are supplied with vault.
- Grounding: See expanded view for grounding applications and inserts.
- Ladder and ladder-up required, See LU. Standard VB105U.
- Ladder mounting eyes to be installed

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DRAWN	DESIGN	SUPR	DATE	REV
LL	ET	JM	08/17	04

ENGINEERING & CONSTRUCTION STANDARD

557 VAULT
CONCRETE PRIMARY
49" X 79" X 61" I.D.

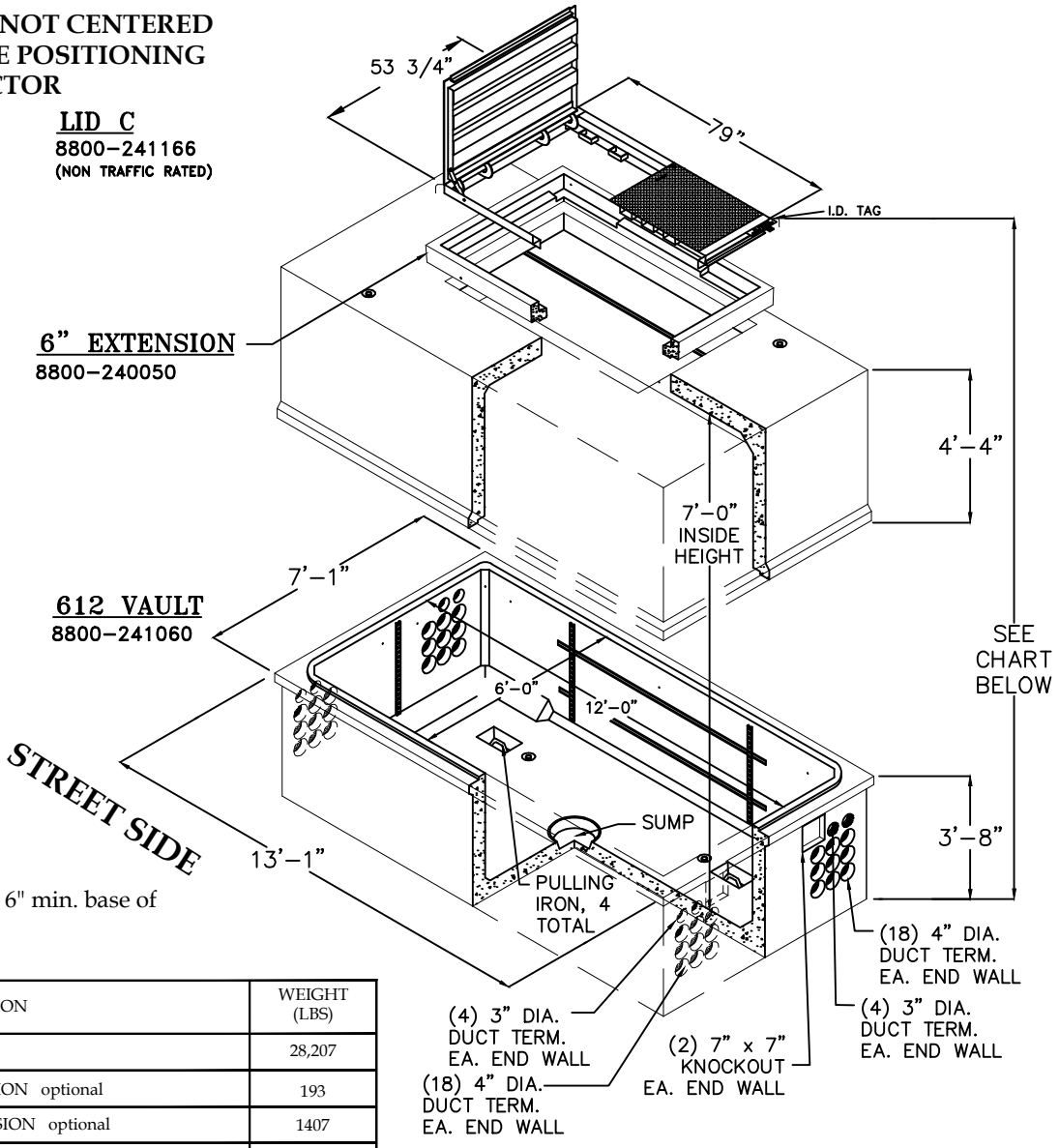
5.8.16 OF 40

SUBSTRUCTURE

DRAWING NUMBER
VB0071U

612 VAULT ISOMETRIC DETAILS

NOTE: LID IS NOT CENTERED COORDINATE POSITIONING WITH INSPECTOR



Note: Install on a 6" min. base of 3/4" drain rock.

STK#	DESCRIPTION	WEIGHT (LBS)
8800-241060	612 VAULT	28,207
8800-240050	6" EXTENSION optional	193
8800-240466	18" EXTENSION optional	1407
8800-241167	LID A H-10 spring assisted	794
8800-241295	LID B H-20	4086
8800-241305	LID B H-20 w/vault section 3' opening	16,000
8800-241166	LID C pedestrian rated spring assisted	600
8800-241075	SWITCH OPENING "E" 5'4" X 13"	16,000
8800-241077	SWITCH OPENING "F" 5'4" X 15"	16,000
8800-241076	SWITCH OPENING "G" 6'7" X 15"	16,000

NOTE: 24-1305 COMES WITH 6" GRADE RING AND MANHOLE TOTAL WEIGHT 1.141 LBS

HEIGHT OF VAULT WITH 6" EXT & CORRESPONDING LIDS	LADDER LENGTH W/ EXT
8'- 9" WITH LID A & C	8'- 6"
9'- 8" WITH LID B	8'- 6"
8'- 11" WITH LID B-1	8'
8' WITH SWITCH TOP SECTIONS E, F, & G	8'

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DRAWN	DESIGN	SUPR	DATE	REV
LL	ET	JM	08/17	04

ENGINEERING & CONSTRUCTION STANDARD

612 VAULT CONCRETE PRIMARY 6' X 12' X 7' I.D.

5.9.17 OF 40

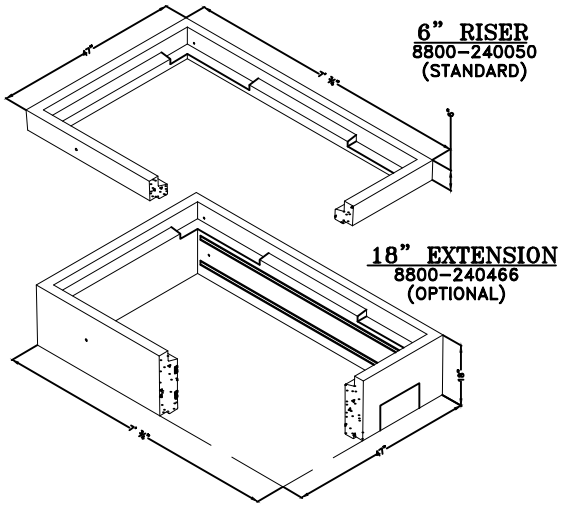
SUBSTRUCTURE

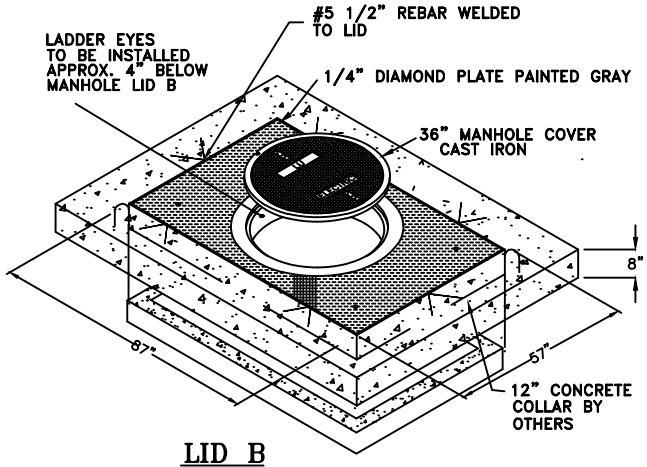
DRAWING NUMBER

VB0085U

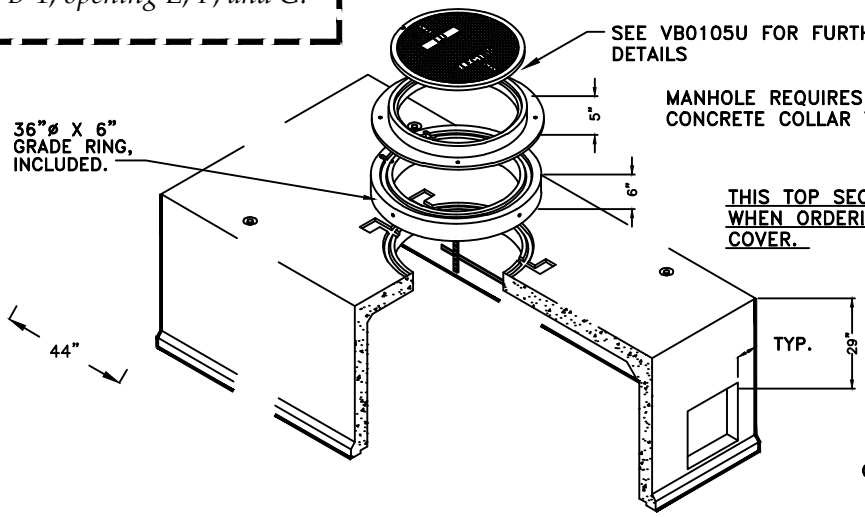
612 VAULT CONSTRUCTION NOTES:

- Vault to be used for H-20 traffic design loading. All live loads shall be for HS-20 - 44 (MS-18) as per AASHTO standard spec Div 1 Sec. 3
  Note: If lid B or B-1 is used, a minimum of 12 inches of vault cover is required.
- Vault excavation and backfill to conform to LU Specification SUB01X.
- Butyl rubber or neoprene gasket seal required between vault sections and/or extensions.
- A 6" extension is installed on all vaults for elevation and lid options.
- Unistrut (See detail A) or 1/2" inserts will be cast into vault.
- Lids to be marked "LU Electric"
- All weights to be clearly marked
- 12 -15" steps are supplied with vault.
- Grounding: See expanded view for grounding applications and inserts.
- 2/0 CU (# 8800-170910) grounding grid is needed if equipment is placed in vault. Wire needs to be ordered separately (approx. 42')
- Ladder and ladder-up required. See LU Standard VB105U.
- Ladder mounting eyes to be installed on lids A and B.
- When ordering designate vault cover.
  Note: vault has a different top section for lid B-1, opening E, F, and G.





LID B
8800-241295
(H-20 TRAFFIC RATED)



MANHOLE REQUIRES A 12" W x 8" D CONCRETE COLLAR TO BE POURED BY OTHERS

THIS TOP SECTION, STK# 8800-241305 COMES ONLY WHEN ORDERING THE GRADE RINGS AND MANHOLE COVER.

LID B-1
(H-20 TRAFFIC RATED)
SPECIAL ORDER
COORDINATE WITH JENSEN

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DRAWN	DESIGN	SUPR	DATE	REV
LL	ET	JM	08/17	04

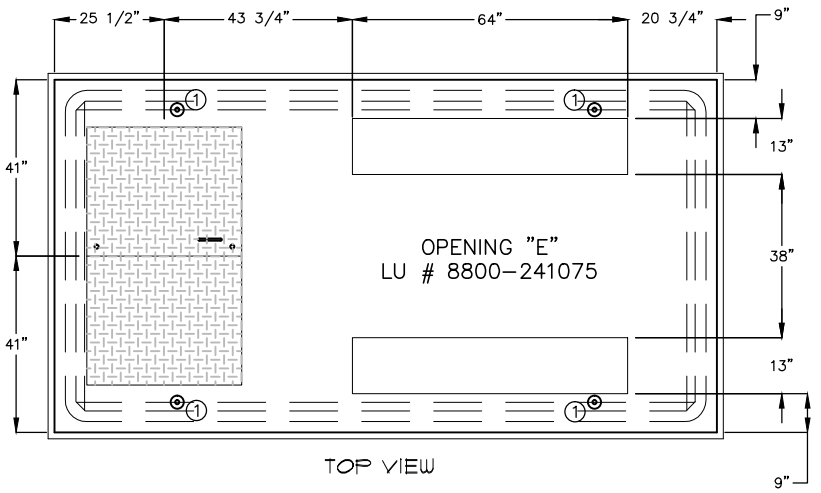
ENGINEERING AND CONSTRUCTION STANDARD

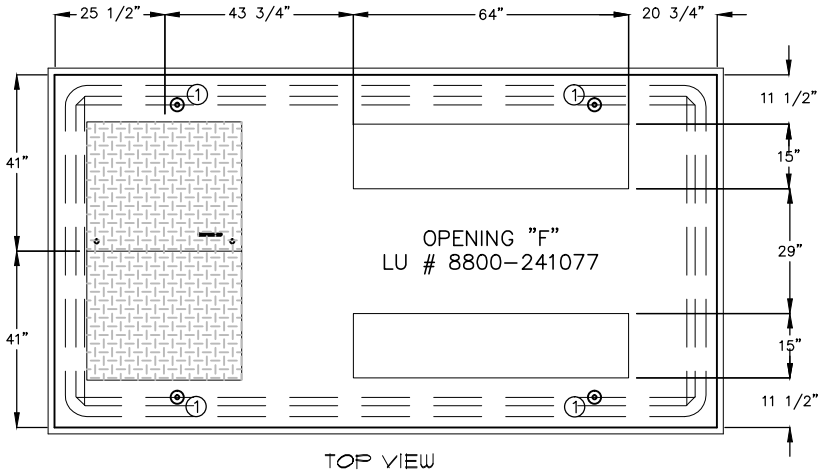
612 VAULT CONCRETE PRIMARY 6' X 12' X 7' I.D.

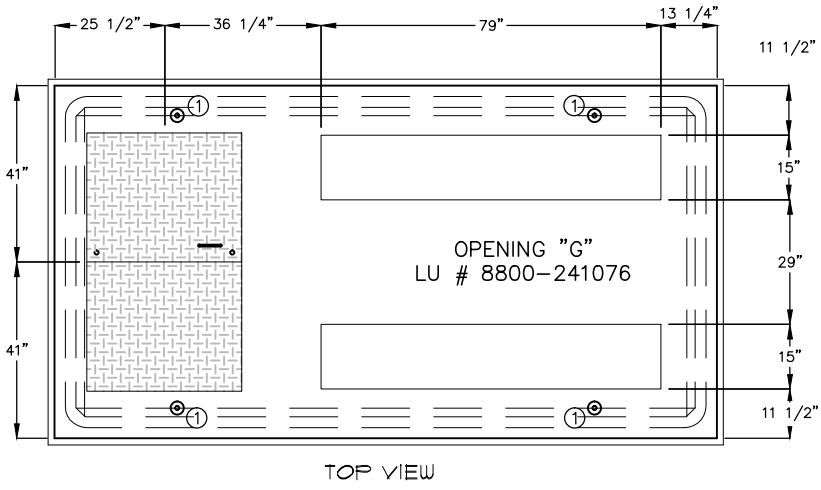
5.9.18 OF 40

SUBSTRUCTURE

DRAWING NUMBER
VB0085U







SWITCH OPENING NOTES:

- Reference Padmaster in Substructure, Section 6, Sheet 5.4.5 for complete cross reference for switches and substructures.
- If J-bar or unitized bracket is used, application will be operated as non loadbreak. An alternate loadbreak application would be to use feed-thru bushings on the 200amp sections of switches, providing multiple taps.
- Top section of existing 612 vaults may be retrofitted with one of the top sections with openings E, F, or G, refer to drawings at left.
- All vaults designed or retrofitted with equipment will have a ground grid installed per Reference sheet 5.10.22, grounding grid detail .

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DRAWN	DESIGN	SUPR	DATE	REV
LL	ET	JM	08/17	04

ENGINEERING AND CONSTRUCTION STANDARD

612 VAULT CONCRETE PRIMARY 6' X 12' X 7' I.D.

5.9.19 OF 40

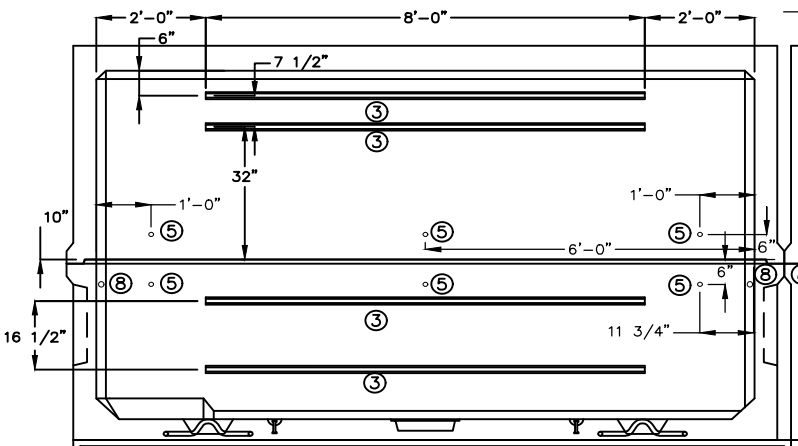
SUBSTRUCTURE

DRAWING NUMBER

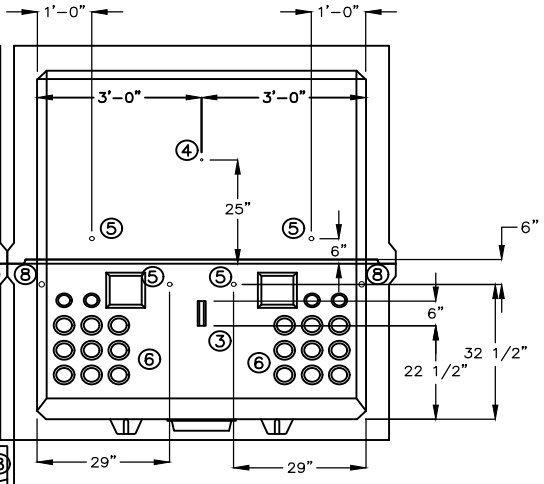
VB0085U

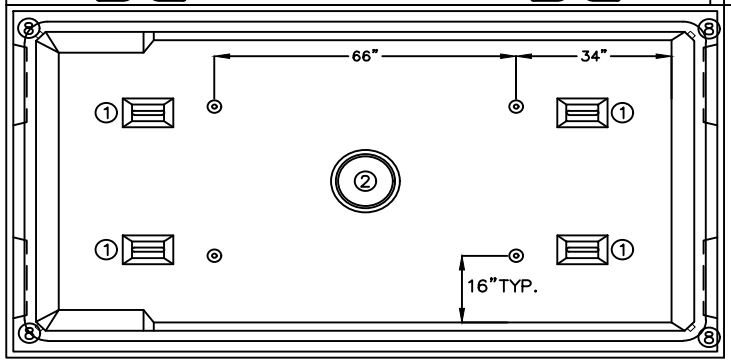
612 VAULT EXPANDED VIEWS

EXPANDED INSIDE TOP SIDE VIEW

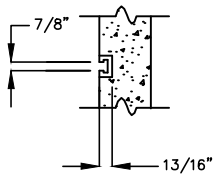


EXPANDED INSIDE TOP AND BOTTOM END VIEW

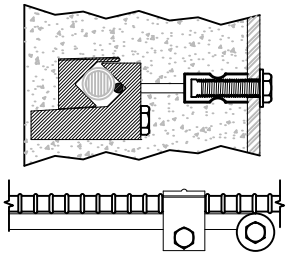




EXPANDED INSIDE BOTTOM SIDE VIEW

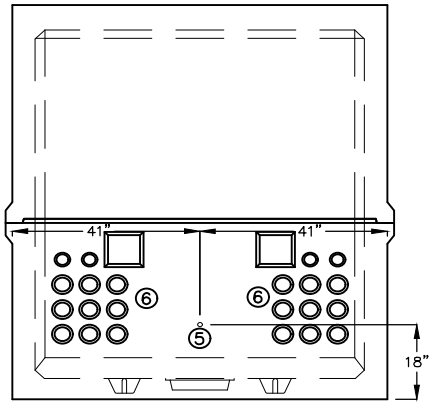


UNISTRUT DETAIL "A"



COPPER PIGTAIL TO BE SECURED TIGHTLY TO REINFORCING BAR WITH CLAMP BEFORE POURING CONCRETE.

GROUND INSERT DETAIL "B"



OUTSIDE BOTTOM & TOP END VIEW GROUNDING INSERTS

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ENGINEERING AND CONSTRUCTION STANDARD

612 VAULT CONCRETE PRIMARY 6' X 12' X 7' I.D.

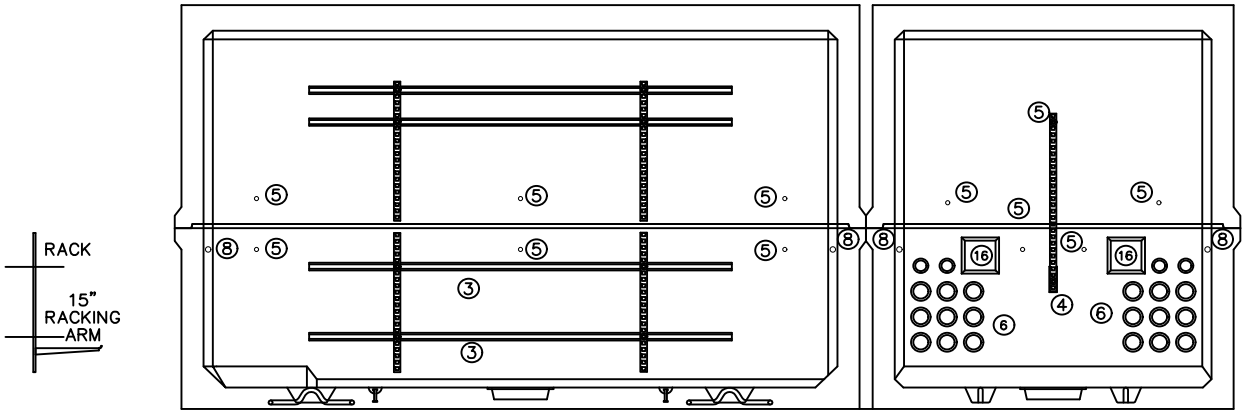
5.9.20 OF 40

SUBSTRUCTURE

DRAWING NUMBER

VB0085U

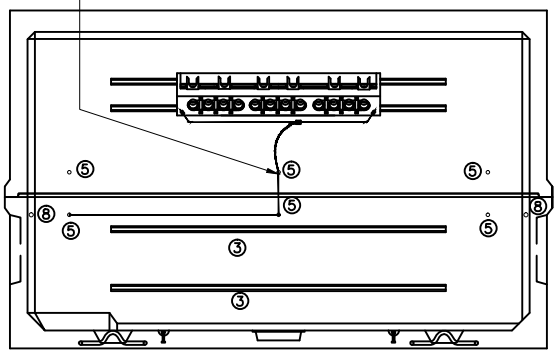
GROUNDING GRID INSTALLATION DETAIL



INSIDE EXPANDED SIDE & END WALLS
RACK APPLICATIONS WITH ARMS

SPLICE ONLY: INSTALL A MINIMUM OF 14' OF 2/0 COPPER TO THREE GROUNDING LUGS ATTACHED TO THREE ½" GROUNDING INSERTS AND BUS TO CONCENTRIC NEUTRAL, J–BAR OR BRACKET.

EQUIPMENT INSTALLATION: INSTALL 45' OF 2/0 COPPER GROUND GRID, TIE TO ALL SECTIONS AND LOOP THROUGH 10 GROUNDING LUGS ATTACHED TO ½" GROUNDING INSERTS AROUND VAULT AND BUS TO TRANSFORMER, CONCENTRIC NEUTRAL, J–BAR OR BRACKET.



INSIDE EXPANDED SIDE WALLS
GROUNDING APPLICATIONS AND INSERTS

MATERIAL LIST *supplied by Vault Manufacturer*

	DESCRIPTION	QTY
1.	PULLING IRON	4
2.	12" DIAMETER SUMP	1
3.	96" LONG UNISTRUT side walls	8
	6" LONG UNISTRUT end walls	2
4.	1/ 2" RACKING INSERT	2
5.	1/ 2" GROUNDING INSERT, 20 inside - 2 outside	22
6.	3" DUCT TERMINATOR 4 (each end)	8
	4" DUCT TERMINATOR 18 (each end)	36
7.	22 HOLE RACK (32 3/4" LONG) side top & bottom	8
	28 HOLE RACK (41 3/4" LONG) end	2
8.	5/8" INSERTS FOR WIRE TRAINING corners	4
9.	SPRING NUT	18
10.	1/2" X 1 1/2" BOLT	21
11.	1/2" WASHER	20
12.	1/2" BRASS GROUND WASHER, 1 top outside	1
13.	15" ARM	12
14.	LADDER UP	1
15.	LADDER	1
16.	7" X 7" KNOCKOUT	4

MAXIMUM CONDUCTORS AND J-BARS					
	200 AMP PRIMARY	600 AMP PRIMARY	SECONDARY	EQUIPMENT	J-BARS 3, 4 OR 5 WAY
VAULT 612	18 12 0	0 6 12	2 SETS ≤ 750 QX OR TX	1-50 KVA PADMOUNTED SWITCH	3 TOTAL
NOTE: REFER TO CAB09U UNDERGROUND FOR COMPLETE APPLICATION					

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LL	ET	JM	08/17	04

ENGINEERING AND CONSTRUCTION STANDARD

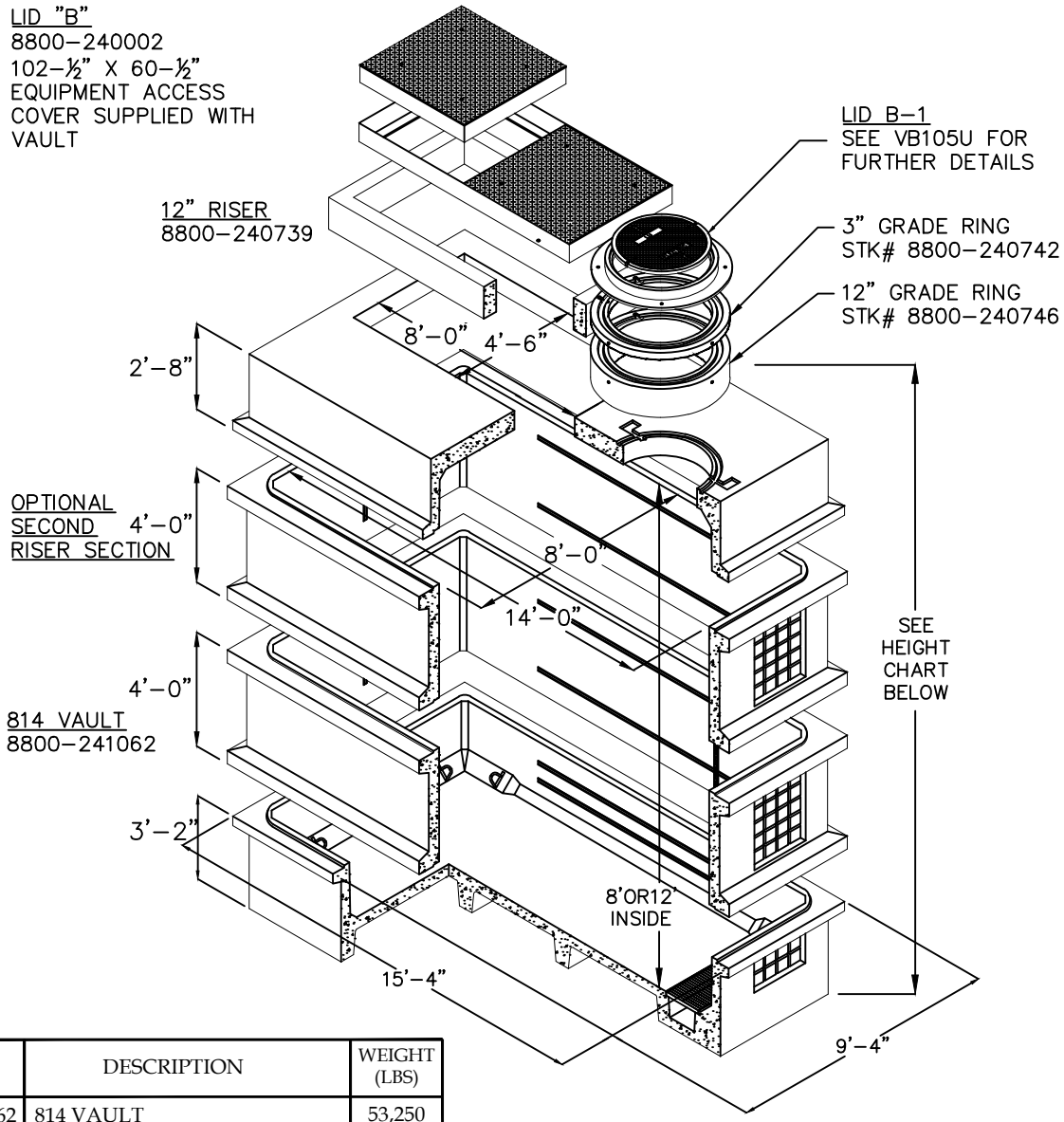
612 VAULT
CONCRETE PRIMARY
6' X 12' X 7' I.D.

5.9.21 OF 40

SUBSTRUCTURE

DRAWING NUMBER
VB0085U

814 VAULT ISOMETRIC DETAIL



STK#	DESCRIPTION	WEIGHT (LBS)
8800-241062	814 VAULT	53,250
8800-240739	12" RISER for lid B	1,993
8800-240002	LID B H-20 equipment	5,200
8800-241215	LID B B-1 H-20 3' manhole	800
8800-240746	12" GRADE RING for MH	682
8800-240744	6" GRADE RING for MH	341
8800-240742	3" GRADE RING for MH	166
8800-241340	LID D GRATE maint only	700

HEIGHT OF VAULT WITH CORRESPONDING LIDS	LADDER LENGTH
15' - 0" W/2 EXT & LIDS B&B-1	13' - 6"
11' - 0" W/1 EXT & LIDS B&B-1	9' - 6"
NOTE: VAULT INCLUDES 12" RISER, LIDS B & B-1, AND 3" AND 12" GRADE RINGS FOR LID B-1	

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DRAWN	DESIGN	SUPR	DATE	REV
LL	ET	JM	08/17	04

ENGINEERING AND CONSTRUCTION STANDARD

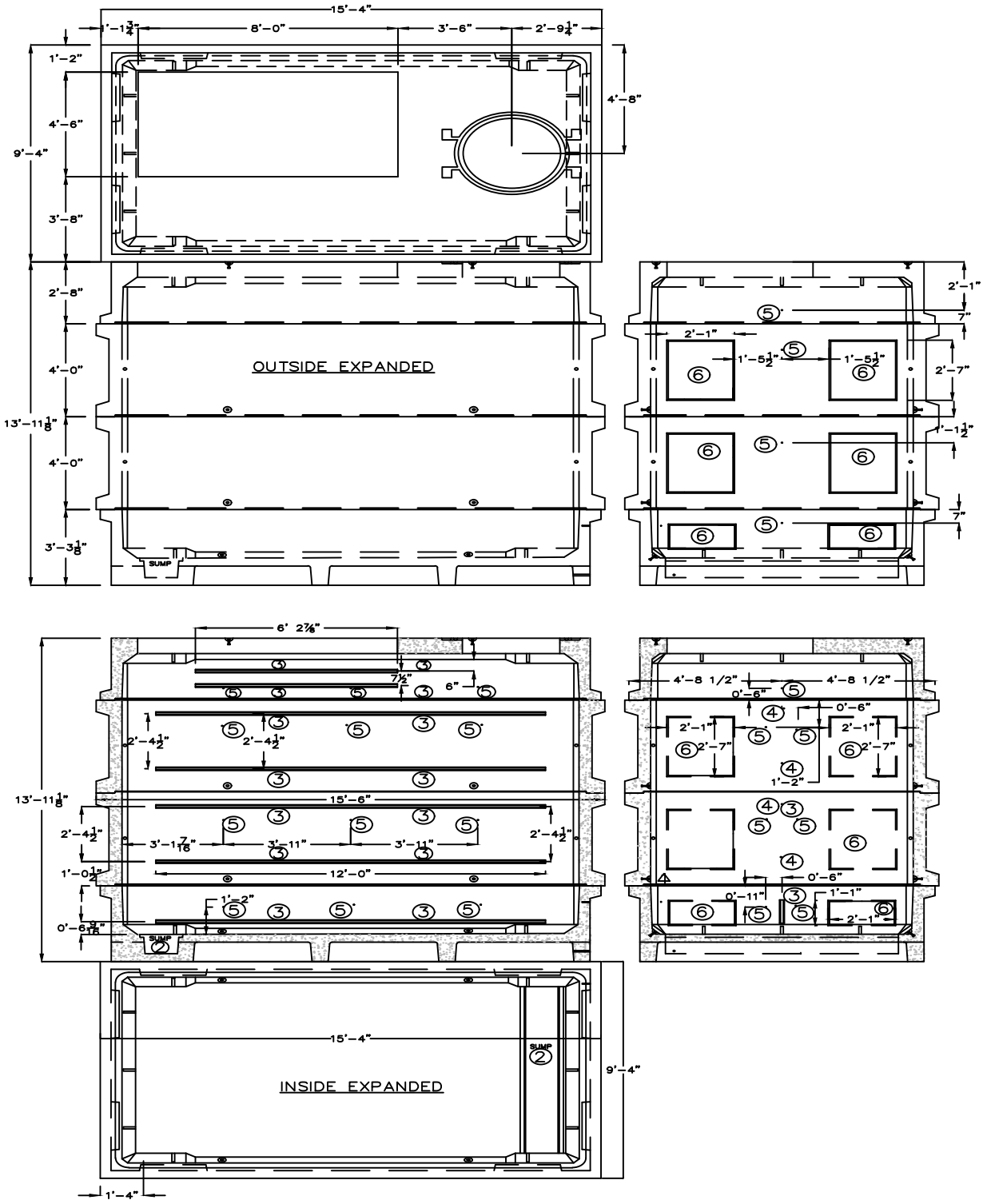
814 VAULT
CONCRETE PRIMARY
8' X 14' X 12' I.D.

5.10.22 OF 40

SUBSTRUCTURE

DRAWING NUMBER
VB0090U

814 VAULT EXPANDED VIEWS



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DRAWN	DESIGN	SUPR	DATE	REV
LL	ET	JM	08/17	04

ENGINEERING AND CONSTRUCTION STANDARD

814 VAULT
CONCRETE PRIMARY
8' X 14' X 12' I.D.

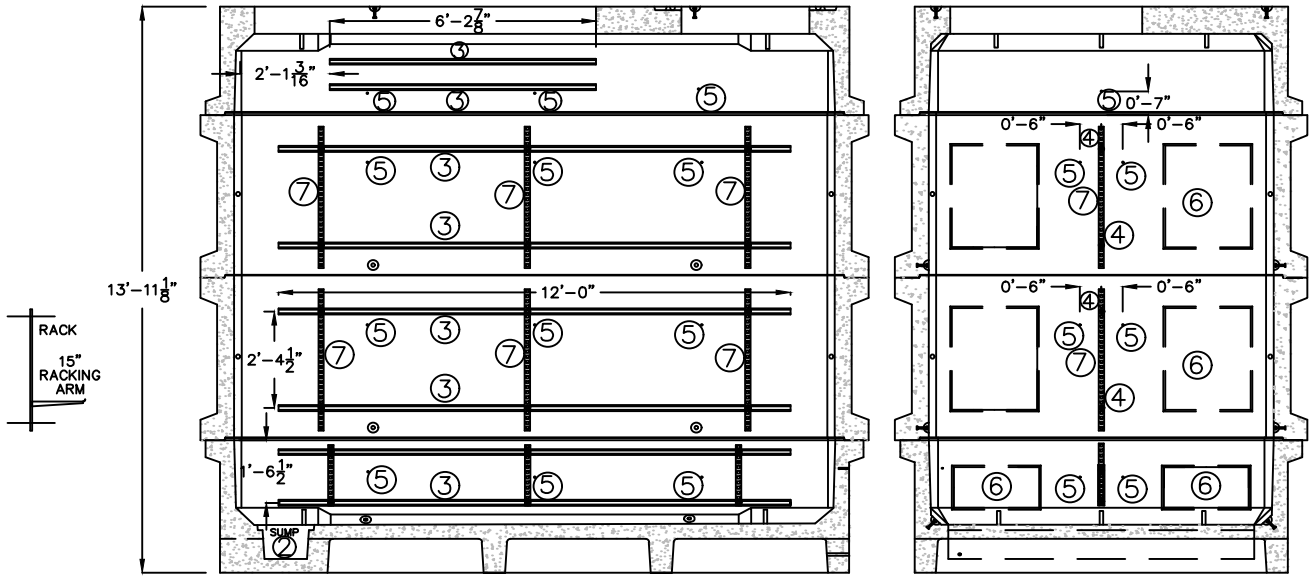
5.10.23 OF 40

SUBSTRUCTURE

DRAWING NUMBER
VB0090U

814 VAULT CONSTRUCTION NOTES:

- Vault to be used for H-20 traffic design loading. All live loads shall be for HS-20-44 (MS-18) as per AASHTO Standard Specification Div 1 Sec.3
  Note: A minimum of 12 inches of vault cover is required.
- Vault excavation and backfill to conform to LU specification SUB01X.
- Butyl rubber or neoprene gasket seal required between vault sections and/or extensions.
- Extensions and risers will be installed on all vaults.
- Unistrut (See detail A) or 1/2" inserts will be cast into vault.
- Lids to be marked "LU Electric"
- All weights to be clearly marked
- 16 -15" steps are supplied with vault.
- Grounding: See expanded view for grounding applications and inserts.
- 2/0 assembly (# 8800-170910) grounding grid is required in this vault.
- Ladder and ladder-up required, See LU Construction Standard VB0105U.
- Middle section is optional.
- Delivery of this vault requires coordination with Jensen Precast.



MAXIMUM CONDUCTORS AND J-BARS					
VAULT 814	200 AMP PRIMARY	600 AMP PRIMARY	SECONDARY	EQUIPMENT	J-BARS 3, 4 OR 5 WAY
	33 18	0 15	4 SETS ≤ 750 QX OR TX	1≤ 225 KVA 1-6 POS SWITCH	3 TOTAL CHECK WITH OPERATIONS
NOTE: REFER TO CAB09U UNDERGROUND FOR COMPLETE APPLICATION					

INSIDE EXPANDED SIDE & END WALL RACK APPLICATIONS WITH ARMS

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DRAWN	DESIGN	SUPR	DATE	REV
LL	ET	JM	08/17	04

ENGINEERING AND CONSTRUCTION STANDARD

814 VAULT CONCRETE PRIMARY 8' X 14' X 12' I.D.

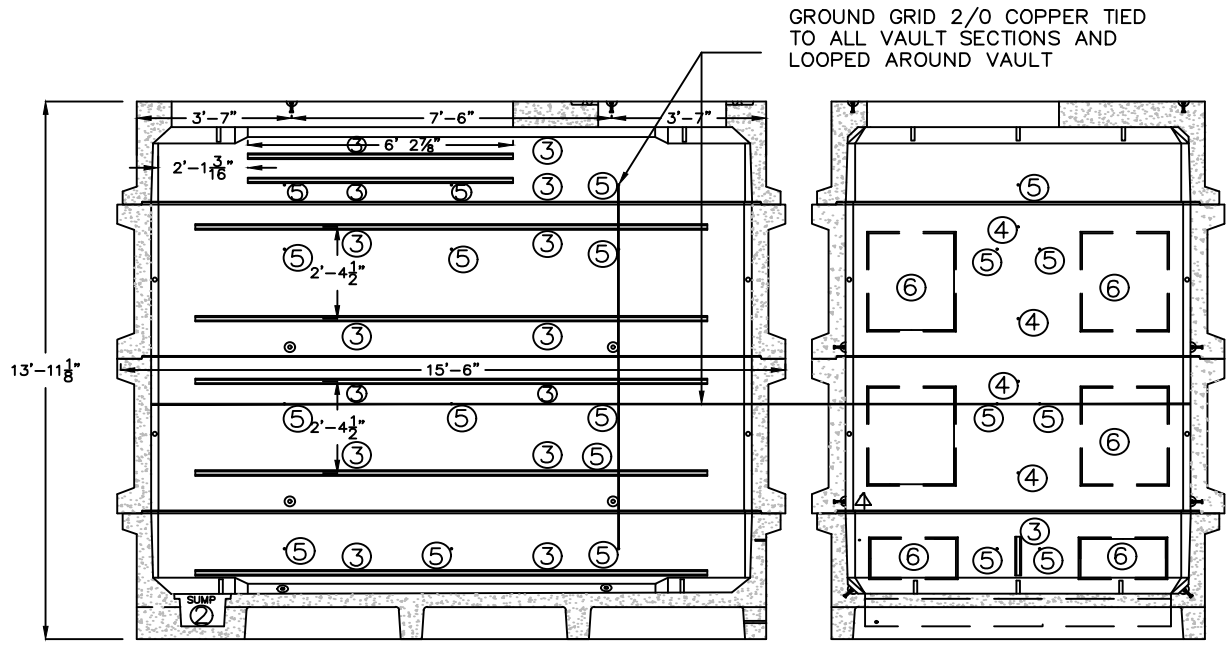
5.10.24 OF 40

SUBSTRUCTURE

DRAWING NUMBER

VB0090U

GROUNDING GRID INSTALLATION DETAILS

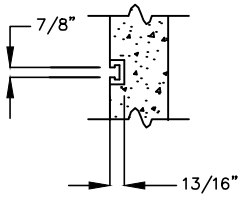


INSIDE EXPANDED SIDE & END WALL
GROUNDING APPLICATIONS AND INSERTS

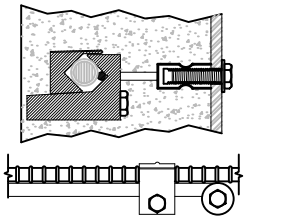
MATERIAL LIST *supplied by Vault Manufacturer*

	INSIDE VAULT HEIGHT	8'	12'
	DESCRIPTION	**QTY**	**QTY**
1.	PULLING IRON 2 per corner	4	4
2.	12" x 84" SUMP W/gate 2 sections	1	1
3.	6' 2-1/2" UNISTRUT top section side walls	8	8
	12" LONG UNISTRUT other section side walls	8	12
	12" LONG UNISTRUT bottom end section	2	2
4.	1/ 2" RACKING INSERT	8	12
5.	1/ 2" GROUNDING INSERT, 28/40 inside 6/8 outside	34	48
6.	12" X 24" KNOCKOUT	4	4
	24" X 30" KNOCKOUT	4	8
7.	12 HOLE RACK (17 3/4" LONG) base	8	8
	28 HOLE RACK (41 3/4" LONG) extension	8	16
9.	SPRING NUT	28	40
10.	1/2" X 1/2" BOLT	37	49
11.	1/2" WASHER	36	48
12.	1/2" BRASS GROUND WASHER, 1 top outside	1	1
13.	15" ARM	12	12
14.	LADDER UP	1	1
15.	LADDER size options on sheet one	1	1

EQUIPMENT INSTALLATION GROUNDING GRID:
INSTALL 54' OF 2/0 COPPER GROUND GRID. TIE TO ALL SECTIONS AND LOOP THROUGH 12 GROUNDING LUGS ATTACHED TO 1/2" GROUNDING INSERTS AROUND VAULT AND BUS TO TRANSFORMER, SWITCH, CONCENTRIC NEUTRAL, J-BAR OR BRACKET.



UNISTRUT
DETAIL "A"



COPPER PIGTAIL TO BE SECURED TIGHTLY TO REINFORCING BAR WITH CLAMP BEFORE POURING CONCRETE.

GROUND INSERT
DETAIL "B"

Liberty Utilities®

DRAWN	DESIGN	SUPR	DATE	REV
LL	ET	JM	08/17	04

ENGINEERING AND CONSTRUCTION STANDARD

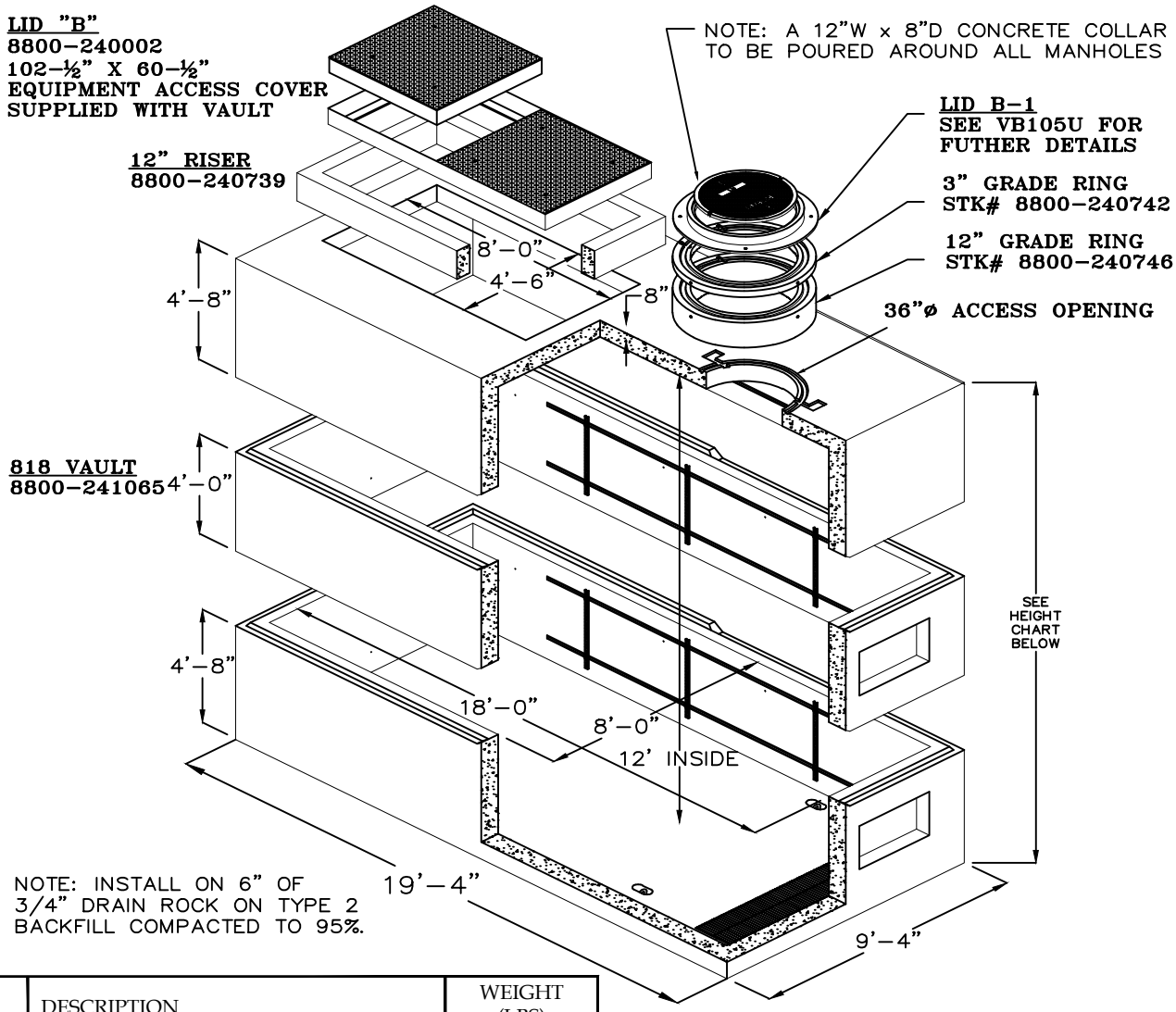
814 VAULT
CONCRETE PRIMARY
8' X 14' X 12' I.D.

5.10.25 OF 40

SUBSTRUCTURE

DRAWING NUMBER
VB0090U

818 VAULT ISOMETRIC DETAIL



STK#	DESCRIPTION	WEIGHT (LBS)
8800-241065	818 VAULT	82,000
8800-240739	12" RISER for lid B	1,993
8800-240002	LID B H-20 equipment	5,200
8800-241215	LID B-1 H-20 3' manhole	800
8800-240746	12" GRADE RING for MH	682
8800-240744	6" GRADE RING for MH	341
8800-240742	3" GRADE RING for MH	166
8800-241340	LID D GRADE maint only	700

HEIGHT OF VAULT WITH CORRESPONDING LIDS	LADDER LENGTH
15'- 0" WITH LID B & B1	14'
NOTE: VAULT INCLUDES 12" RISER, LIDS B & B-1, AND 3" AND 12" GRADE RINGS FOR LID B-1	

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DRAWN	DESIGN	SUPR	DATE	REV
LL	ET	JM	08/17	04

ENGINEERING AND CONSTRUCTION STANDARD

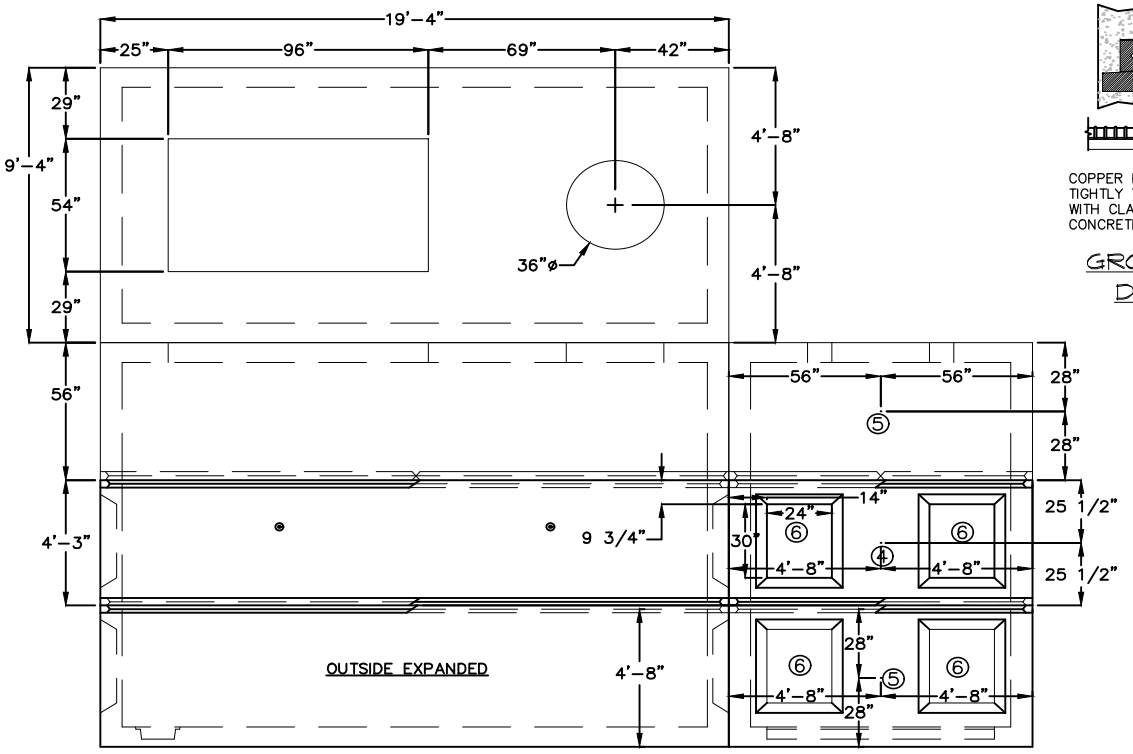
818 VAULT
CONCRETE PRIMARY
8' X 18' X 12' I.D.

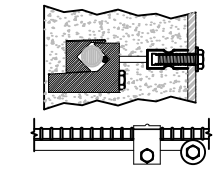
5.11.26 OF 40

SUBSTRUCTURE

DRAWING NUMBER
VB0095U

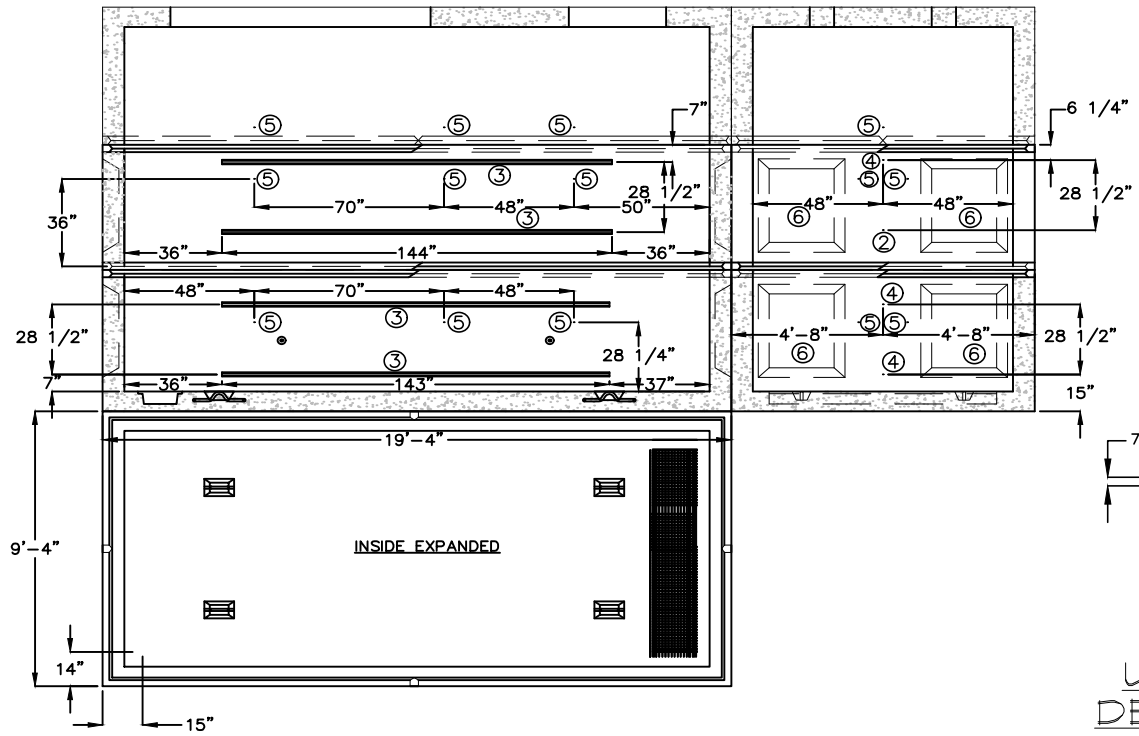
818 VAULT EXPANDED VIEWS

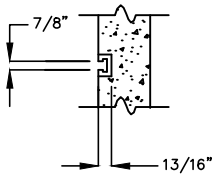




COPPER PIGTAIL TO BE SECURED TIGHTLY TO REINFORCING BAR WITH CLAMP BEFORE POURING CONCRETE.

GROUND INSERT
DETAIL "B"





UNISTRUT
DETAIL "A"

Liberty Utilities®

DRAWN	DESIGN	SUPR	DATE	REV
LL	ET	JM	08/17	04

ENGINEERING AND CONSTRUCTION STANDARD

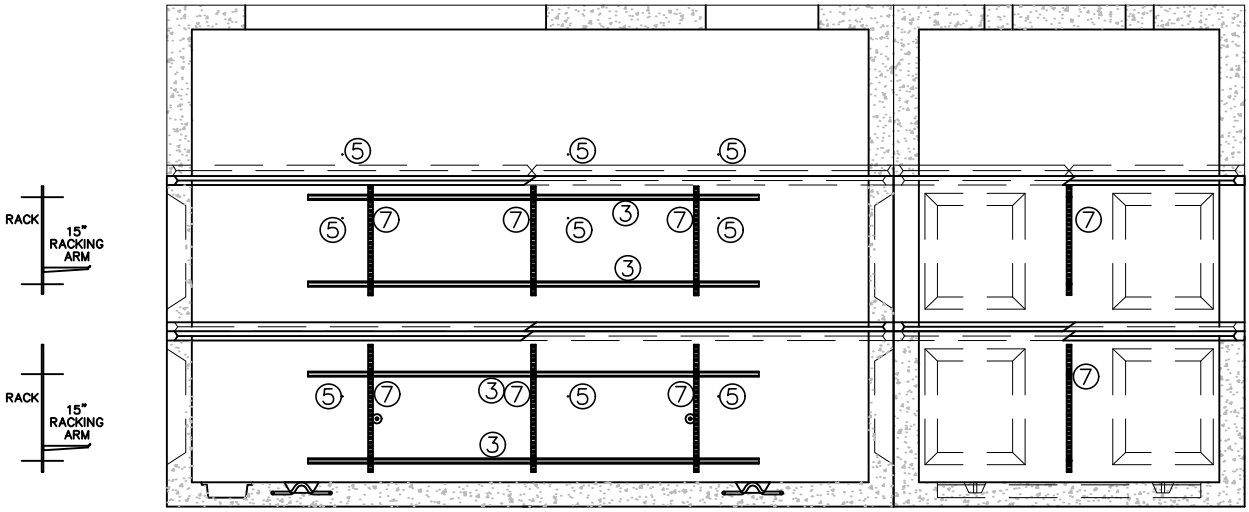
818 VAULT
CONCRETE PRIMARY
8' X 18' X 12' I.D.

5.11.27 OF 40

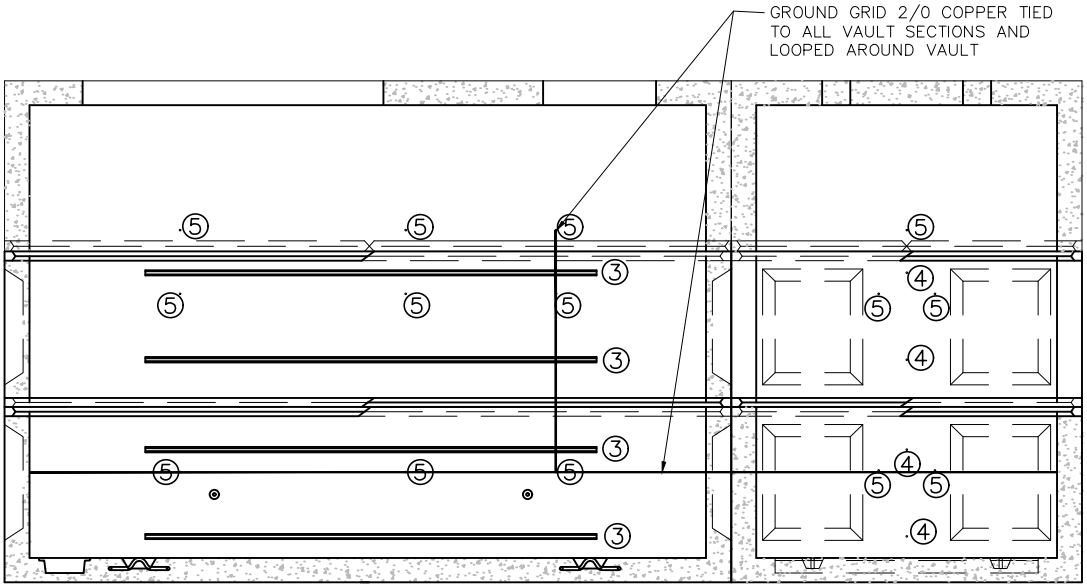
SUBSTRUCTURE

DRAWING NUMBER
VB0095U

GROUNDING GRID INSTALLATION DETAIL



INSIDE EXPANDED SIDE & END WALL
RACK APPLICATIONS WITH ARMS



INSIDE EXPANDED SIDE WALL
GROUNDING APPLICATIONS AND INSERTS

EQUIPMENT INSTALLATION GROUNDING GRID:
INSTALL 62' OF 2/0 COPPER GROUND GRID. TIE TO ALL SECTIONS AND LOOP THROUGH 12 GROUNDING LUGS ATTACHED TO 1/2" GROUNDING INSERTS AROUND VAULT AND BUS TO TRANSFORMER, SWITCH, CONCENTRIC NEUTRAL, J-BAR OR BRACKET.

Liberty Utilities®

DRAWN	DESIGN	SUPR	DATE	REV
LL	ET	JM	08/17	04

ENGINEERING AND CONSTRUCTION STANDARD

818 VAULT
CONCRETE PRIMARY
8' X 18' X 12' I.D.

5.11.28 OF 40

SUBSTRUCTURE

DRAWING NUMBER
VB0095U

818 VAULT CONSTRUCTION NOTES:

- Vault to be used for H-20 traffic design loading. All live loads shall be for HS-20 - 44 (MS18)as per AASHTO Standard Specification, Div 1, Sec.3
  Note: A minimum of 12inches of vault cover is required.
- Vault excavation and backfill to conform to LU Specification SUB01X.
- Butyl rubber or neoprene gasket seal required between vault sections and/or extensions.
- Extensions and risers will be installed on all vaults.
- Unistrut (See detail A) or 1/2" inserts will be cast into vault.
- Lids to be marked "LU Electric"
- All weights to be clearly marked
- 16 -15" steps are supplied with vault.
- Grounding: See expanded view for grounding applications and inserts.
- 2/0 CU (# 8800-170910) grounding grid is required in this vault.
- Ladder and ladder-up required, See LU Standard VB105U.
- Middle section is optional.
- Delivery of this vault requires coordination with the vault manufacturer.

MATERIAL LIST *supplied by Vault Manufacturer*

	DESCRIPTION	QTY
1.	PULLING IRON 2 per corner	8
2.	12" X 84" SUMP W/grate 2 sections	1
3.	12' LONG UNISTRUT side walls	8
4.	1/ 2" RACKING INSERT	8
5.	1/ 2" GROUNDING, 28 inside - 6 outside	34
6.	24" x 30" KNOCKOUT	8
7.	24 HOLE RACK (35 3/4" LONG) extension	8
	28 HOLE RACK (41 3/4" LONG) base	8
9.	SPRING NUT	24
10.	1/2" X 1 1/2" BOLT	33
11.	1/2" WASHER	34
12.	1/2" BRASS GROUND WASHER, 1 top outside	1
13.	15" ARM	16
14.	LADDER UP	1
15.	LADDER size options on sheet one	1

MAXIMUM CONDUCTORS AND J-BARS

	200 AMP PRIMARY	600 AMP PRIMARY	SECONDARY	EQUIPMENT	J-BARS 3, 4 OR 5 WAY
VAULT 818	18 12	0 6	4 SETS ≤ 750 QX OR TX	1 ≤225 KVA 2-6 POS SWITCHES	3 TOTAL CHECK WITH OPERATIONS

NOTE: REFER TO CAB09U UNDERGROUND FOR COMPLETE APPLICATION

Liberty Utilities®

DRAWN	DESIGN	SUPR	DATE	REV
LL	ET	JM	08/17	04

ENGINEERING AND CONSTRUCTION STANDARD

818 VAULT CONCRETE PRIMARY 8' X 18' X 12' I.D.

5.11.29 OF 40

SUBSTRUCTURE

DRAWING NUMBER

VB0095U

DESIGN GUIDE FOR CUSTOMER-OWNED TRANSFORMER VAULTS

1.0 INDEX

2.0 PURPOSE

This standard represents LU's basic design criterion for customer-owned transformer vaults. **Customer owned vaults must follow GO 128 33.4.**

3.0 GENERAL

The requirements in this standard may be in addition to the requirements in GO 128, and all Local Codes. The customer is responsible for providing a complete vault structure.

Vaults may be either installed Underground, with access and ventilation through an opening in the top section, furnished by the customer within his premises, or as an attachment with access through a door in one of the vault walls and/or a hatch in the roof of the vault.

4.0 LOCATION OF INSTALLATION

4.1 When furnished by the customer and installed on his premises, the vault must be so located as to be accessible at all times by LU crews and hoisting equipment. Future expansion plans by the customer must not affect accessibility. Customer shall furnish dimensioned plan and elevation views of the entire project showing the vault location in relation to surrounding structural parts. **Two sets of drawings clearly showing the vault must be submitted to the appropriate LU Engineering Dept.** The elevational view will be checked for vault

elevation and its ventilating system in relation to the levels of streets, water mains, sewer lines, storm-drains, and other discharge facilities that, when ruptured or overflowing, could flood he vault. No such piping is permitted to enter or pass through a transformer vault (GO 128 Sec III 34.2)

4.2 Vaults shall be located where they can be ventilated to the outside air whenever practicable (GO 128 Sec III 34.2-C)

4.3 Underground vaults with openings at or below street level must be considered as subject to flooding. A means to eliminate or reduce the degree of flooding is to raise the vault's top section above its surroundings where possible on customer's property.

5.0 VENTILATION

5.1 The vault can be provided with ventilation directly to the outside air of total net area as shown below in 5.2. Ventilation may be incorporated into the design of the door, cover, hatches, etc. Net area means after deducting area taken by grates, mesh, louers, etc. Vault ambient temperatures shall not exceed 40°C and the average ambient temperature for any 24 hour period shall not exceed 30°C. Forced ventilation thermostatically controlled (5.3) can be utilized if necessary and approved by LU. Forced air inlets shall be near the floor and exhaust near the ceiling of the vault. Both inlet and exhaust ducts shall be fire proofed including fire damperers.

5.2 Natural Air Circulation: The size of opening is determined by as follows: **Net** Area in square inches > 3 x kVA rating.
Example:
For a 50 kVA transformer, net ventilation area = 3 x 50 = 150 sq. in.

Note: 1 sq. ft. is the minimum net area also for any transformer under 50 kVA. When determining the size of the opening, all obstructions, such as the grate, must be added to the net area. Two openings at opposite vault ends are more effective than one center opening of the same total net area.

5.3 Forced Air Circulation:

A. The accurate calculation of the minimum required quality of cooling air, expressed in cubic-foot per minute (CFM), should be made. The flow of the air must be such that the transformer is cooled.

B. Air inlets and outlets shall be located at opposite ends of the vault, the inlet positioned as close to the floor as possible (maximum of 18"), and the outlet as close as possible to the roof of the vault. The farther apart inlet and outlet are from each other within the given vault space, the more efficient the cooling of the transformer(s) within it.

C. Transformer data for loss calculations will be 1.15% of nameplate for transformers less than 750kva; 0.87% for 750/1000/1500 kva transformers and 0.77% for transformers greater than 1500 kva.

D. Use 0.045 kw per 10 ft² for heat transferred through the vault walls and roof, if not exposed to the sun.

E. The volume of cooling air per minute will be calculated as follows:
1. CFM = 110CFM/KW net loss.
2. Net Loss KW = transformer losses minus vault heat transfers.

F. Fans will be less than 1750 RPM to reduce noise. Axial type fans capable of continuous service are recommended. All fans require a manual "across the line" starter and "overload" protection.

G. In vaults where continuous heavy loading does not occur, thermostatic control of the fan may provide economic advantages by reducing power requirements and fan maintenance. Thermostats will generally be set @ 85°F with a differential of 15°F.

6.0 VAULTS IN STREET AND RIGHTS-OF-WAY

6.1 Vaults of this type are usually precast, selected from manufacturer's catalogs, and installed by the customer or in some cases by LU The following rules apply:

A. Opening(s) in the top section shall be large enough to install and remove transformer(s) in their upright position with only the cover section of the vault removed and without disturbing the pavement that extends over the remainder of the vault.

B. The cover section(s) will have an opening covered by a grate to permit adequate ventilation. All ventilation openings shall be covered with durable gratings, screens, or louvers according to the treatment required in order to avoid unsafe conditions.

C. Transformers and equipment in underground vaults shall be submersible or partially submersible as the case may permit.

D. Vaults containing more than 100 kVA transformer capacity shall be provided with a sump in the lowest part of the floor.

E. Ground rods, minimum of (2) 5/8" x 8', to be installed in the trench near opposite corners of the vault. Grounding bus will be connected to the rods (grd inserts) and will be continuous around the inside of the vault, consisting of #2/0 str copper (min.). Aluminum not permitted.

7.0 CUSTOMER BUILDING VAULTS

7.1 The vault must conform to drawing on sheet 5.13.38 of this standard. The no-scale outline on that drawing must be supplemented by a scaled drawing showing all installations in their true relationship per 4.1.

7.2 Pulling irons are to be rated at least 20,000 lbs. working load. Two or more on each wall, (if more than 2 transformers, 1 for each transformer), 24 inches from the wall, the location to be determined by LU Customer Services Engineering. Each pulling iron must be tied into the rebar in the wall and located approximately 18" above the floor. One iron will be provided for cable pulling located in opposite wall, same height as incoming primary conduits.

7.3 The walls and roof of vaults shall be constructed of materials which have adequate structural strength for the conditions with a minimum fire resistance of three hours. The floors of vaults in contact with the earth shall be of concrete not less than 4 inches thick, but when the vault is constructed with a vacant space or other stories below it, the floor shall have adequate structural strength for the loading imposed thereon (25,000 lbs for a 2500 kva) and a minimum fire resistance of three hours. The three - hour fire resistance requirement may be reduced to one hour fire resistance if transformers are protected with automatic carbon dioxide or Halon systems.

7.4 For doorways.
Floor and bottom four inches of wall and doorway openings to be constructed and sealed so as to contain any oil spill. Each doorway leading into a vault from the building interior shall be provided with a tight - fitting door having a minimum **fire rating of three hours**. *The vault shall have at least two means of entrance/exit.* The doors shall swing out and be equipped with lock sand hinges/latches that permit opening by easy pressure or torque on the operating components. Door will be provided with a LU key box.

7.5 If the customer cannot guarantee that the vault is safe from entry of water, all equipment must be at least partially submersible and installations such as electrical outlets and lights must be vapor tight.

7.6 Vault floors shall slope to a sump of 12" diameter, (or one (1) foot square), with 12" minimum depth. A grated cover will be required.

7.7 The customer must provide a continuous grounding bus ring consisting of a minimum of #2/0 str copper wire and shall be tied to the structural steel of the building at two or more points and be run around the inside walls of the vault at 12" above the floor. Grounding connections shall be cadweld or equivalent. The grounding bus will be used for equipment grounding. Aluminum is not permitted.

7.8 Vault lighting and wall outlets will be provided by the customer and shall be connected to the customers emergency power supply when applicable. As a rule, lighting, approximately 2 watts per square foot (25 foot candles) of floor space, shall be provided from at least two

overhead fixtures with a control switchmounted close to the personnel access entrance into the vault. 120V wall outlets consisting of duplex receptacles, minimum rating 20 amps, shall be provided so that no point on a wall is more that ten feet away from an outlet.

7.9 Primary cables will not be be laid on the vault floor. Wall racking or ceiling supports will be provided by the customer. Any support structures shall be constructed such that a minimum of 9' of clearance exists from the bottom of the cable rack to the vault floor. Any metal racking will be bonded to the vault ground system.

7.10 Any pipe or duct system foreign to the electrical installation shall not enter or pass through a transformer vault. Piping or other facilities provided for fire protection, or for transformer operation shall not be considered foreign to the electrical system.

7.11 Transformer vault area shall not be used for storage.

7.12 A telephone is required to be installed in the vault room. This requirement does not apply to outside underground vaults where access to a radio is available.

7.13 No Customer equipment is allowed in the transformer vault area with the exception of his secondary bus. The bus shall be designed and located such that it will not block the primary cable installation.

7.14 Each vault, through the roof access, must have a permanently attached ladder. A light switch must be near the top of the ladder. The ladder must be installed so as not to interfere with vault's equipment opening.

8.0 SECONDARY TERMINATION AT TRANSFORMERS

8.1 The customer shall provide a secondary cable support system. Any metal racking will be bonded to the vault ground system. The support system shall be arranged to provide a maximum unobstructed passageway for personnel.

8.2 For the installation of the bus duct, see LU Standard SB0001M, in Section 8.

8.3 The bus duct will be terminated to the transformer using an 18" or 24" flexible copper braid connector rated at 1000 amps each. LU stock #8800-252802/8800-252804.

8.4 For general information see Drawings on Sheets 5.13.38 & 5.13.39 of this Standard.

9.0 METERING

The customer's main switch and metering panel shall be located outside of and adjacent to the vault. Space at the metering panel shall be provided for the meter(s) and metering instrument transformers which LU shall provide. Metering equipment and switchgear must be approved by LU metering dept. prior to installation.

10.0 REFERENCES

10.1 LU engineering and construction standard: Underground, DES05U, " large underground commercial distribution service planning guide".

10.2 LU: TRS10X "three- phase subway/vault - type distribution transformer specification".

10.3 ASTM standard E119-75 "construction materials for 3 - hour fire resistance".

10.4 NFPA 251: "fire tests of building construction and materials".

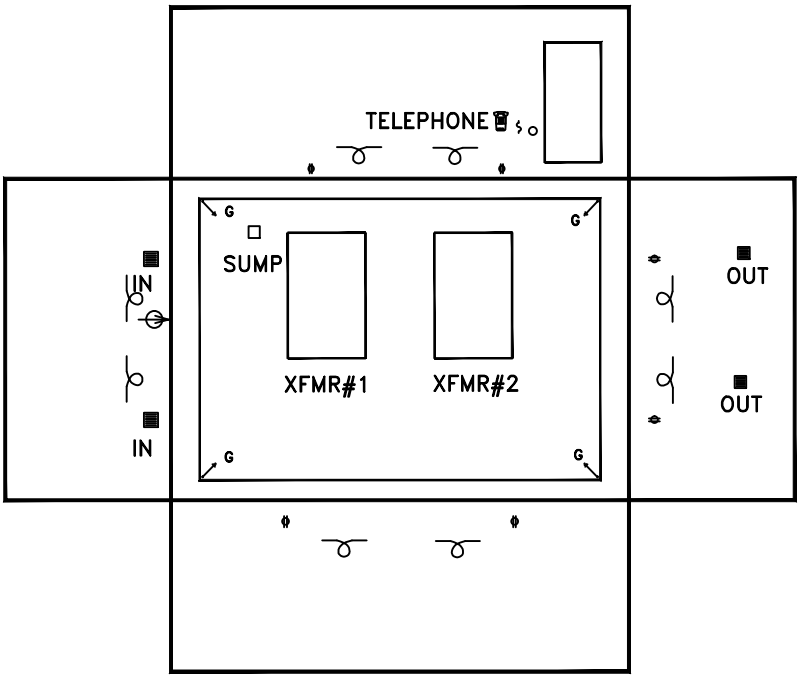
10.5 NFPA 80 (ANSI): standard for the installation of fire doors and windows".

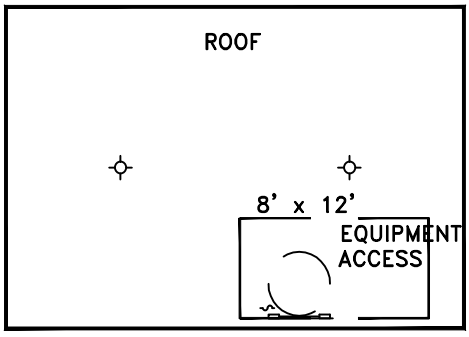
10.6 ANSI 42.1: "methods of fire tests of building and materials".

10.7 ANSI/UL 555: "standard for fire dampers".

10.8 California administrative code: title 8 "industrial relations".

11.0 VAULT DETAILS/DRAWINGS





TOP VIEW
SHOWING WALLS

NOTE

LU MUST HAVE 16' TO 20' O/H CLEARANCE FOR INSTALLING AND REMOVING LU EQUIPMENT WHICH WILL REQUIRE AN O/H CRANE. IF OVERHANG IS PROVIDED IT MUST BE REMOVABLE.
MIN: VAULT SIZE FOR 2–2500 kVA XFMR IS 25' X 25' X 15'HT

LEGEND

1. RECESSED PULLING IRONS (MIN. 2 PER WALL)
2. SUMP–GRATED 12"X 12"X 12" (MINIMUM)
3. DOOR–METAL WITH 4" SILL (MIN.)
4. GROUNDS (2 MINIMUM) / GROUND BUSS.
5. EQUIPMENT ACCESS (3 PIECE: 4' X 8')
6. GRATING COVER (39")
7. 120 VOLT OUTLET
8. OVERHEAD LIGHT (150 WATT) VAPORTIGHT
9. OVERHEAD LIGHT SWITCH (3 WAY)
10. TRANSFORMER
11. LOUVERS (FIRE DAMPER)
12. LU KEY LATCH ASSEMBLY CUSTOMER (OUTSIDE OF VAULT/METER ROOM)
13. TELEPHONE–WALL MOUNTED
14. FORCED AIR VENT
15. LADDER

CONSTRUCTION NOTES

A. Be sure adequate concentric neutral wire is provided for proper operation of separable connectors.

B. Underground Cable identification tags to be used in accordance with CAB07U, Underground and Operating Procedures Section 21.

C. Fault indicators to be used in accordance with HDE02U, Underground.

D. Energized cables to be handled in accordance with Underground Operating Procedures, Section 20.

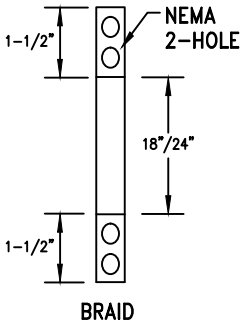
CUSTOMER NOTES

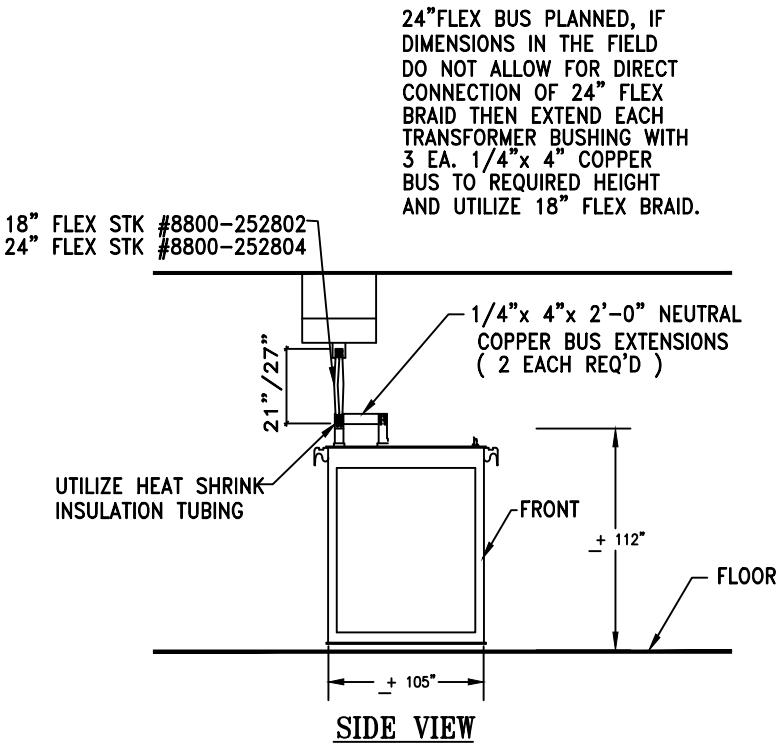
1. Customer is responsible for secondary buss duct and primary cable trays.

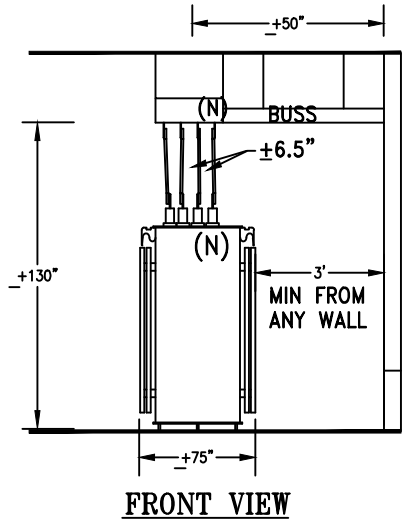
2 Contact appropiate LU Planner for precise transformer measurements.

3. Dimensions shown are for 25KV 2500 kVA transformer .

4. Buss duct will terminate with NEMA standard spacing (4 hole) see SB0001M.







EXAMPLE ONLY

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LL	ET	JM	08/17	04

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ENGINEERING AND CONSTRUCTION STANDARD

DESIGN GUIDE FOR CUSTOMER OWNED TRANSFORMER VAULTS

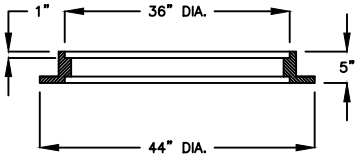
5.12.37 OF 40

SUBSTRUCTURE

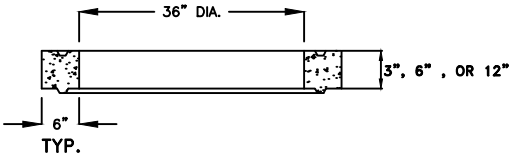
DRAWING NUMBER

VB0100U

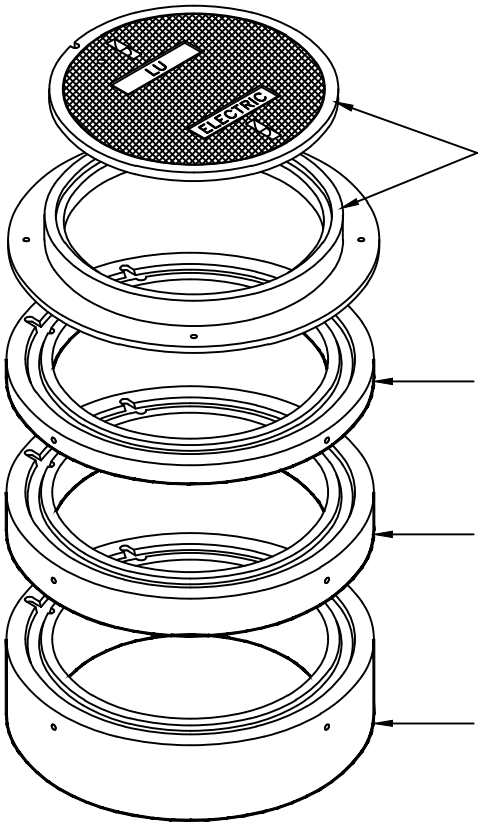
MANHOLE RISERS AND COVER DETAILS



36" DIA. CAST IRON FRAME



GRADE RING SECTION VIEW



MANHOLE FRAME & COVER LU STOCK No. 8800-241215 EXTRA HEAVY FOR H-20 FULL TRAFFIC AREAS.

36"ø X 3" HIGH GRADE RING LU STOCK No. 8800-240742

36"ø X 6" HIGH GRADE RING LU STOCK No. 8800-240744

36"ø X 12" HIGH GRADE RING LU STOCK No. 8800-240746

NOTES:
1. FRAME WILL ACCOMODATE VENTED COVER.
2. 42" OPENINGS: JENSEN PRECAST SPECIAL ORDER.

STK#	DESCRIPTION	WEIGHT (LBS)
8800-241215*	MANHOLE FRAME AND COVER	800
8800-240742*	36" DIA. X 3" HIGH GRADE RING	166
8800-240744	36" DIA. X 6" HIGH GRADE RING	341
8800-240746* (a)	36" DIA. X 12" HIGH GRADE RING	682
*THESE COMPONENTS ARE CALLED OUT AS STK# 8800-241305		
(a) INCLUDES 14-1/2" STEP RUN		

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ENGINEERING AND CONSTRUCTION STANDARD

LADDER, LADDER-UP STEP RUNG & MANHOLE RISERS & COVER

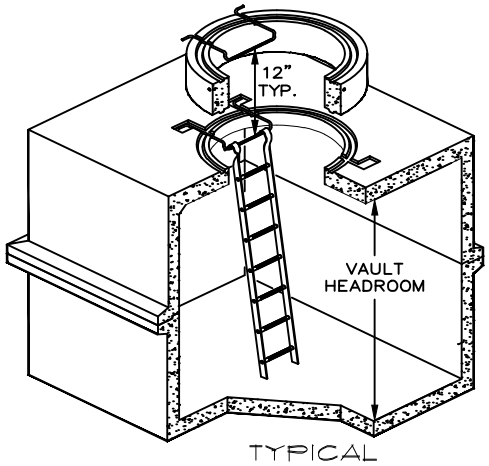
5.13.38 OF 40

SUBSTRUCTURE

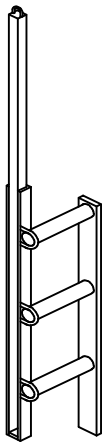
DRAWING NUMBER

VB0105U

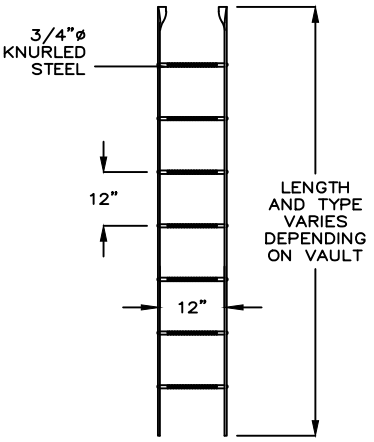
LADDER, LADDER-UP, & STEP RUNG DETAILS



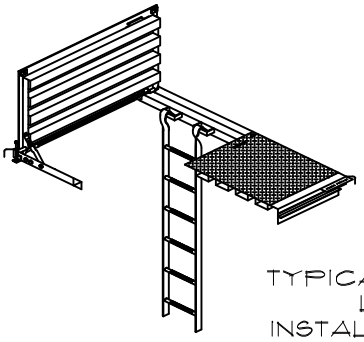
TYPICAL INSTALLATION LID B-1
H-20 RATED
3' MANHOLE OPENING



LADDER-UP (CUT AWAY DETAIL)

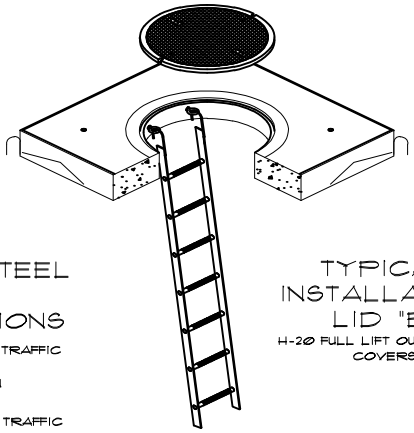


LADDER (GALVANIZED)

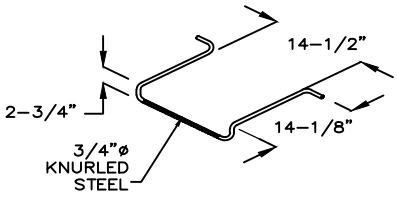


TYPICAL STEEL LID INSTALLATIONS
LID "A" H-10 TRAFFIC RATED
LID A SHOWN

LID "C" NON TRAFFIC RATED
TORSION SPRING ASSISTED COVERS



TYPICAL INSTALLATION LID "B"
H-20 FULL LIFT OUT ACCESS COVERS



STEP RUNG USED ON LID B-1
(GALVANIZED)

CONSTRUCTION NOTES:

- LADDER-UP SAFETY POST NEEDED FOR ALL APPLICATIONS. LU STK# 8800-955580 TYPICALLY SUPPLIED WITH VAULT.
- FOR LADDER LENGTH, REFERENCE THE FIRST PAGE OF THE INDIVIDUAL STANDARD FOR THAT VAULT.

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ENGINEERING AND CONSTRUCTION STANDARD

LADDER, LADDER-UP, STEP RUNG & MANHOLE RISERS & COVER

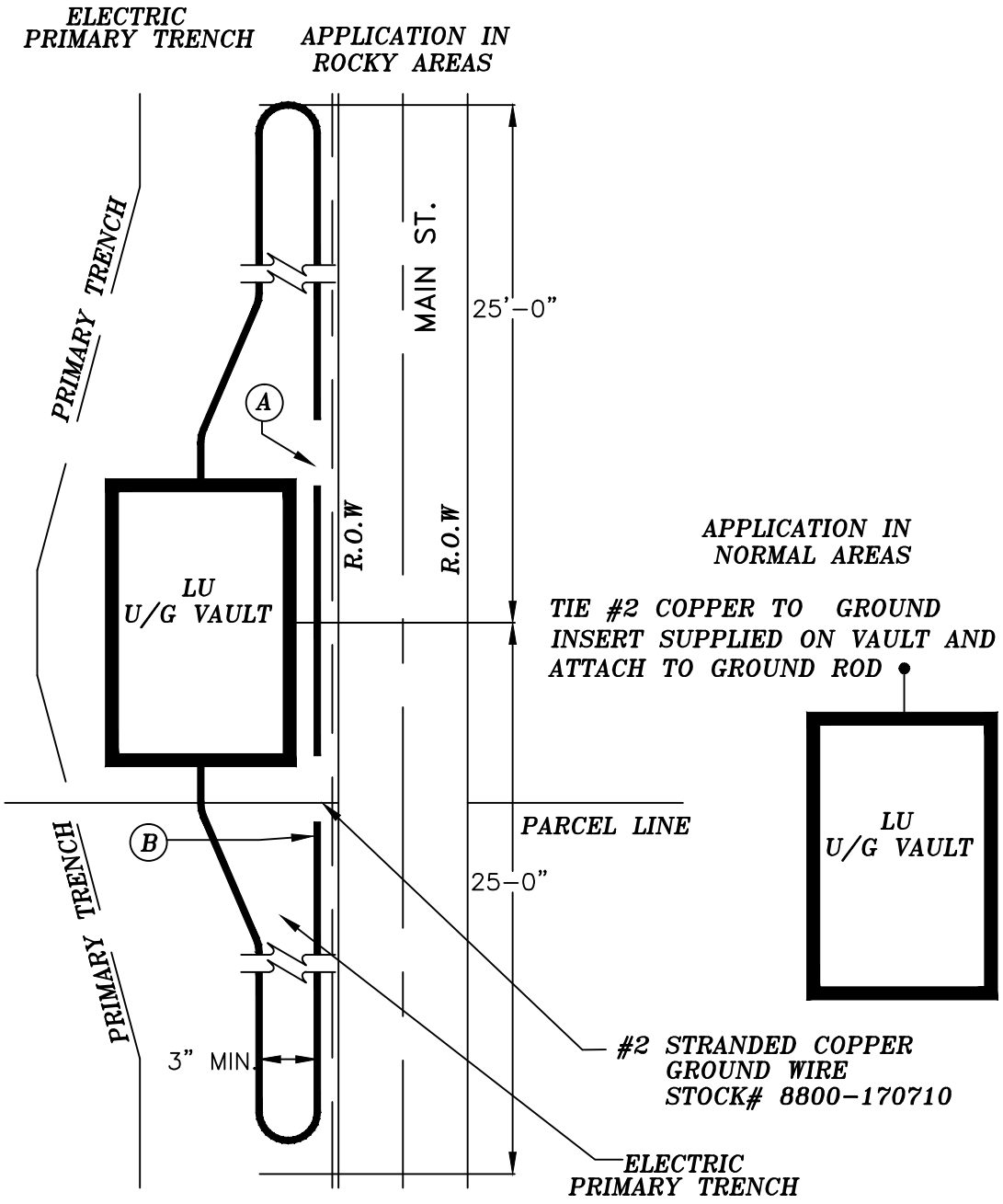
5.13.39 OF 40

SUBSTRUCTURE

DRAWING NUMBER
VB0105U

VAULT GROUNDING DETAILS

APPLICATION GUIDE IF ADDITIONAL GROUNDING IS NEEDED WHERE OHMS OF RESISTANCE IS HARD TO ACHIEVE



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ENGINEERING AND CONSTRUCTION STANDARD

ALTERNATE VAULT GROUNDING DETAIL

5.14.40 OF 40

SUBSTRUCTURE

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VB0115U