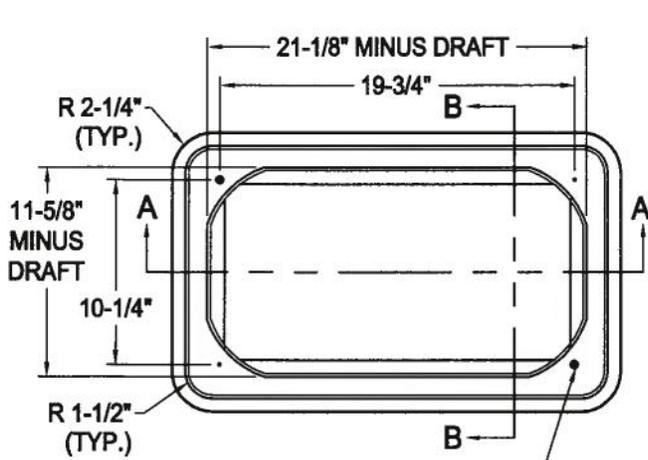
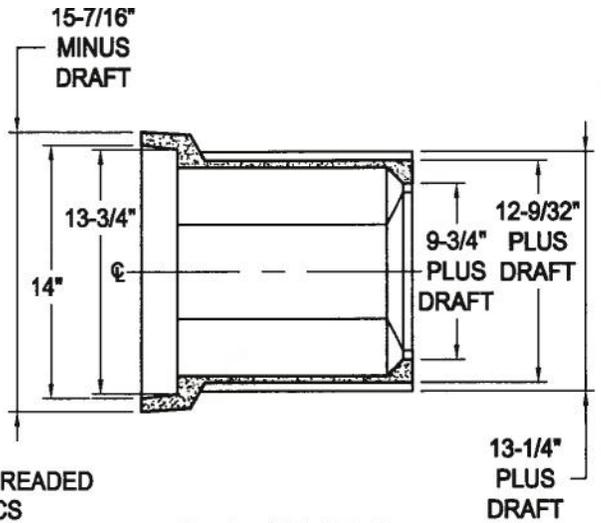


APPENDIX A

CITY OF BEVERLY HILLS STANDARD DRAWINGS

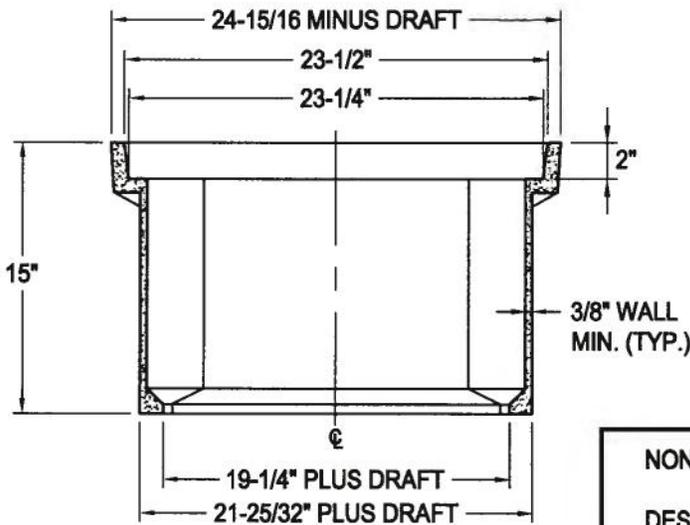


PLAN VIEW

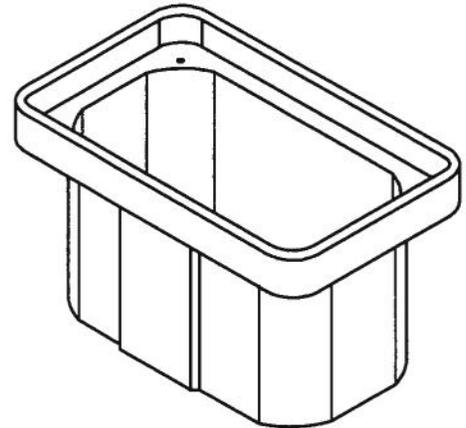


SECTION B-B

3/8-16 SST THREADED INSERT, 2 PLCS
(4 PLCS OR FLOATING NUT ALSO AVAILABLE)



SECTION A-A



NON-TRAFFIC RATED	
DESCRIPTION OF MATERIAL:	POLYMER CONCRETE (GRAY)
TOLERANCE:	±1/8"
ESTIMATED PART WEIGHT:	65.0 LBS.

WATER METER BOX & LID - 13" x 24"

REVISIONS		
MARK	DATE	DESCRIPTION

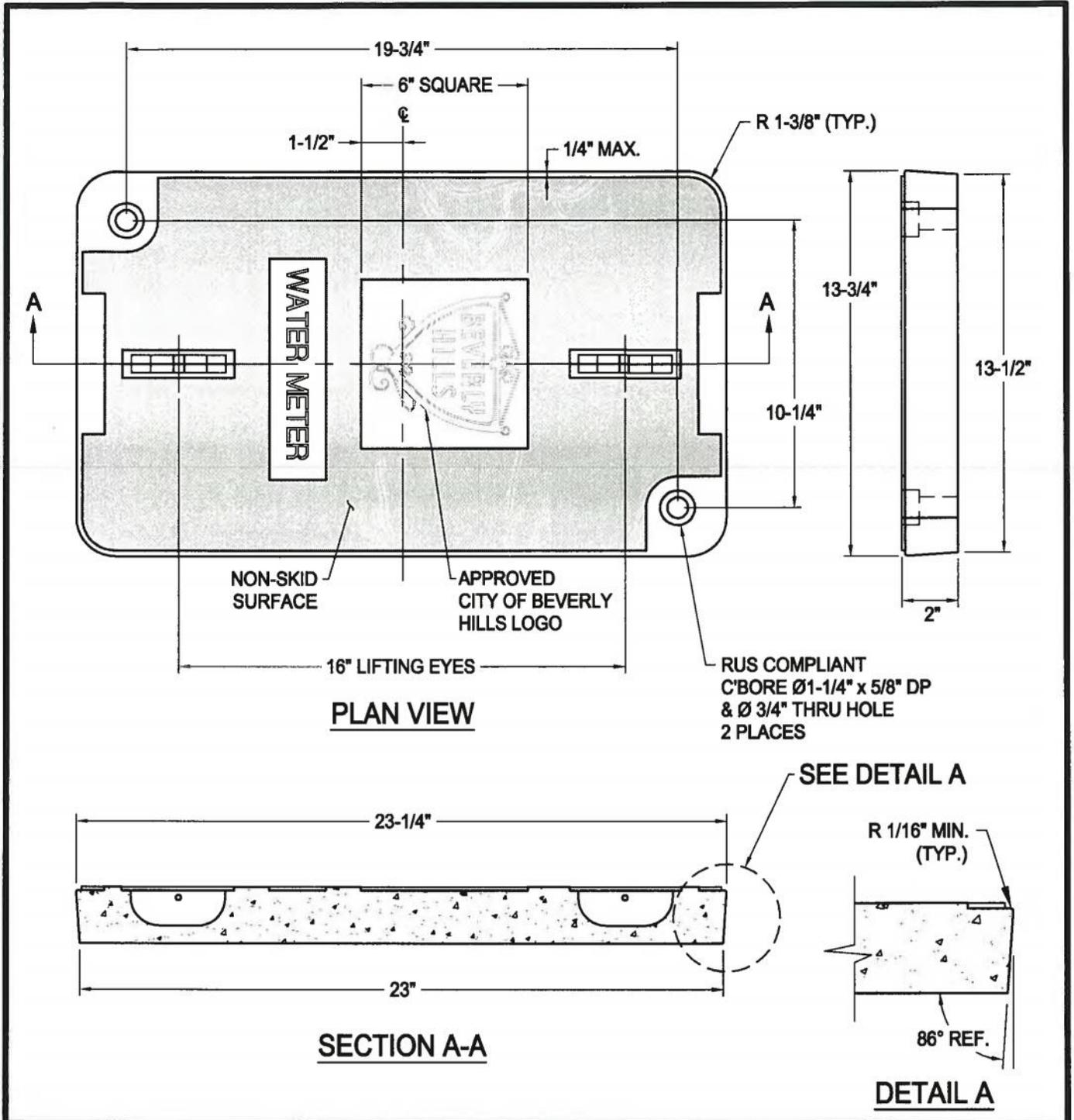


CITY OF BEVERLY HILLS, CALIFORNIA

DEPARTMENT OF PUBLIC WORKS & TRANSPORTATION
CIVIL ENGINEERING DIVISION

RECOMMENDED *Chris T...* DATE *11-18-10*
CITY ENGINEER
APPROVED *Ray L. ...* DATE *11-18-10*
PUBLIC WORKS DIRECTOR

STANDARD DRAWING
BH 712
SHEET 1 OF 2



WATER METER BOX & LID - 13" x 24"

REVISIONS		
MARK	DATE	DESCRIPTION



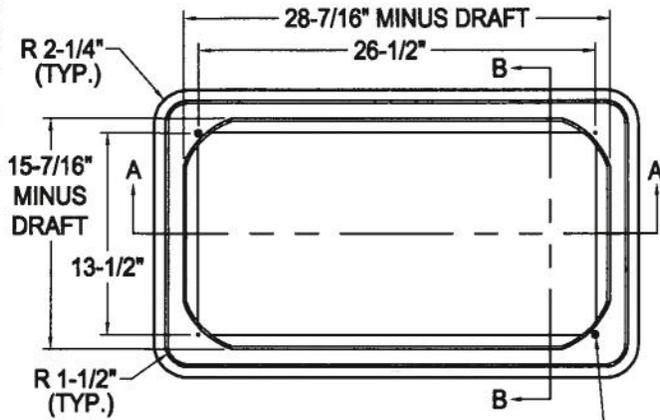
CITY OF BEVERLY HILLS, CALIFORNIA

DEPARTMENT OF PUBLIC WORKS & TRANSPORTATION
CIVIL ENGINEERING DIVISION

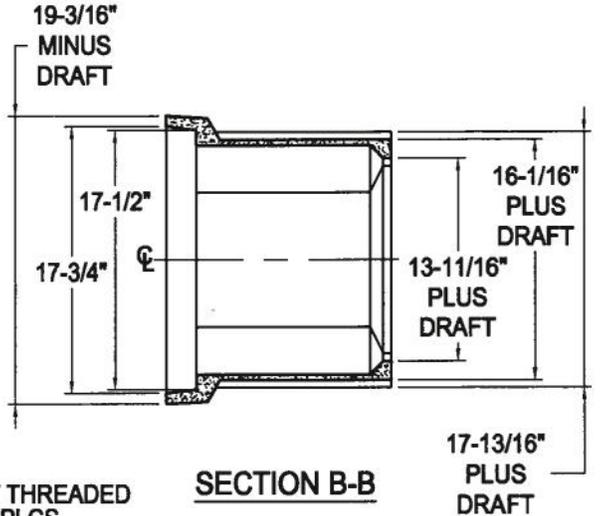
RECOMMENDED *Christina* DATE 11-8-10
CITY ENGINEER

APPROVED *Russ E. East* DATE 11-18-10
PUBLIC WORKS DIRECTOR

STANDARD DRAWING
BH 712
SHEET 2 OF 2

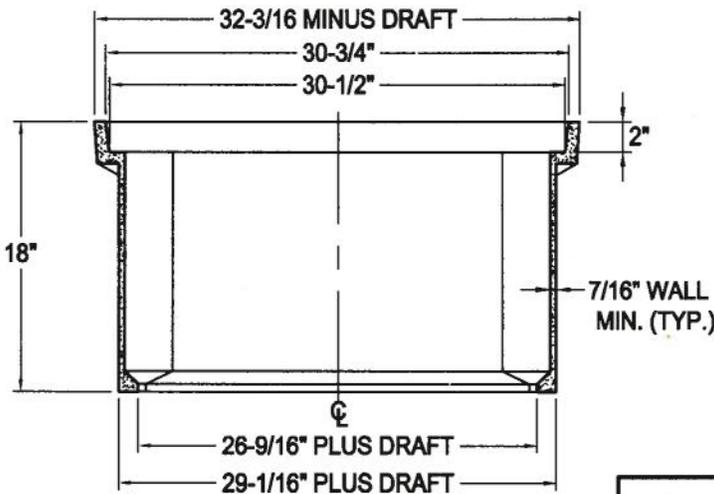


PLAN VIEW

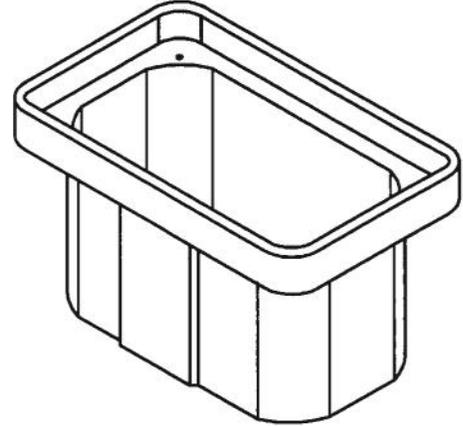


SECTION B-B

3/8-16 SST THREADED INSERT, 2 PLCS
(4 PLCS OR FLOATING NUT ALSO AVAILABLE)



SECTION A-A



NON-TRAFFIC RATED	
DESCRIPTION OF MATERIAL:	POLYMER CONCRETE (GRAY)
TOLERANCE:	±1/8"
ESTIMATED PART WEIGHT:	99.0 LBS.

WATER METER BOX & LID - 17" x 30"

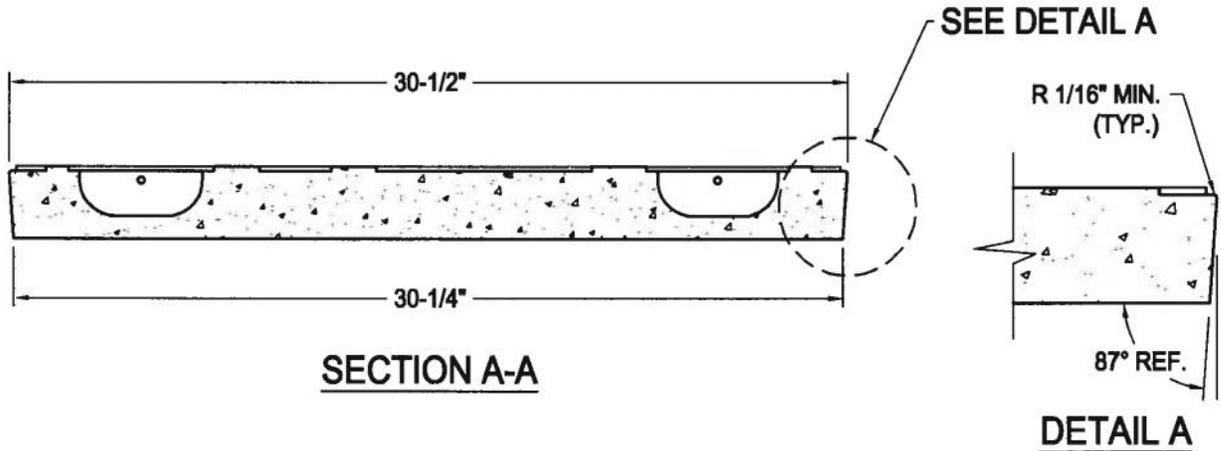
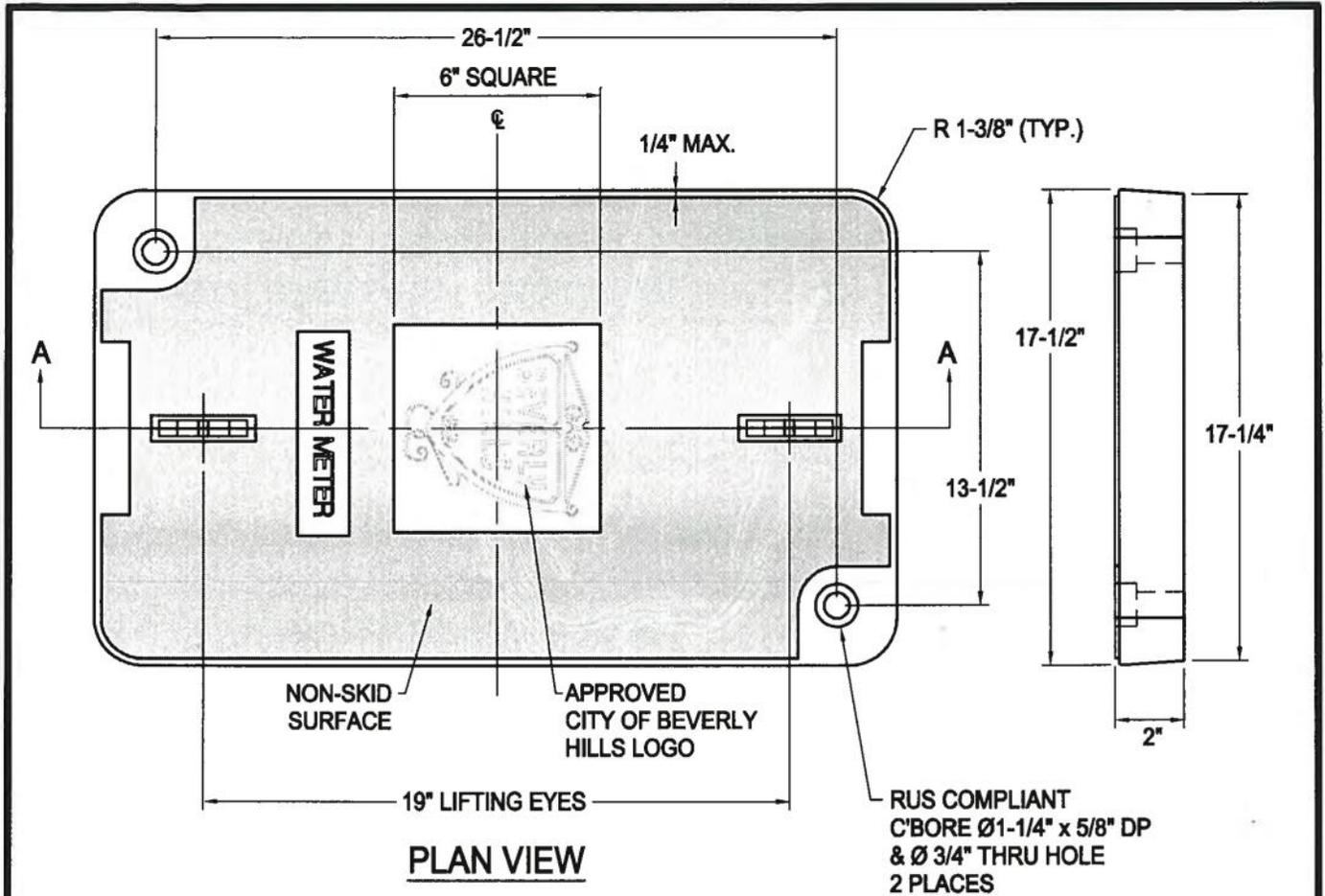
REVISIONS		
MARK	DATE	DESCRIPTION



CITY OF BEVERLY HILLS, CALIFORNIA
DEPARTMENT OF PUBLIC WORKS & TRANSPORTATION
CIVIL ENGINEERING DIVISION

RECOMMENDED *[Signature]* DATE 11-18-10
CITY ENGINEER
APPROVED *[Signature]* DATE 11-18-10
PUBLIC WORKS DIRECTOR

STANDARD DRAWING
BH 713
SHEET 1 OF 2



WATER METER BOX & LID - 17" x 30"

REVISIONS		
MARK	DATE	DESCRIPTION



CITY OF BEVERLY HILLS, CALIFORNIA

DEPARTMENT OF PUBLIC WORKS & TRANSPORTATION
CIVIL ENGINEERING DIVISION

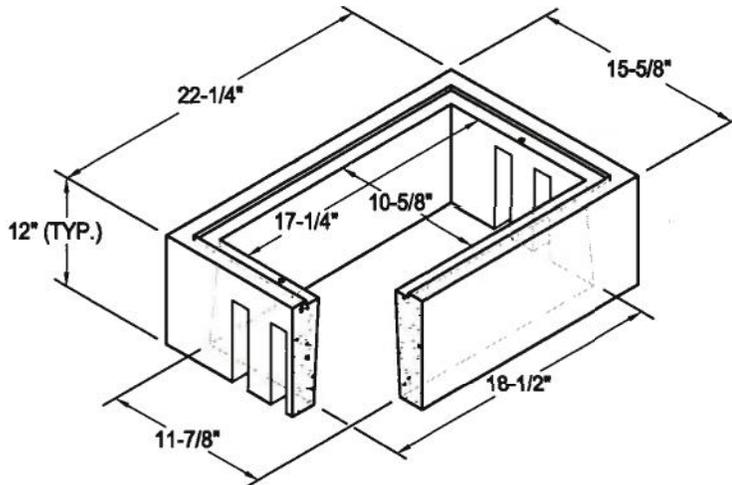
RECOMMENDED *[Signature]* DATE *11-18-10*
CITY ENGINEER

APPROVED *[Signature]* DATE *11-18-10*
PUBLIC WORKS DIRECTOR

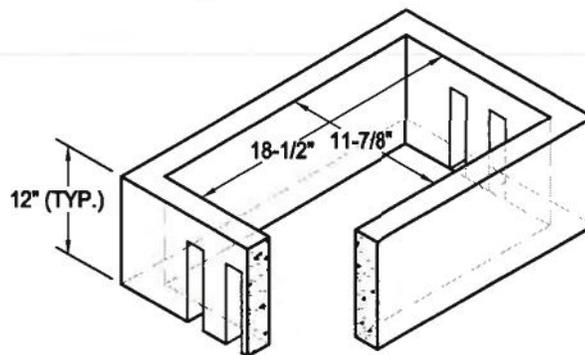
STANDARD DRAWING

BH 713

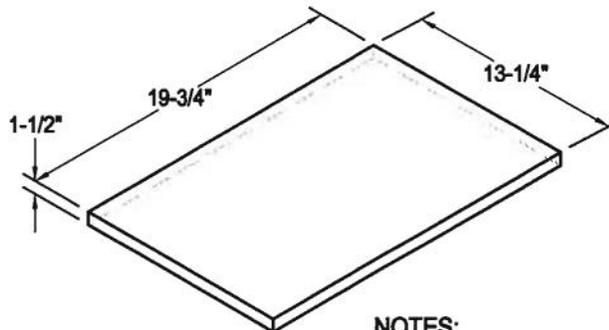
SHEET 2 OF 2



TRAFFIC BOX
 REINFORCED CONCRETE
 H-20 LOADING
 130 lbs.



EXTENSION
 REINFORCED CONCRETE
 H-20 LOADING
 129 lbs.



SLAB
 REINFORCED CONCRETE
 32 lbs.

NOTES:

- CALTRANS No. 3-1/2T STATE SPECIFICATIONS.

10" x 17" WATER METER BOX & LID - H/20 LOADING

REVISIONS		
MARK	DATE	DESCRIPTION

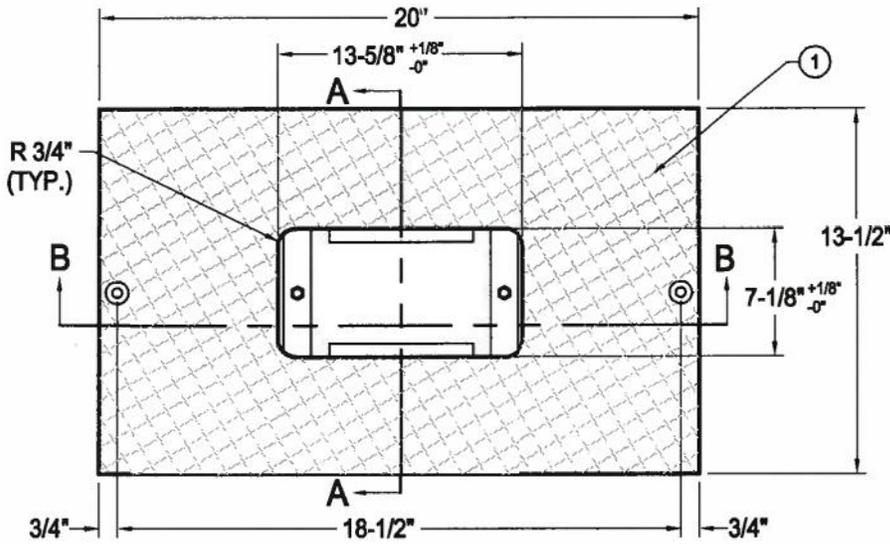


CITY OF BEVERLY HILLS, CALIFORNIA

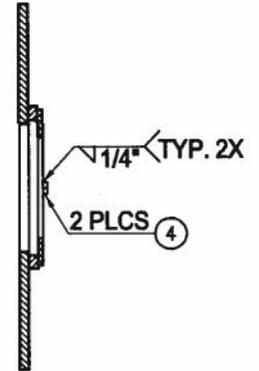
DEPARTMENT OF PUBLIC WORKS & TRANSPORTATION
 CIVIL ENGINEERING DIVISION

RECOMMENDED *[Signature]* DATE *11-18-10*
CITY ENGINEER
 APPROVED *[Signature]* DATE *11-18-10*
PUBLIC WORKS DIRECTOR

STANDARD DRAWING
BH 714
 SHEET 1 OF 2



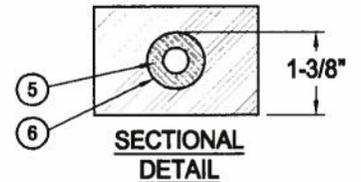
PLAN VIEW



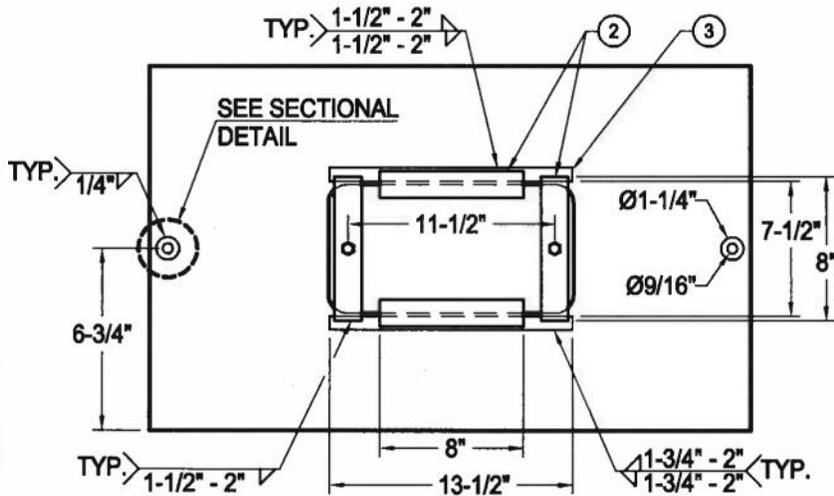
SECTION A-A



SECTION B-B



SECTIONAL
DETAIL



MATERIALS

- ① - 1/2" DIAMOND CHECKER PLATE
- ② - 1/4" x 1-1/2" STEEL FLAT STOCK
- ③ - 3/4" x 1/2" STEEL FLAT STOCK
- ④ - 3/8" - 16 STEEL NUT
- ⑤ - 3/16" THICK WASHER TO BE WELDED PER ASTM A-706
- ⑥ - SURFACE AROUND WELD TO BE FLAT

10" x 17" WATER METER BOX & LID - H/20 LOADING

REVISIONS		
MARK	DATE	DESCRIPTION



CITY OF BEVERLY HILLS, CALIFORNIA

DEPARTMENT OF PUBLIC WORKS & TRANSPORTATION
CIVIL ENGINEERING DIVISION

RECOMMENDED

Christina
CITY ENGINEER

DATE 11-18-10

APPROVED

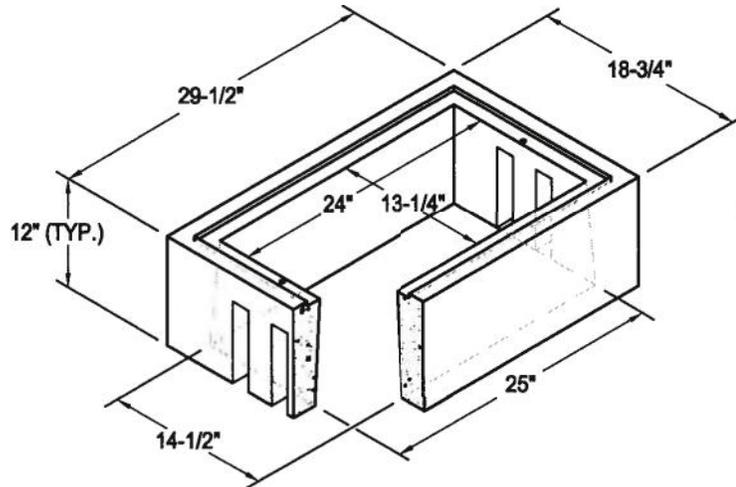
Robert
PUBLIC WORKS DIRECTOR

DATE 11-18-10

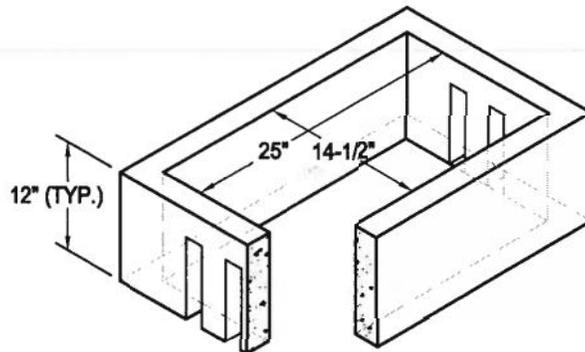
STANDARD DRAWING

BH 714

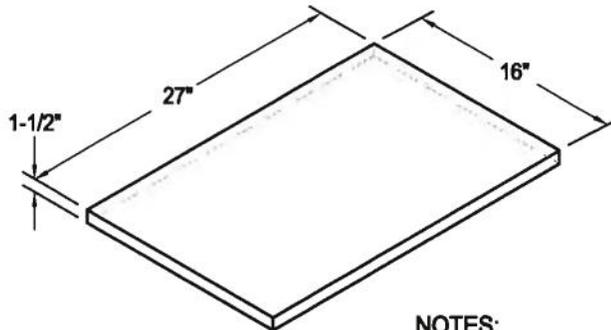
SHEET 2 OF 2



TRAFFIC BOX
 REINFORCED CONCRETE
 H-20 LOADING
 166 lbs.



EXTENSION
 REINFORCED CONCRETE
 H-20 LOADING
 163 lbs.



SLAB
 REINFORCED CONCRETE
 52 lbs.

NOTES:

1. CALTRANS No. 5T STATE SPECIFICATIONS.

13" x 24" WATER METER BOX & LID - H/20 LOADING

REVISIONS		
MARK	DATE	DESCRIPTION



CITY OF BEVERLY HILLS, CALIFORNIA

DEPARTMENT OF PUBLIC WORKS & TRANSPORTATION
 CIVIL ENGINEERING DIVISION

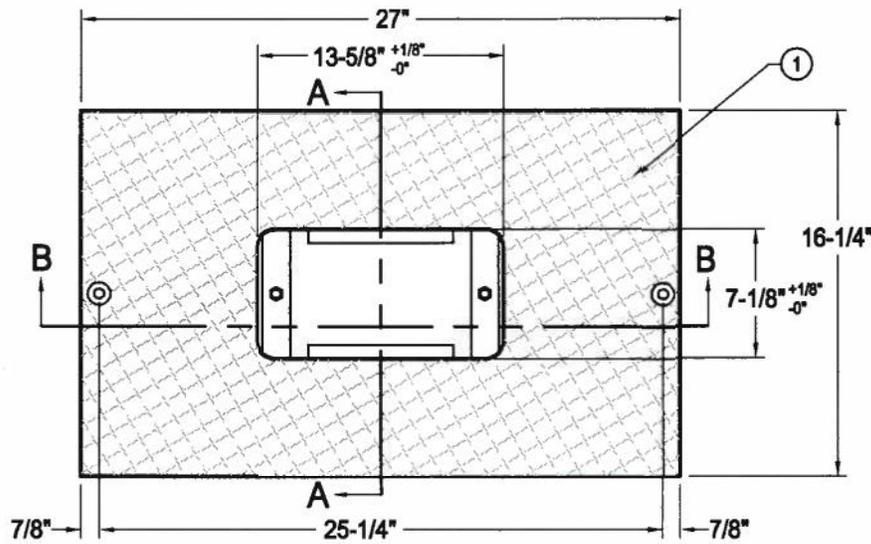
RECOMMENDED *[Signature]*
 CITY ENGINEER

APPROVED *[Signature]*
 PUBLIC WORKS DIRECTOR

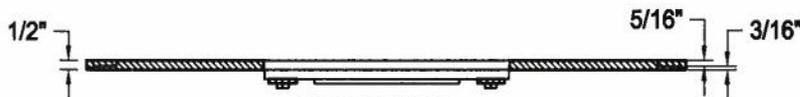
DATE 11-18-10

DATE 11-18-10

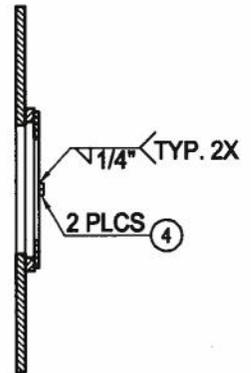
STANDARD DRAWING
BH 715
 SHEET 1 OF 2



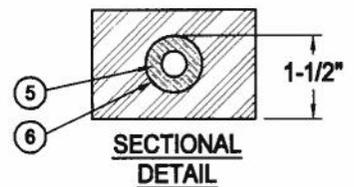
PLAN VIEW



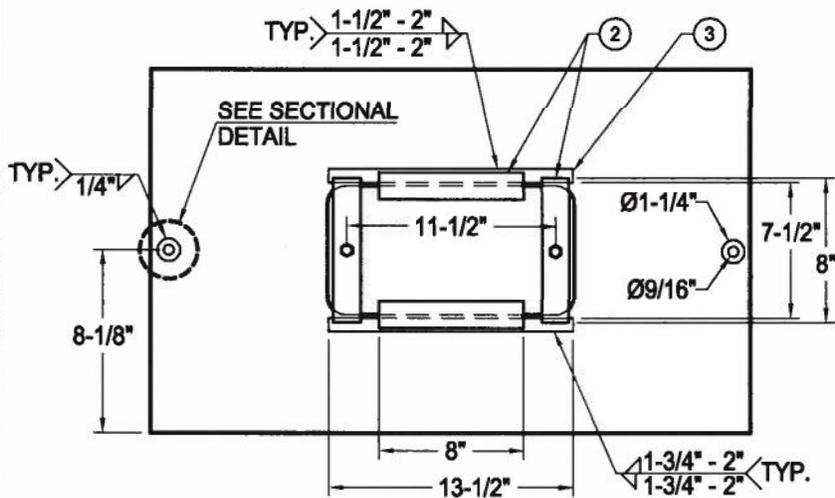
SECTION B-B



SECTION A-A



SECTIONAL
DETAIL



MATERIALS

- ① - 1/2" DIAMOND CHECKER PLATE
- ② - 1/4" x 1-1/2" STEEL FLAT STOCK
- ③ - 3/4" x 1/2" STEEL FLAT STOCK
- ④ - 3/8" - 16 STEEL NUT
- ⑤ - 3/16" THICK WASHER TO BE WELDED PER ASTM A-706
- ⑥ - SURFACE AROUND WELD TO BE FLAT

13" x 24" WATER METER BOX & LID - H/20 LOADING

REVISIONS		
MARK	DATE	DESCRIPTION



CITY OF BEVERLY HILLS, CALIFORNIA

DEPARTMENT OF PUBLIC WORKS & TRANSPORTATION
CIVIL ENGINEERING DIVISION

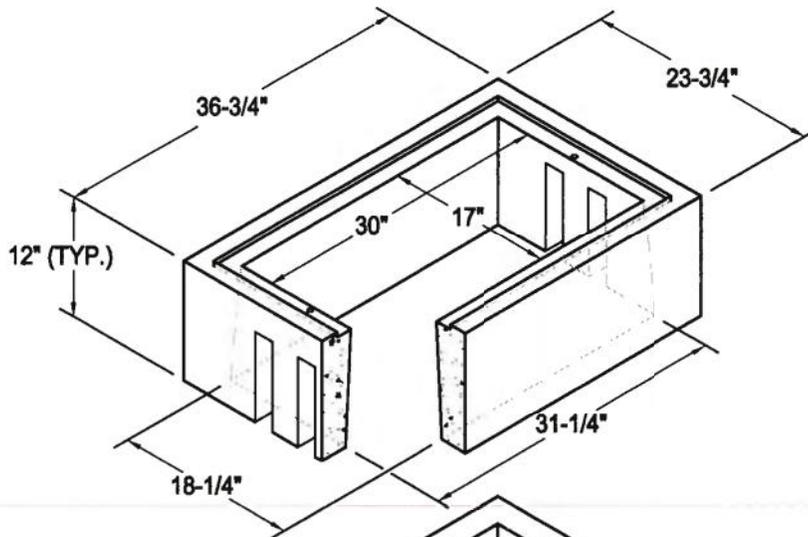
RECOMMENDED *[Signature]* DATE 11-18-10
CITY ENGINEER

APPROVED *[Signature]* DATE 11-18-10
PUBLIC WORKS DIRECTOR

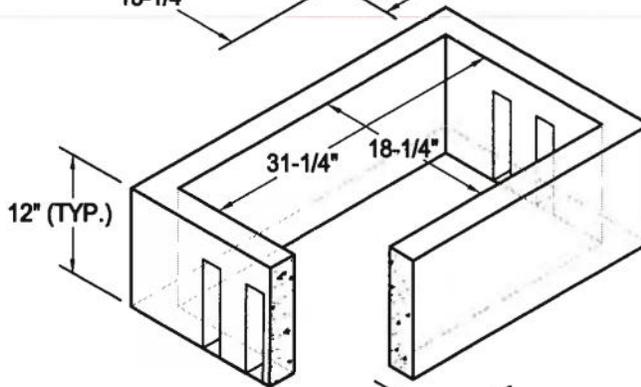
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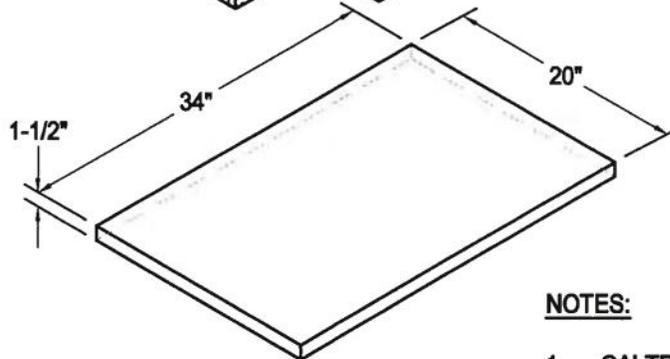
STANDARD DRAWING
BH 715
SHEET 2 OF 2



BOX
 REINFORCED CONCRETE
 H-20 LOADING
 268 lbs.



EXTENSION
 REINFORCED CONCRETE
 H-20 LOADING
 250 lbs.



SLAB
 REINFORCED CONCRETE
 108 lbs.

NOTES:

1. CALTRANS No. 6T STATE SPECIFICATIONS.

17" x 30" WATER METER BOX & LID - H/20 LOADING

REVISIONS		
MARK	DATE	DESCRIPTION



CITY OF BEVERLY HILLS, CALIFORNIA

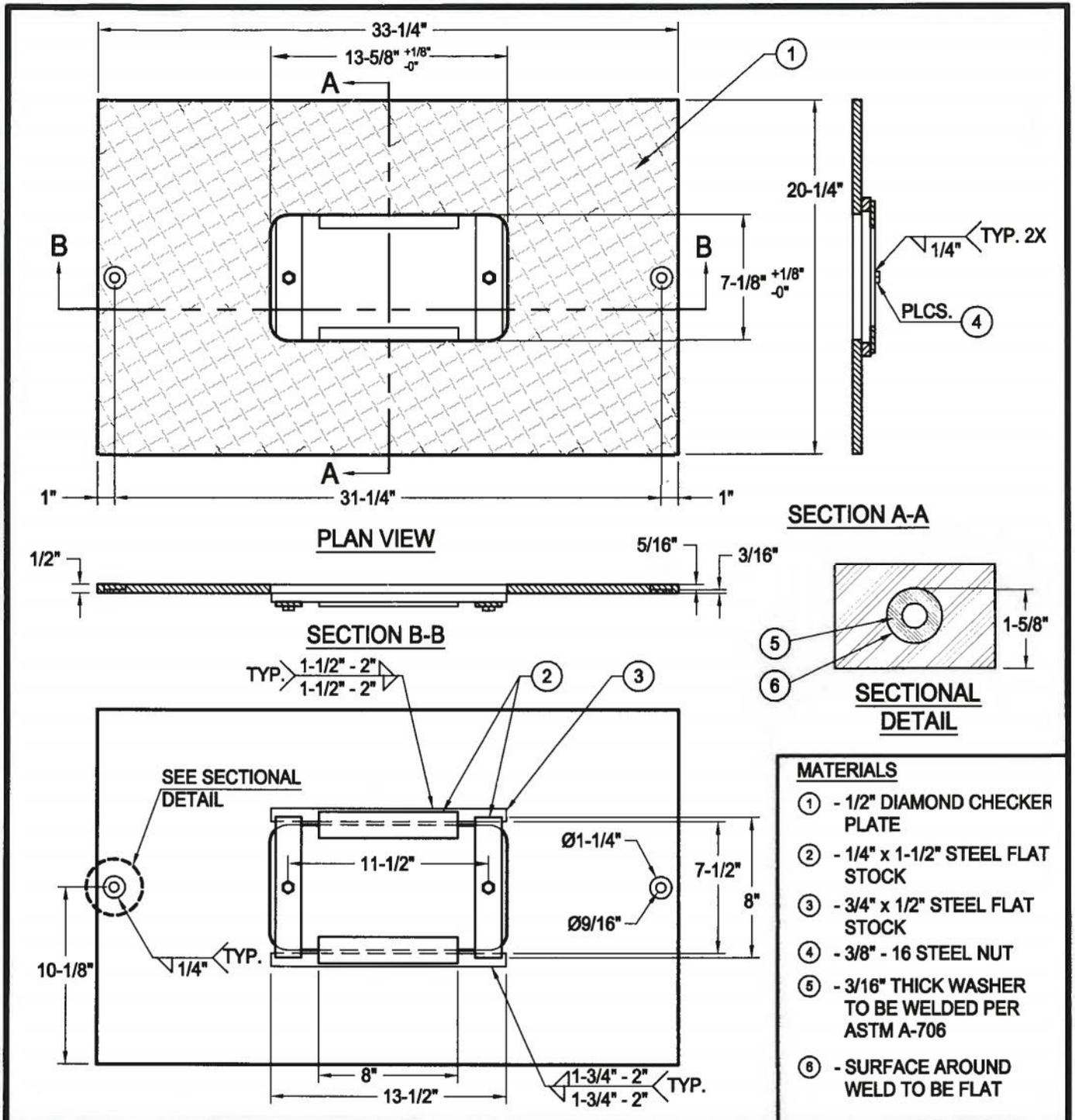
DEPARTMENT OF PUBLIC WORKS & TRANSPORTATION
 CIVIL ENGINEERING DIVISION

RECOMMENDED *[Signature]* DATE 11-18-10
CITY ENGINEER
 APPROVED *[Signature]* DATE 11-18-10
PUBLIC WORKS DIRECTOR

STANDARD DRAWING

BH 716

SHEET 1 OF 2



17" x 30" WATER METER BOX & LID - H/20 LOADING

REVISIONS		
MARK	DATE	DESCRIPTION



CITY OF BEVERLY HILLS, CALIFORNIA

DEPARTMENT OF PUBLIC WORKS & TRANSPORTATION
CIVIL ENGINEERING DIVISION

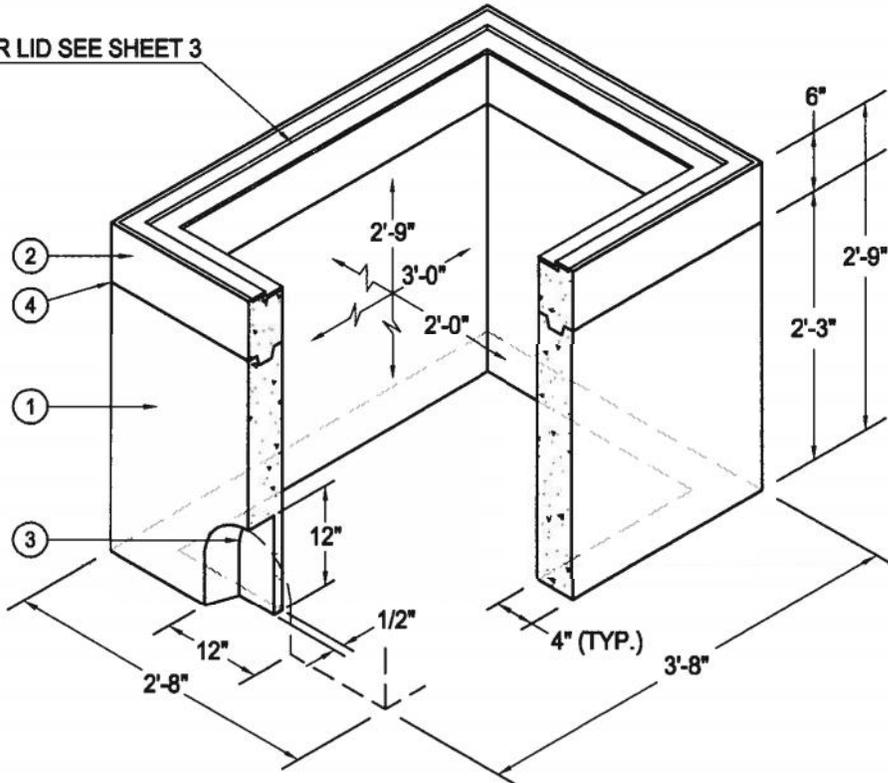
RECOMMENDED *[Signature]* DATE 11-18-10
CITY ENGINEER

APPROVED *[Signature]* DATE 11-18-10
PUBLIC WORKS DIRECTOR

DATE 11-18-10

STANDARD DRAWING
BH 716
SHEET 2 OF 2

FOR LID SEE SHEET 3



NOTES:

MATERIALS:

- ① 27" HIGH LOWER SECTION.
- ② 6" TOP SECTION WITH GALVANIZED CAST-IN FRAME.
- ③ 12" x 12" KNOCK OUT x 3-1/2" DEEP ON EACH END WALL
- ④ 6" OR 12" EXTENSION SECTIONS AVAILABLE.

- 1. DESIGNED FOR PEDESTRIAN/PARKWAY LOADS OR TRAFFIC AASHTO H20 FOR USE IN OFF-STREET LOCATIONS ONLY.

STRUCTURE DESIGNED IN ACCORDANCE WITH:

- AASHTO H-20 TRAFFIC BRIDGE LOADING
- ASTM C-857 STANDARD PRACTICE FOR MINIMUM STRUCTURAL DESIGN LOADING FOR UNDERGROUND PRECAST CONCRETE UTILITY STRUCTURES
- AMERICAN CONCRETE INSTITUTE ACI 318-05
- 2. CONCRETE COMPRESSIVE STRENGTH $F'_c = 5500$ PSI.
- 3. REINFORCEMENT IN ACCORDANCE WITH ASTM A-706 WITH A YIELD STRENGTH OF $F_y = 80,000$ PSI.
- 4. 6" MINIMUM COMPACTED GRANULAR MATERIAL RECOMMENDED FOR SUB-BASE FOR EASE OF INSTALLATION AND EVEN LOAD DISTRIBUTION.
- 5. MINIMUM EXCAVATION SIZE: 3'-2" x 4'-2" x REQUIRED DEPTH.

2' x 3' WATER VAULT BOX & LID

REVISIONS		
MARK	DATE	DESCRIPTION



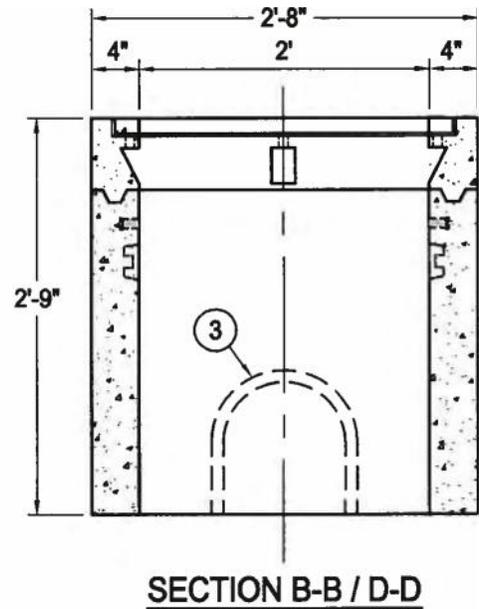
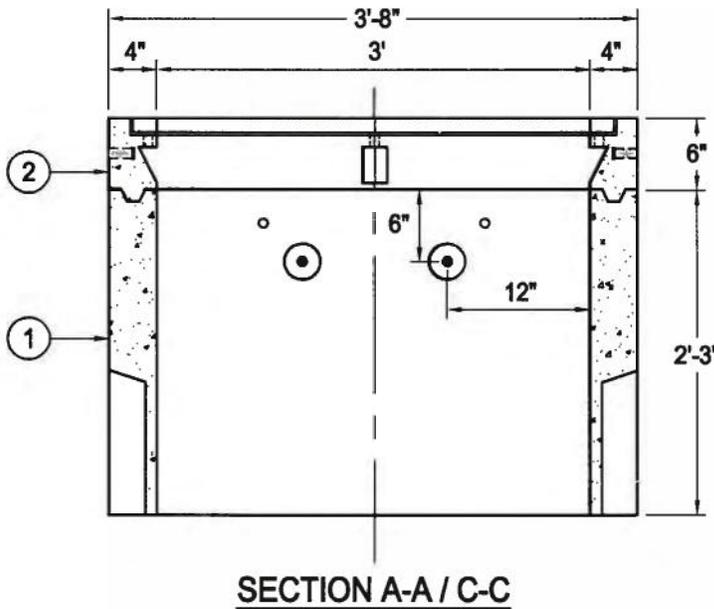
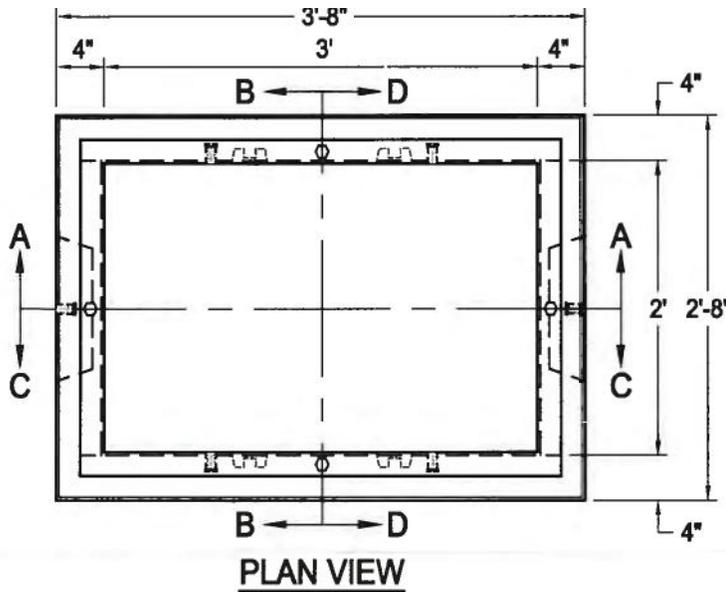
CITY OF BEVERLY HILLS, CALIFORNIA

DEPARTMENT OF PUBLIC WORKS & TRANSPORTATION
CIVIL ENGINEERING DIVISION

RECOMMENDED DATE 11-18-10
CITY ENGINEER

APPROVED DATE 11-18-10
PUBLIC WORKS DIRECTOR

STANDARD DRAWING
BH 717
 SHEET 1 OF 3



2' x 3' WATER VAULT BOX & LID

REVISIONS		
MARK	DATE	DESCRIPTION



CITY OF BEVERLY HILLS, CALIFORNIA

DEPARTMENT OF PUBLIC WORKS & TRANSPORTATION
CIVIL ENGINEERING DIVISION

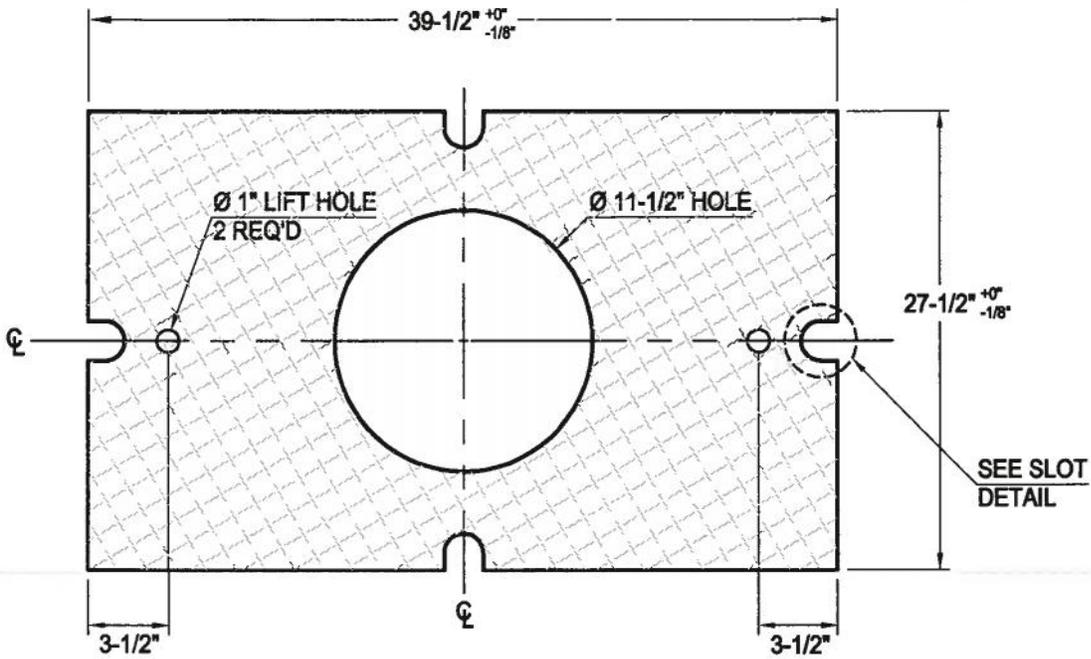
RECOMMENDED *[Signature]*
CITY ENGINEER

APPROVED *[Signature]*
PUBLIC WORKS DIRECTOR

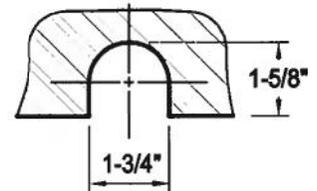
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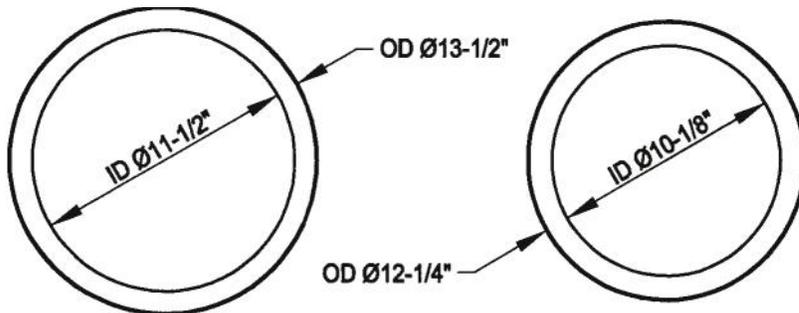
STANDARD DRAWING
BH 717
SHEET 2 OF 3



PLAN VIEW



SLOT DETAIL
4 PLACES



1/4" PLATE (1)

1/4" PLATE (1)

APPROX. 104 lbs.

QTY.	MATERIALS
1	5/16" DIAMOND PLATE 27-1/2" x 39-1/2"
1	10-1/8" ID x 12-1/4" OD 1/4" PLATE
1	11-1/2" ID x 13-1/2" OD 1/4" PLATE

2' x 3' WATER VAULT BOX & LID

REVISIONS		
MARK	DATE	DESCRIPTION



CITY OF BEVERLY HILLS, CALIFORNIA

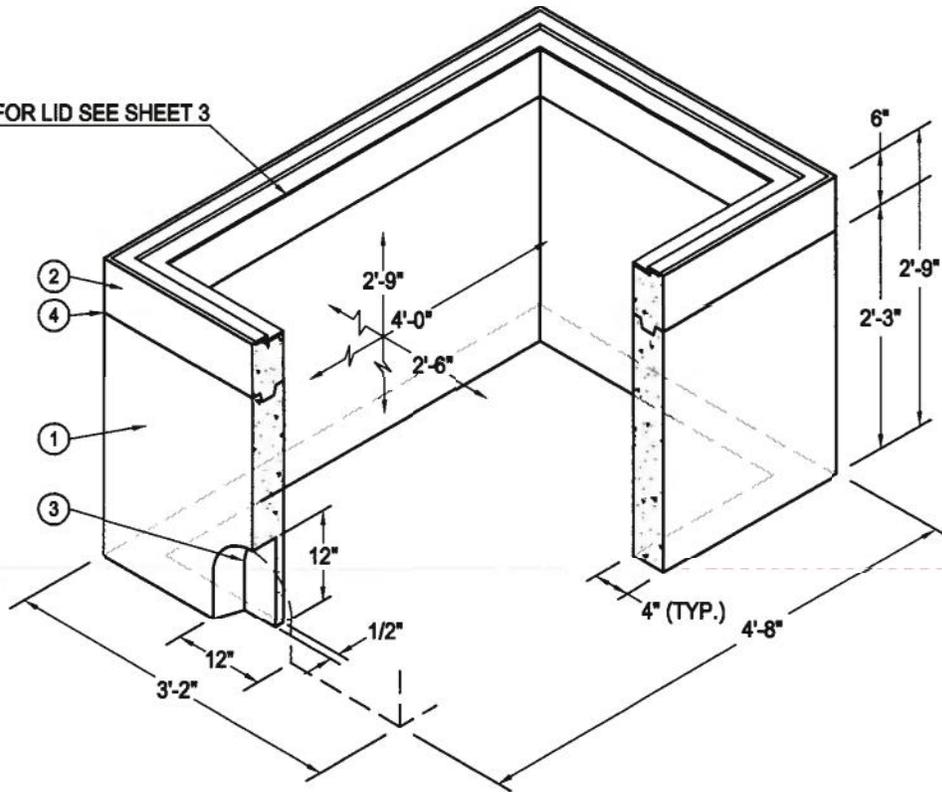
DEPARTMENT OF PUBLIC WORKS & TRANSPORTATION
CIVIL ENGINEERING DIVISION

RECOMMENDED *[Signature]* DATE 11-18-10
CITY ENGINEER

APPROVED *[Signature]* DATE 11-18-10
PUBLIC WORKS DIRECTOR

STANDARD DRAWING
BH 717
SHEET 3 OF 3

FOR LID SEE SHEET 3



NOTES:

MATERIALS:

- ① 27" HIGH LOWER SECTION.
- ② 6" TOP SECTION WITH GALVANIZED CAST-IN FRAME.
- ③ 12" x 12" KNOCK OUT x 3-1/2" DEEP ON EACH END WALL
- ④ 6" OR 12" EXTENSION SECTIONS AVAILABLE.

1. DESIGNED FOR PEDESTRIAN/PARKWAY LOADS OR TRAFFIC AASHTO H20 FOR USE IN OFF-STREET LOCATIONS ONLY.

STRUCTURE DESIGNED IN ACCORDANCE WITH:
 - AASHTO H-20 TRAFFIC BRIDGE LOADING
 - ASTM C-857 STANDARD PRACTICE FOR MINIMUM STRUCTURAL DESIGN LOADING FOR UNDERGROUND PRECAST CONCRETE UTILITY STRUCTURES
 - AMERICAN CONCRETE INSTITUTE ACI 318-05
2. CONCRETE COMPRESSIVE STRENGTH $F_c = 5500$ PSI.
3. REINFORCEMENT IN ACCORDANCE WITH ASTM A-706 WITH A YIELD STRENGTH OF $F_y = 80,000$ PSI.
4. 6" MINIMUM COMPACTED GRANULAR MATERIAL RECOMMENDED FOR SUB-BASE FOR EASE OF INSTALLATION AND EVEN LOAD DISTRIBUTION.
5. MINIMUM EXCAVATION SIZE: 3'-6" x 5'-2" x REQUIRED DEPTH.

2'-6" x 4' WATER VAULT BOX & LID

REVISIONS		
MARK	DATE	DESCRIPTION



CITY OF BEVERLY HILLS, CALIFORNIA

DEPARTMENT OF PUBLIC WORKS & TRANSPORTATION
CIVIL ENGINEERING DIVISION

RECOMMENDED

[Signature]
CITY ENGINEER

DATE

11-18-10

APPROVED

[Signature]
PUBLIC WORKS DIRECTOR

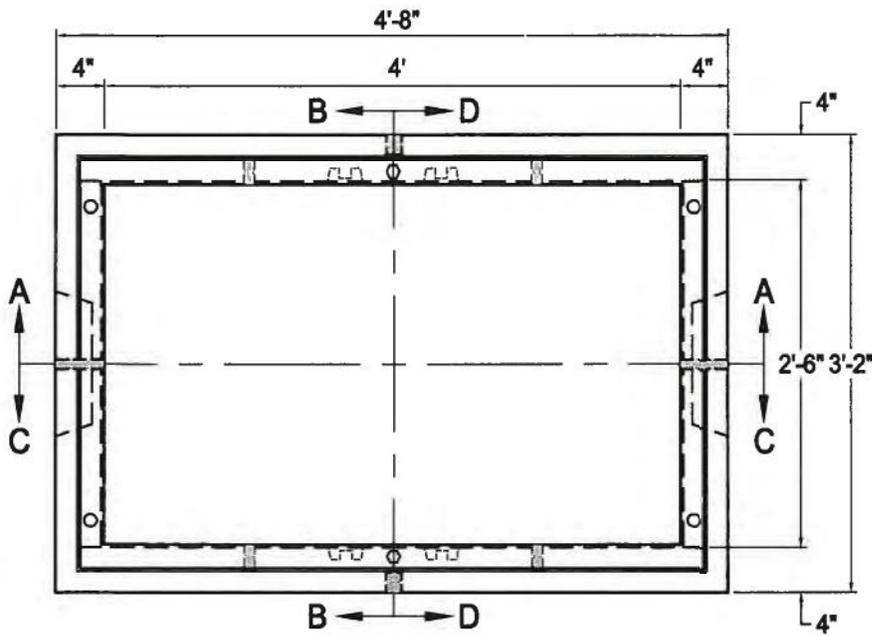
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11-18-10

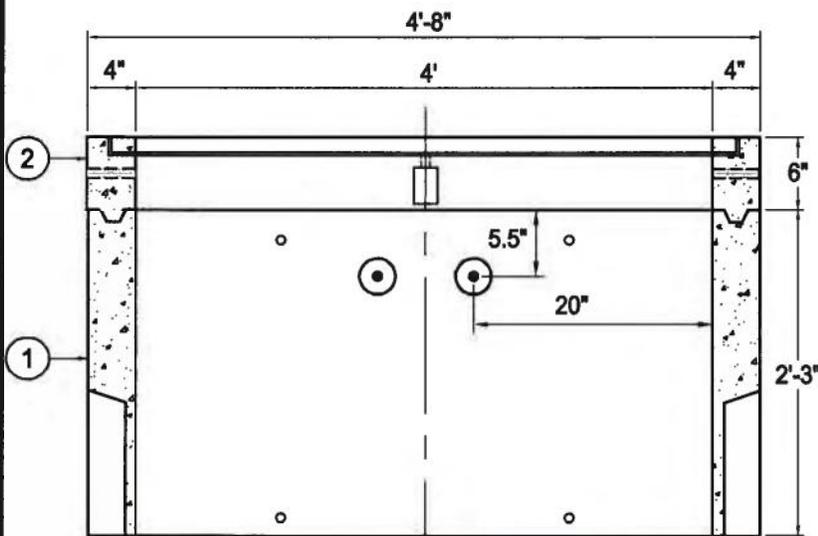
STANDARD DRAWING

BH 718

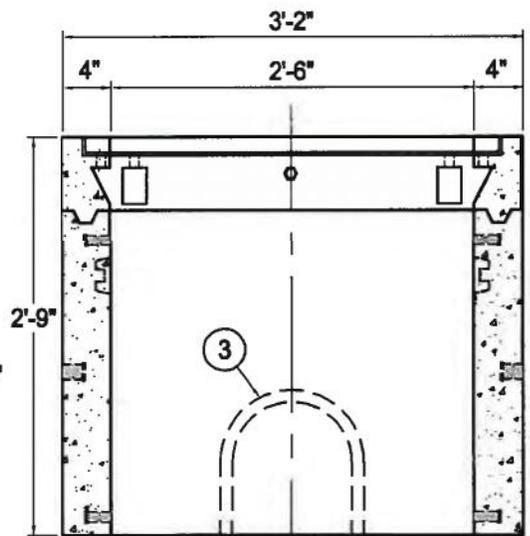
SHEET 1 OF 3



PLAN VIEW



SECTION A-A / C-C



SECTION B-B / D-D

2'-6" x 4' WATER VAULT BOX & LID

REVISIONS		
MARK	DATE	DESCRIPTION



CITY OF BEVERLY HILLS, CALIFORNIA

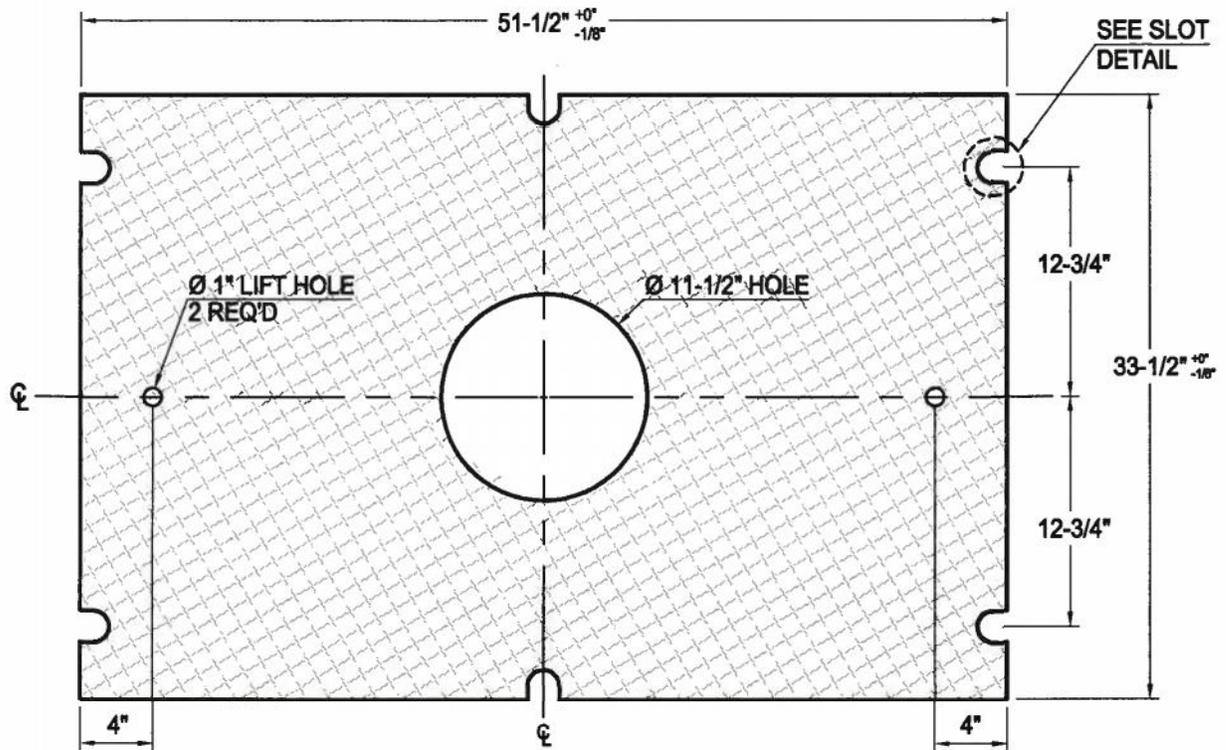
DEPARTMENT OF PUBLIC WORKS & TRANSPORTATION
CIVIL ENGINEERING DIVISION

RECOMMENDED *[Signature]* DATE 11-18-10
CITY ENGINEER
APPROVED *[Signature]* DATE 11-18-10
PUBLIC WORKS DIRECTOR

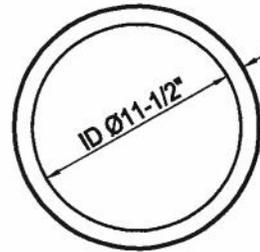
STANDARD DRAWING

BH 718

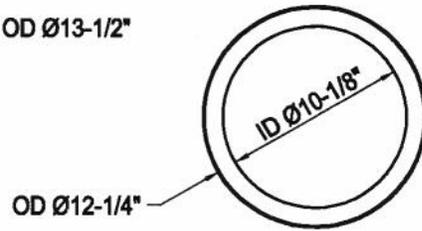
SHEET 2 OF 3



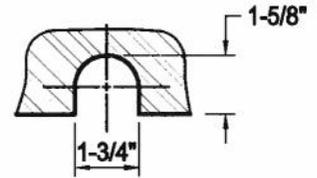
PLAN VIEW



1/4" PLATE (1)



1/4" PLATE (1)



SLOT DETAIL
6 PLACES

QTY.	MATERIALS
1	5/16" DIAMOND PLATE 33-1/2" x 51-1/2"
1	10-1/8" ID x 12-1/4" OD 1/4" PLATE
1	11-1/2" ID x 13-1/2" OD 1/4" PLATE

2'-6" x 4' WATER VAULT BOX & LID

REVISIONS		
MARK	DATE	DESCRIPTION



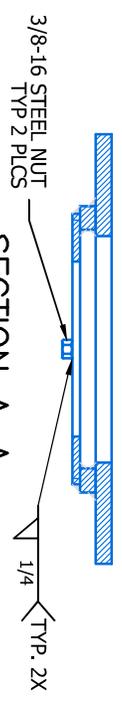
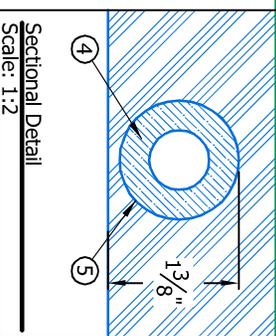
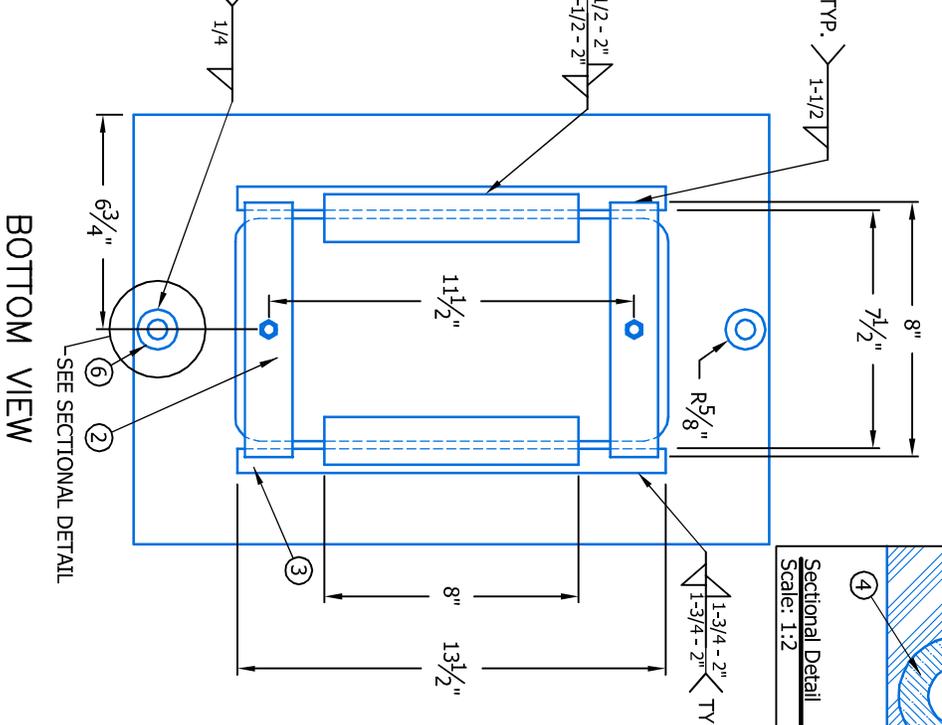
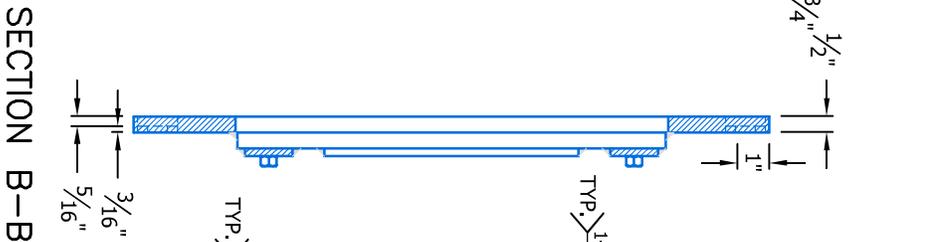
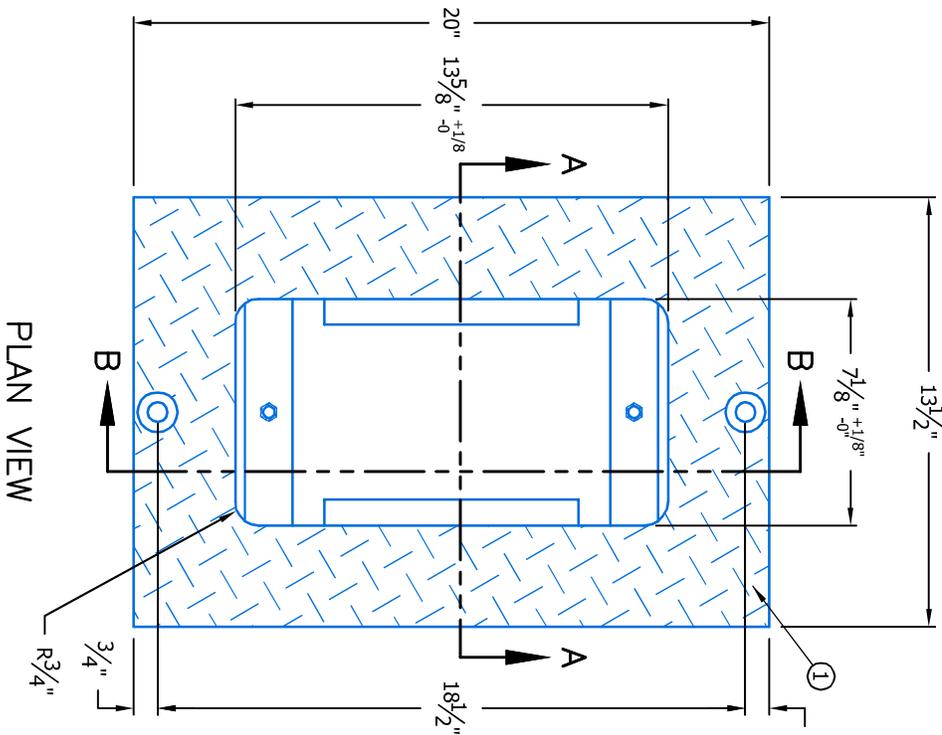
CITY OF BEVERLY HILLS, CALIFORNIA
DEPARTMENT OF PUBLIC WORKS & TRANSPORTATION
CIVIL ENGINEERING DIVISION

RECOMMENDED *[Signature]* DATE 11-18-10
CITY ENGINEER
APPROVED *[Signature]* DATE 11-18-10
PUBLIC WORKS DIRECTOR

STANDARD DRAWING
BH 718
SHEET 3 OF 3

APPENDIX B

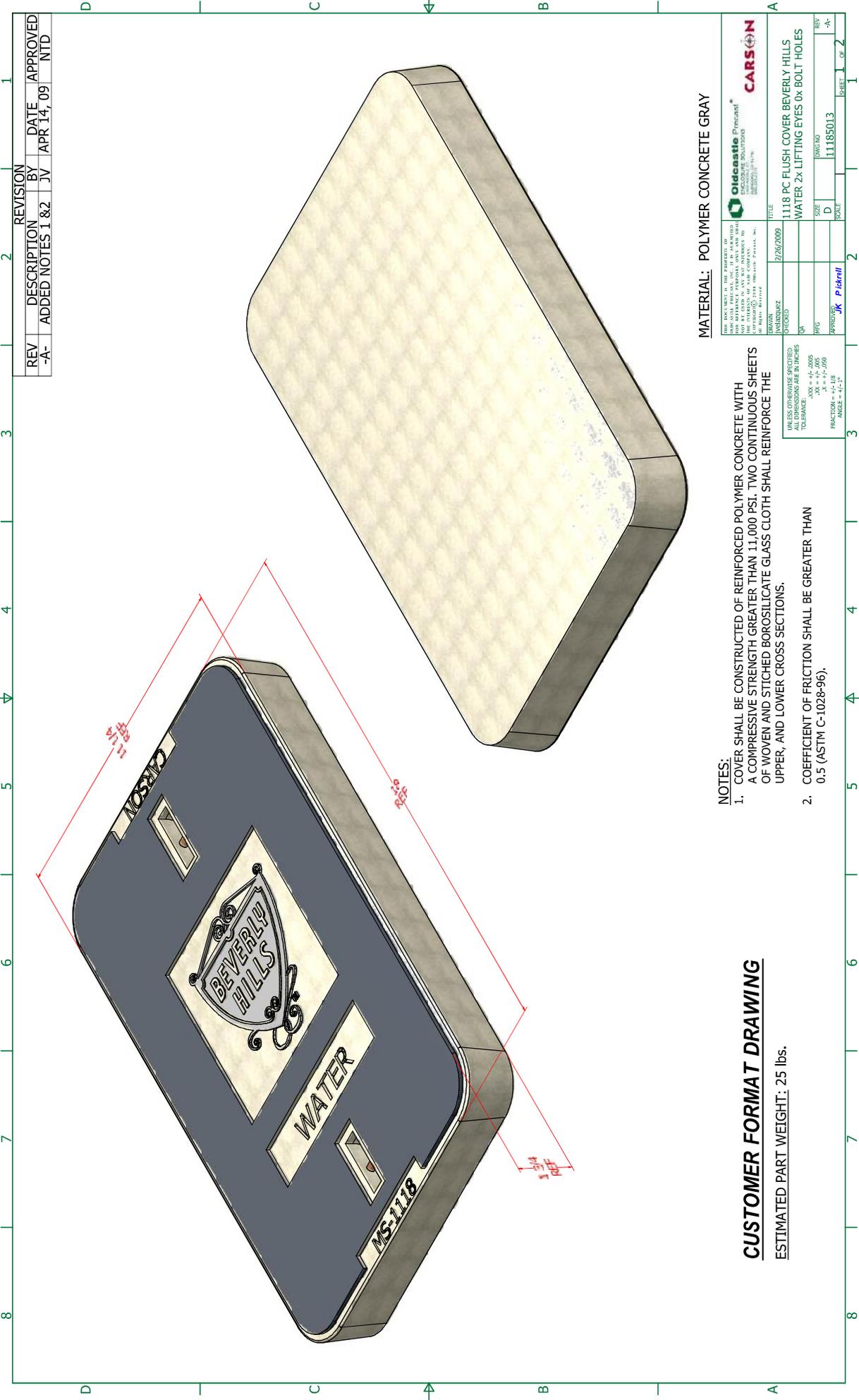
BEVERLY HILLS UPDATED METER BOX DETAILS



NOTES: UNLESS OTHERWISE SPECIFIED.

1. MATERIAL: 1/2" DIAMOND CHECKER PLATE.
2. MATERIAL: 1/4" x 1 1/2" STEEL FLAT STOCK.
3. MATERIAL: 3/4" x 1/2" STEEL FLAT STOCK.
4. MATERIAL: 3/16" STEEL FLAT STOCK.
5. 3/16" WASHER TO BE WELDED PER ASTM A-706
6. SURFACE AROUND WELD TO BE FLAT.

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<p>DRAWN T. BARKER</p>	<p>CHECKED A. LOUCKS</p>	<p>DATE 07/06/09</p>	<p>TITLE B1017-51E w/ 7X13 POLYMER CONCRETE READER</p>
<p>APPROVED</p>	<p>SCALE SCALE 2" = 1'-0"</p>	<p>SIZE A</p>	<p>DWG NO. 1017-E-STEELCOVER-E</p>
<p>REV E</p>	<p>SHEET 1 OF 1</p>	<p>Oldcastle Precast 801 S. Pine St. Hesperia, CA 92571</p>	<p>REV E</p>



REV	DESCRIPTION	BY	DATE	APPROVED
-A-	ADDED NOTES 1 & 2	JV	APR 14, 09	NTD

MATERIAL: POLYMER CONCRETE GRAY

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DRAWN BY	DATE	TITLE
OT/COO	2/25/2009	1118 PC FLUSH COVER BEVERLY HILLS
CHKD		WATER 2x LIFTING EYES 0x BOLT HOLES
APP'D		
SCALE		
DWG NO	11185013	
REV		
-A-		

NOTES:

- COVER SHALL BE CONSTRUCTED OF REINFORCED POLYMER CONCRETE WITH A COMPRESSIVE STRENGTH GREATER THAN 11,000 PSI. TWO CONTINUOUS SHEETS OF WOVEN AND STITCHED BOROSILICATE GLASS CLOTH SHALL REINFORCE THE UPPER, AND LOWER CROSS SECTIONS.
- COEFFICIENT OF FRICTION SHALL BE GREATER THAN 0.5 (ASTM C-1028-96).

CUSTOMER FORMAT DRAWING

ESTIMATED PART WEIGHT: 25 lbs.

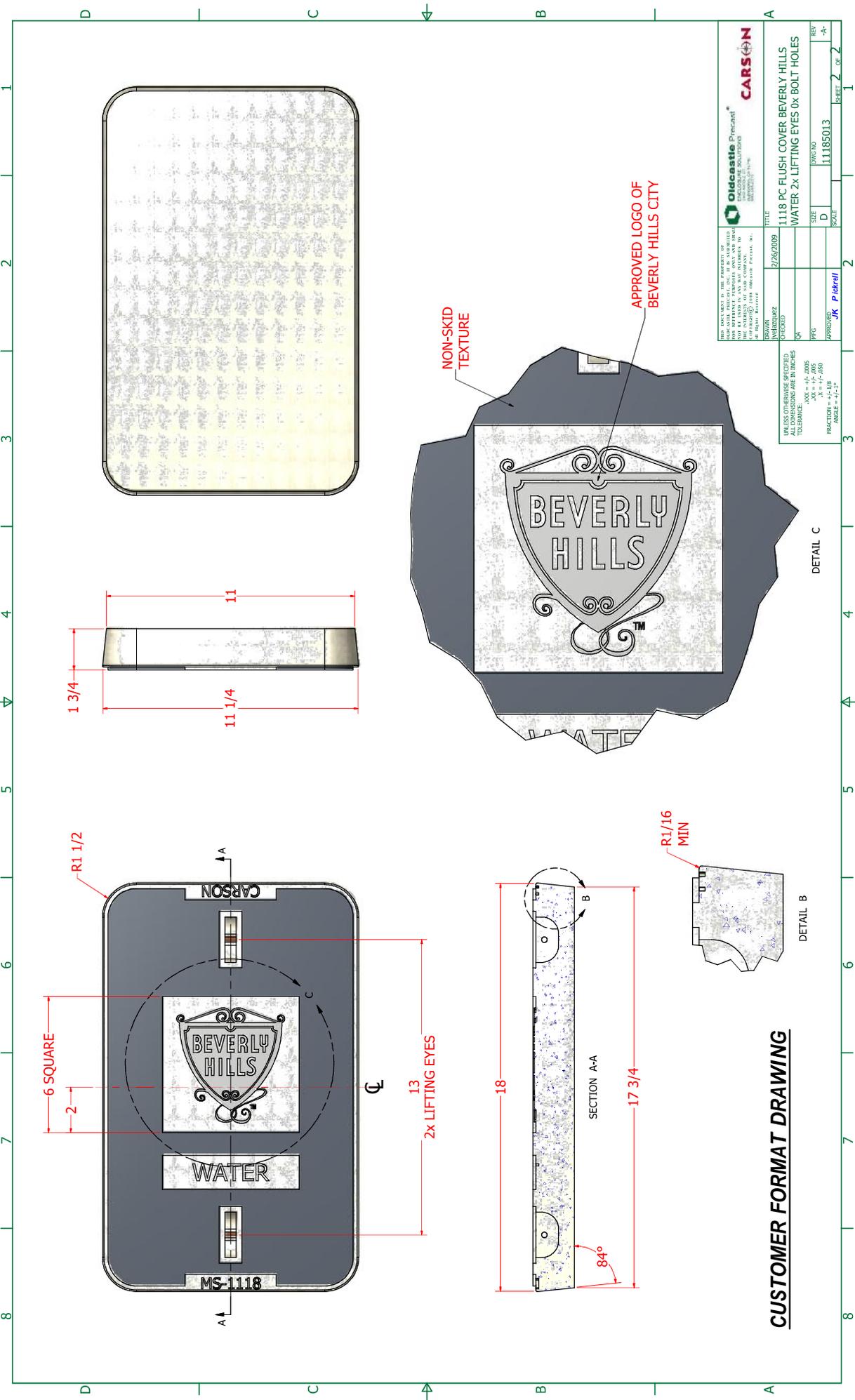
ALL DIMENSIONS UNLESS OTHERWISE SPECIFIED ARE IN INCHES

ALL DIMENSIONS ARE IN INCHES

TOLERANCE:

- +XX = +1/16"
- XX = -1/16"
- XX = ± 1/32"

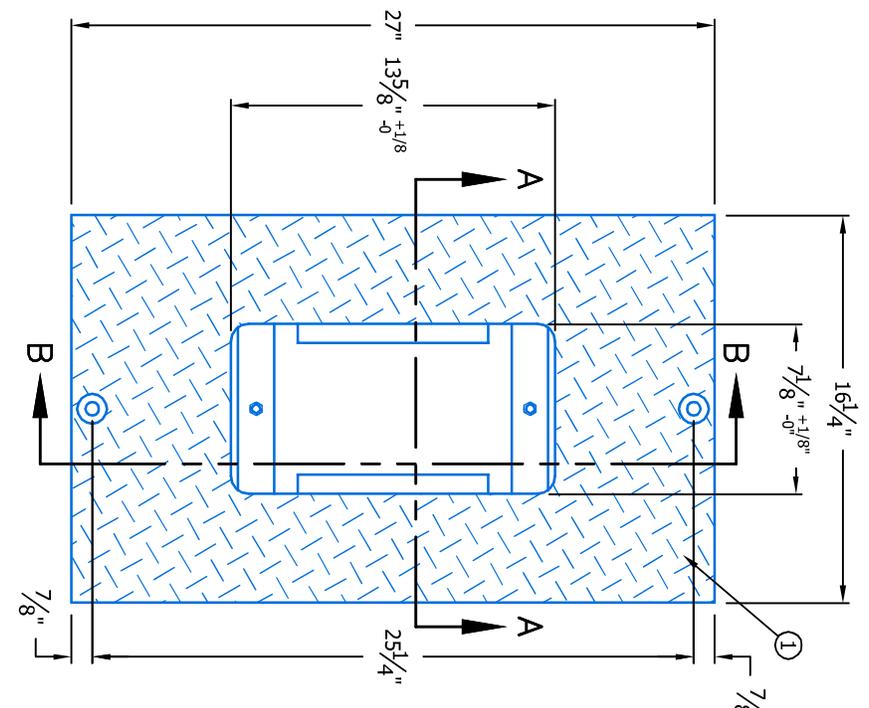
FRACTION = 1/16"



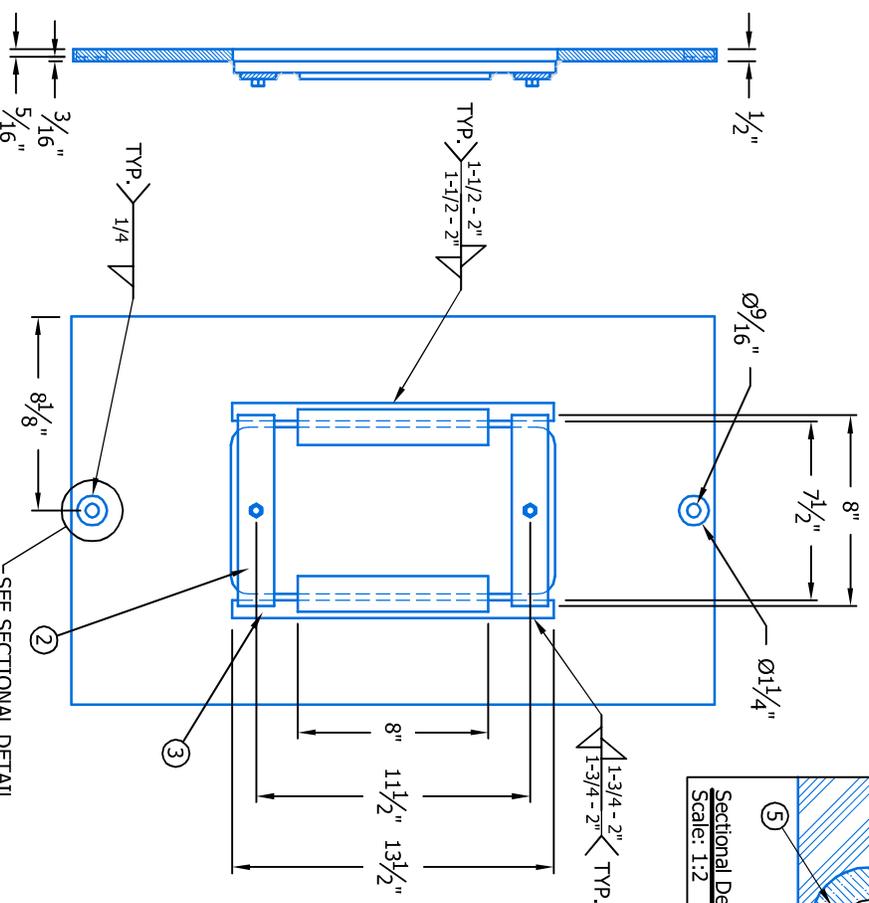
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DATE	2/25/2009
TITLE	1118 PC FLUSH COVER BEVERLY HILLS WATER 2x LIFTING EYES Øx BOLT HOLES
SIZE	D
DRAWN BY	J.K. P. Idrill
CHECKED BY	J.K. P. Idrill
SCALE	1:1
SHEET	2 OF 2

UNLESS OTHERWISE SPECIFIED ALL DIMENSIONS ARE IN INCHES
 TOLERANCE:
 .XXX = +0.005
 .XX = +0.005
 .X = +0.010
 FRACTIONS = +1/32"
 ANGLE = +1/2°

CUSTOMER FORMAT DRAWING

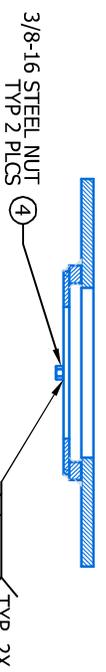


PLAN VIEW

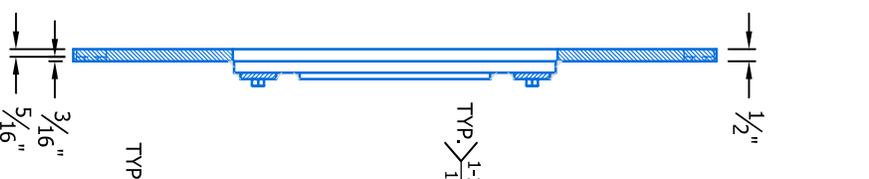


BOTTOM VIEW

SECTION A-A

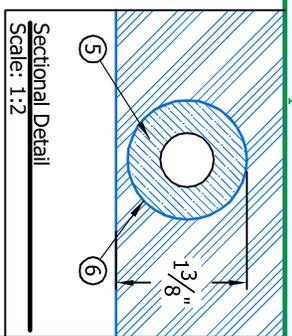


SECTION B-B



NOTES: UNLESS OTHERWISE SPECIFIED.

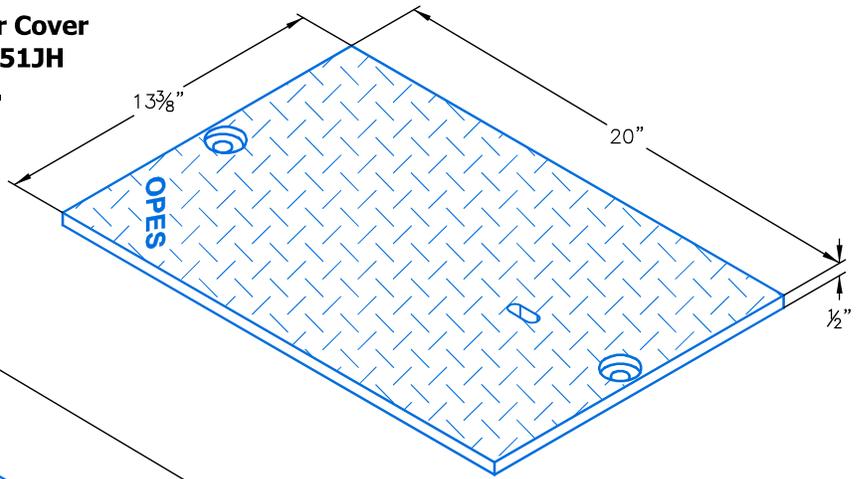
1. MATERIAL: 1/2" DIAMOND CHECKER PLATE.
2. MATERIAL: 1/4" x 1 1/2" STEEL FLAT STOCK.
3. MATERIAL: 3/4" x 1/2" STEEL FLAT STOCK.
4. MATERIAL: 3/8"-16 STEEL NUT.
5. 3/16" THICK WASHER TO BE WELDED PER ASTM A-706
6. SURFACE AROUND WELD TO BE FLAT.



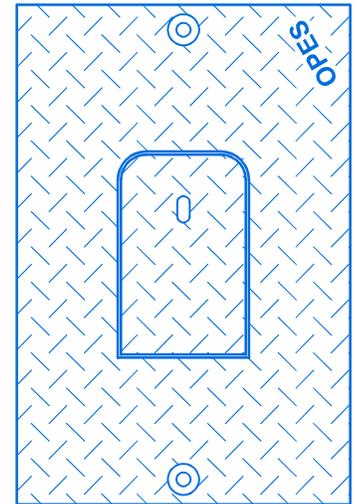
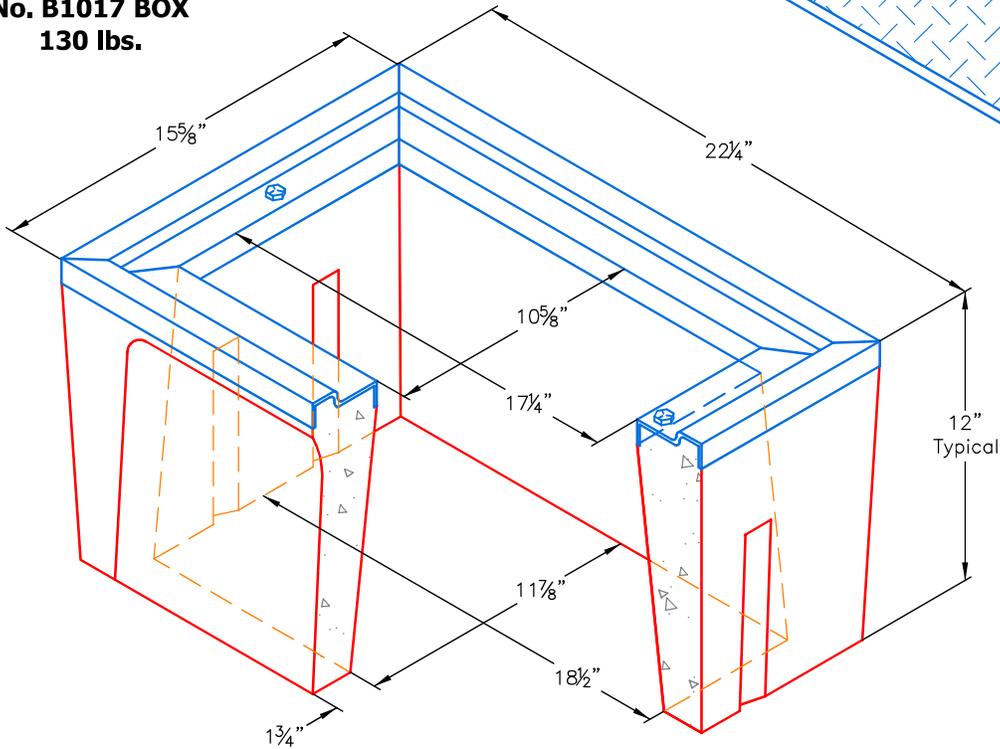
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DRAWN	T. BARKER	TITLE	
CHECKED	A. LUDICKS	DATE	07/29/09
APPROVED		SIZE	A
		DWG NO.	1324-E-STEELCOVER-A
		SCALE	1-1/2" = 1'-0"
		SHEET	1 OF 1
<p>B1324-51E w/ 7X13 POLYMER CONCRETE READER - 2001341</p>		REV	A

Traffic Box
Caltrans No. 3-1/2T State Specs

Steel Checker Cover
No. B1017-51JH
44 lbs.



Traffic Box
No. B1017 BOX
130 lbs.



B1017-51GH

A high density reinforced concrete box with non-settling shoulders positioned to maintain grade and facilitate back filling. Hex-Head Bolts are included with Box. Approximate dimensions and weight shown.

Oldcastle Ordering Code	Item	Approx. Shipping Weight	Description
B1017BOX	BOX	130 lbs.	B1017 Utility Box (10 ⁵ / ₈ " x 17 ¹ / ₄ ") H/20 Loading w/ Bolts - 20 per pallet
B1017-51JH	COVER	44 lbs.	Steel Checker Plate, H/20, Bolt Down
B1017-51GH	COVER	46 lbs.	Steel Checker Plate, H/20 with 5" x 8" Reading Lid
B1017X12	EXTENSION	129 lbs.	12" Reinforced Concrete H/20 Loading - 20 per pallet
B9SL	SLAB	32 lbs.	Reinforced Concrete (13 ³ / ₈ " x 19 ³ / ₄ ")

Galvanizing available on all steel covers



Oldcastle Precast®
Enclosure Solutions

Phone: (800) 486-7070 Fax: (800) 486-6804
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B1017 BOX

FILE NAME: B1017_ISO

ISSUE DATE: January, 2011

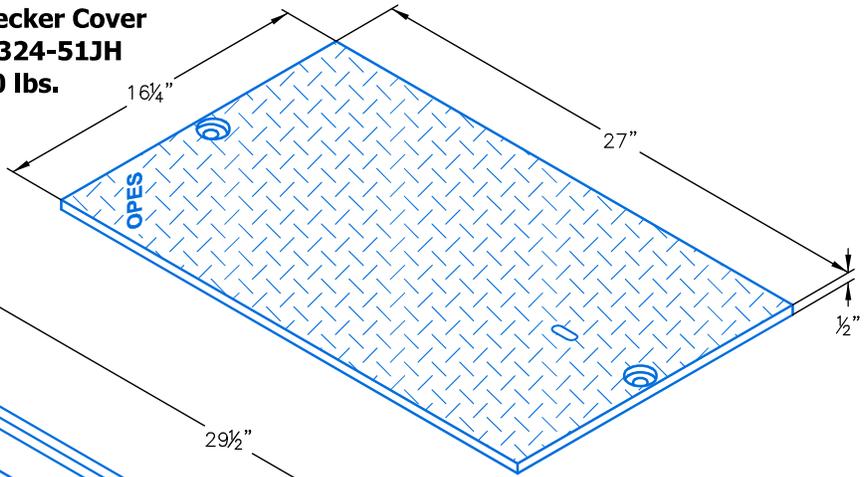
www.oldcastleprecast.com

B1017 BOX H/20 LOADING
10-5/8" x 17-1/4"

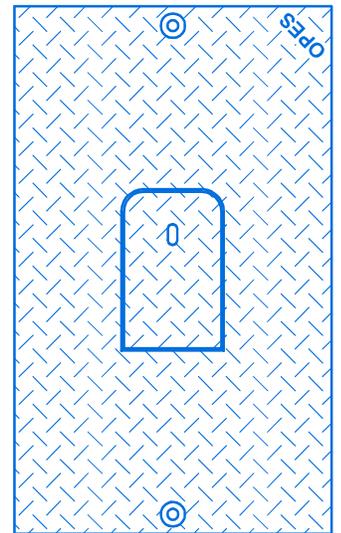
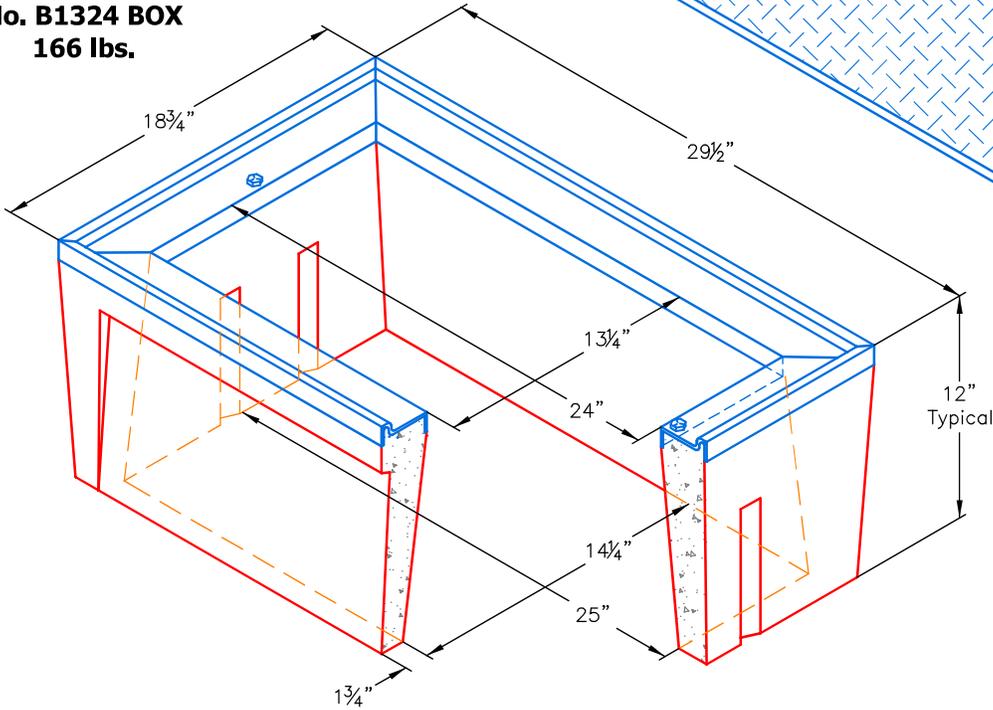


Traffic Box
Caltrans No. 5T State Specs

Steel Checker Cover
No. B1324-51JH
70 lbs.



Traffic Box
No. B1324 BOX
166 lbs.



B1324-51GH

A high density reinforced concrete box with non-settling shoulders positioned to maintain grade and facilitate back filling. Hex-Head Bolts are included with Box. Approximate dimensions and weight shown.

Oldcastle Ordering Code	Item	Approx. Shipping Weight	Description
B1324BOX	BOX	166 lbs.	B1324 Utility Box (13 1/4" x 24") H/20 Loading w/ Bolts - 16 per pallet
B1324-51JH	COVER	70 lbs.	Steel Checker Plate, H/20, Bolt Down
B1324-51GH	COVER	72 lbs.	Steel Checker Plate, H/20 with 5" x 8" Reading Lid
B1324X12	EXTENSION	163 lbs.	12" Reinforced Concrete H/20 Loading - 16 per pallet
B30SL	SLAB	52 lbs.	Reinforced Concrete (16" x 28")

Galvanizing available on all steel covers



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B1324 BOX

FILE NAME: B1324_ISO

ISSUE DATE: January, 2011

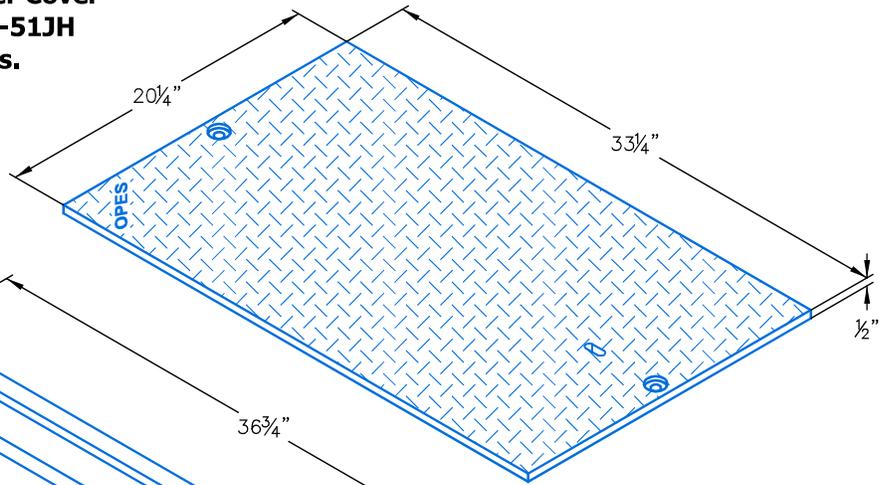
www.oldcastleprecast.com

B1324 BOX H/20 LOADING
13-1/4" x 24"

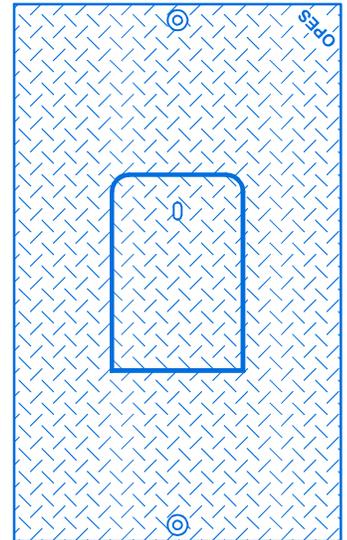
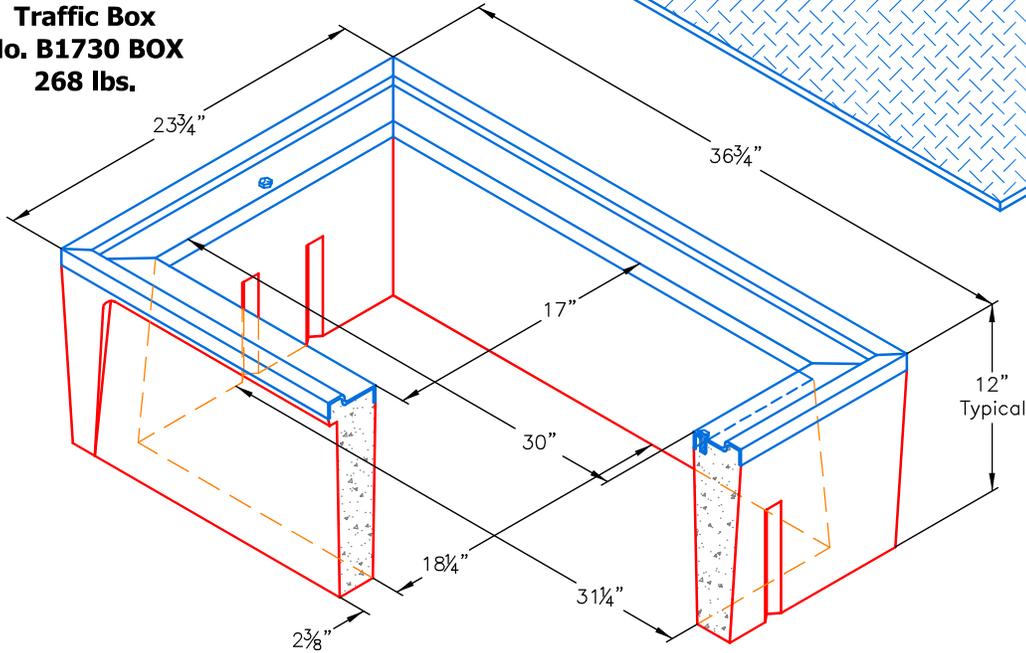


Traffic Box
Caltrans No. 6T State Specs

Steel Checker Cover
No. B1730-51JH
111 lbs.



Traffic Box
No. B1730 BOX
268 lbs.



B1730-51GH

A high density reinforced concrete box with non-settling shoulders positioned to maintain grade and facilitate back filling. Head-Head Bolts are included with Box. Approximate dimensions and weight shown.

Oldcastle Ordering Code	Item	Approx. Shipping Weight	Description
B1730BOX	BOX	268 lbs.	B1730 Utility Box (17" x 30") H/20 Loading w/ Bolts - 6 per pallet
B1730-51JH	COVER	111 lbs.	Steel Checker Plate, H/20, Bolt Down
B1730-51GH	COVER	112 lbs.	Steel Checker Plate, H/20 with 8" x 12" Reading Lid
B1730X12	EXTENSION	250 lbs.	12" Reinforced Concrete H/20 Loading - 6 per pallet
B36SL	SLAB	108 lbs.	Reinforced Concrete (20" x 34")

Galvanizing available on all steel covers



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Enclosure Solutions

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B1730 BOX

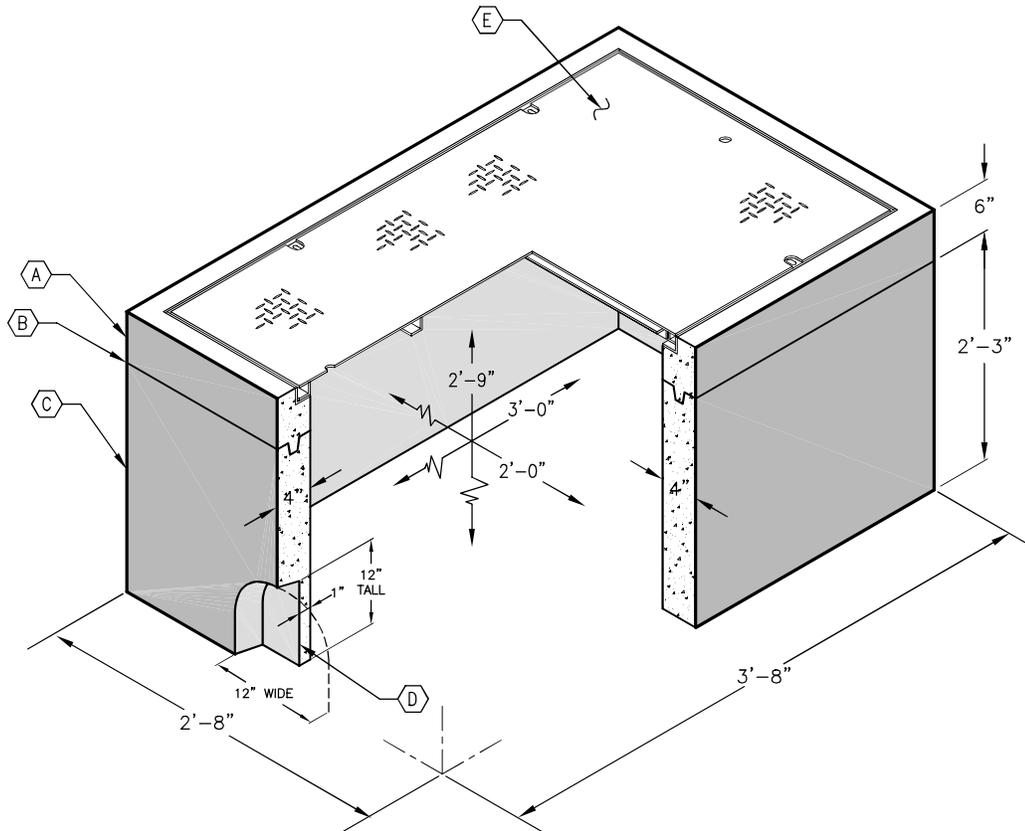
FILE NAME: B1730_ISO

ISSUE DATE: January, 2011

www.oldcastleprecast.com

B1730 BOX H/20 LOADING
17" x 30"





■ ILLUSTRATION IS TYPICAL ONLY OF GENERAL SERIES CONFIGURATION; FOR SPECIFIC CONFIGURATION, CALL JENSEN PRECAST.

MINIMUM EXCAVATION SIZE:
3'-2" x 4'-2" x DEPTH REQUIRED.

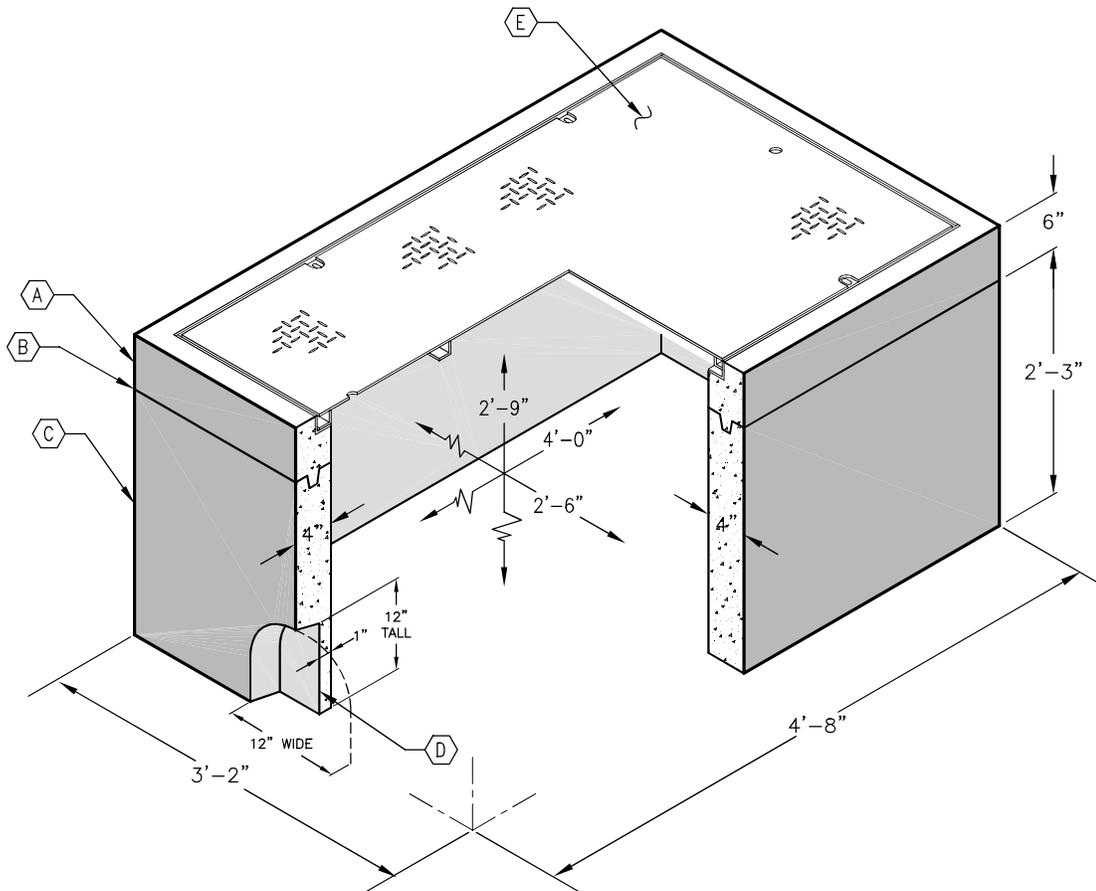
- (A) 6" TOP SECTION WT.= 200 Lbs.
- (B) 6" OR 12" EXTENSION SECTIONS AVAILABLE.
- (C) BOTTOM SECTION WT.= 1,200 Lbs.
- (D) 10" WIDE X 10" TALL PIPE KNOCKOUT ON EACH END WALL, CUSTOM SIZES AVAILABLE UPON REQUEST.
- (E) FOR COVERS: SEE COVER AND NECKING SECTION.

- DESIGNED FOR PEDESTRIAN OR LIGHT TRAFFIC LOADING.
- PLEASE CALL WITH DEPTH REQUIREMENTS. OTHER SIZES ARE AVAILABLE THAN WHAT IS SHOWN.

2'-0" x 3'-0" VARIABLE DEPTH FLAT WALL WATER / GAS VAULT	
ORG. DWG. DATE 08-01-04	REV. DWG. DATE

**JENSEN
PRECAST**

W-2436 SERIES



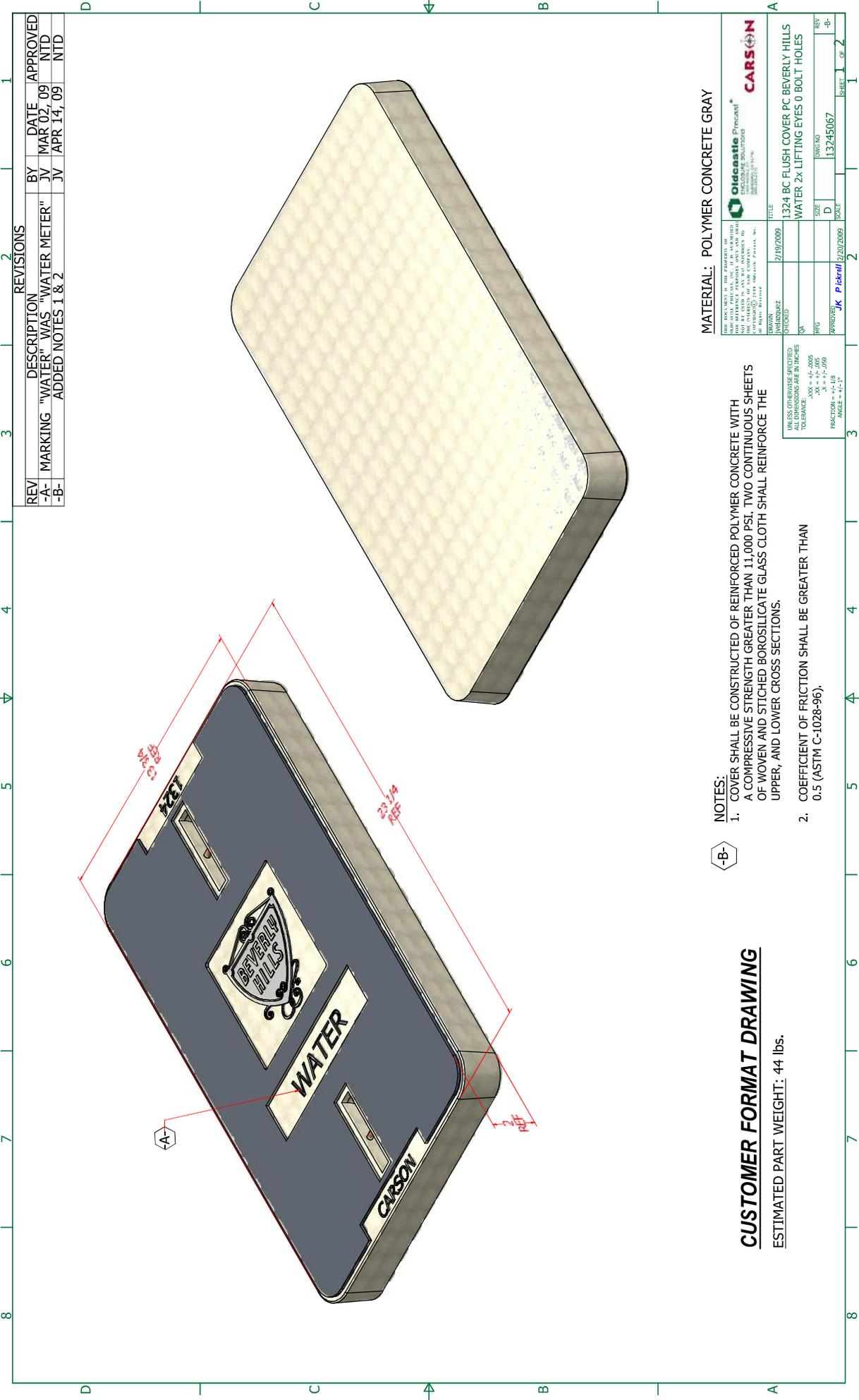
■ ILLUSTRATION IS TYPICAL ONLY OF GENERAL SERIES CONFIGURATION: FOR SPECIFIC CONFIGURATION, CALL JENSEN PRECAST.

MINIMUM EXCAVATION SIZE:
3'-8" x 5'-2" x DEPTH REQUIRED.

- Ⓐ 6" TOP SECTION WT.= 230 Lbs.
- Ⓑ 6" OR 12" EXTENSION SECTIONS AVAILABLE.
- Ⓒ BOTTOM SECTION WT.= 1,674 Lbs.
- Ⓓ 10" WIDE X 10" TALL PIPE KNOCKOUT ON EACH END WALL, CUSTOM SIZES AVAILABLE UPON REQUEST.
- Ⓔ FOR COVERS: SEE COVER AND NECKING SECTION.

- DESIGNED FOR PEDESTRIAN OR LIGHT TRAFFIC LOADING.
- PLEASE CALL WITH DEPTH REQUIREMENTS, OTHER SIZES ARE AVAILABLE THAN WHAT IS SHOWN.

2'-6" x 4'-0" VARIABLE DEPTH FLAT WALL WATER / GAS VAULT		
W-3048 SERIES		
ORG. DWG. DATE 08-01-04	REV. DWG. DATE	



REVISIONS			
REV	DESCRIPTION	BY	DATE
-A-	MARKING "WATER" WAS "WATER METER"	JV	MAR 02, 09
-B-	ADDED NOTES 1 & 2	JV	APR 14, 09
			NTD
			NTD

MATERIAL: POLYMER CONCRETE GRAY

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DRAWN BY	2/19/2009	TITLE	1324 BC FLUSH COVER PC BEVERLY HILLS
CHECKED BY		SIZE	WATER 2x LIFTING EYES 0 BOLT HOLES
DATE		DWG NO	13245067
APPROVED BY	Jk Pakrull	SCALE	1 OF 2

NOTES:

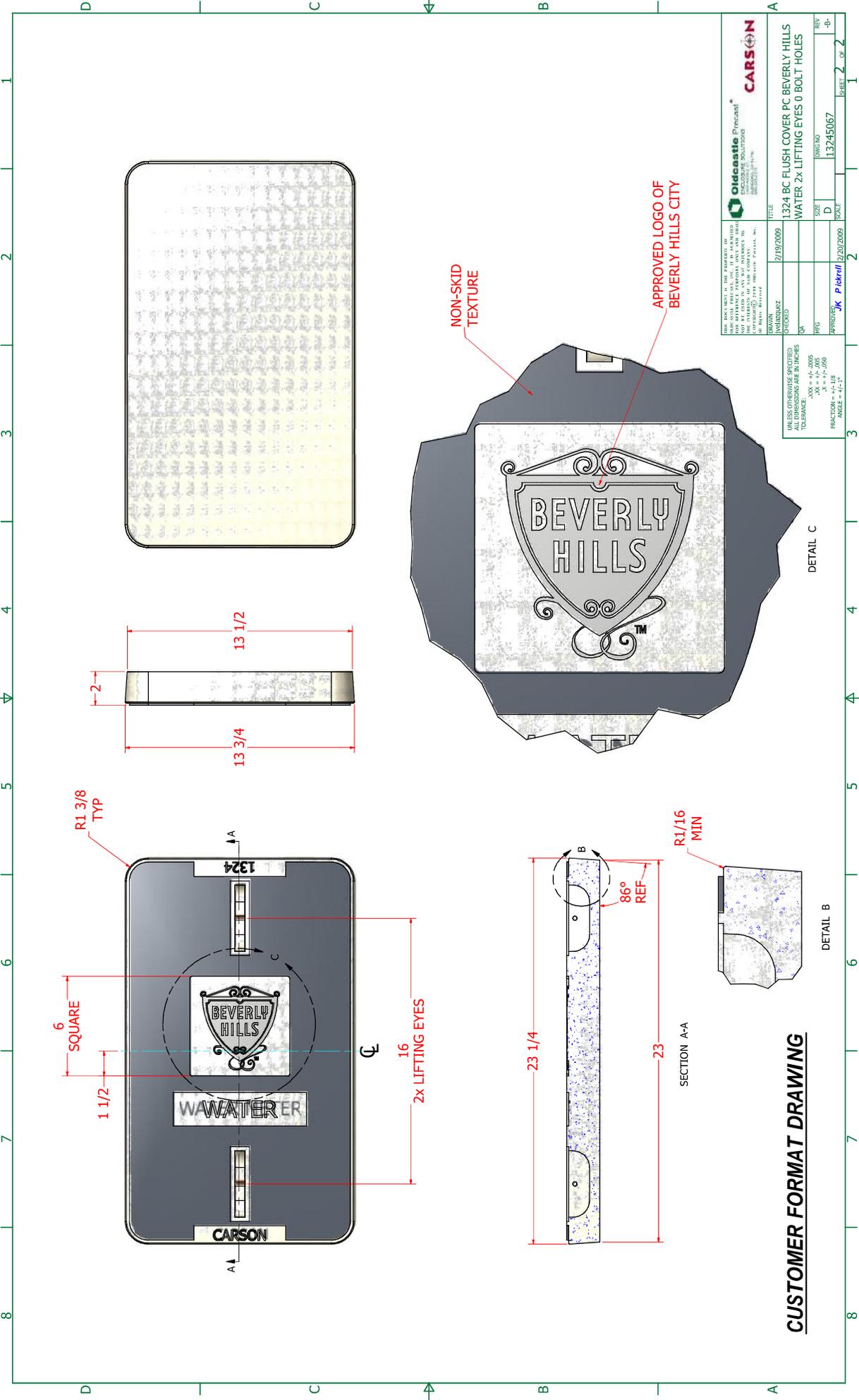
- COVER SHALL BE CONSTRUCTED OF REINFORCED POLYMER CONCRETE WITH A COMPRESSIVE STRENGTH GREATER THAN 11,000 PSI. TWO CONTINUOUS SHEETS OF WOVEN AND STITCHED BOROSILICATE GLASS CLOTH SHALL REINFORCE THE UPPER, AND LOWER CROSS SECTIONS.
- COEFFICIENT OF FRICTION SHALL BE GREATER THAN 0.5 (ASTM C-1028-96).

CUSTOMER FORMAT DRAWING

ESTIMATED PART WEIGHT: 44 lbs.

UNLESS OTHERWISE SPECIFIED
 ALL DIMENSIONS ARE IN INCHES
 TOLERANCE:
 .XX = +.005
 .X = +.010
 FRACTION = +.015

ANGLE = +.2°

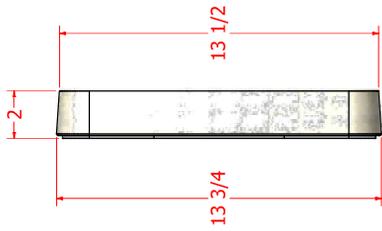


R1 3/8
TYP

6
SQUARE
1 1/2



16
2x LIFTING EYES

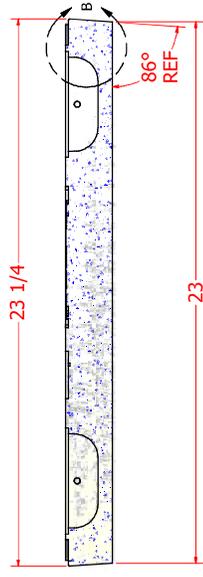


2
13 3/4



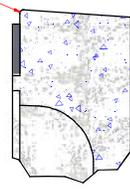
NON-SKID
TEXTURE

APPROVED LOGO OF
BEVERLY HILLS CITY



R1/16
MIN

SECTION A-A

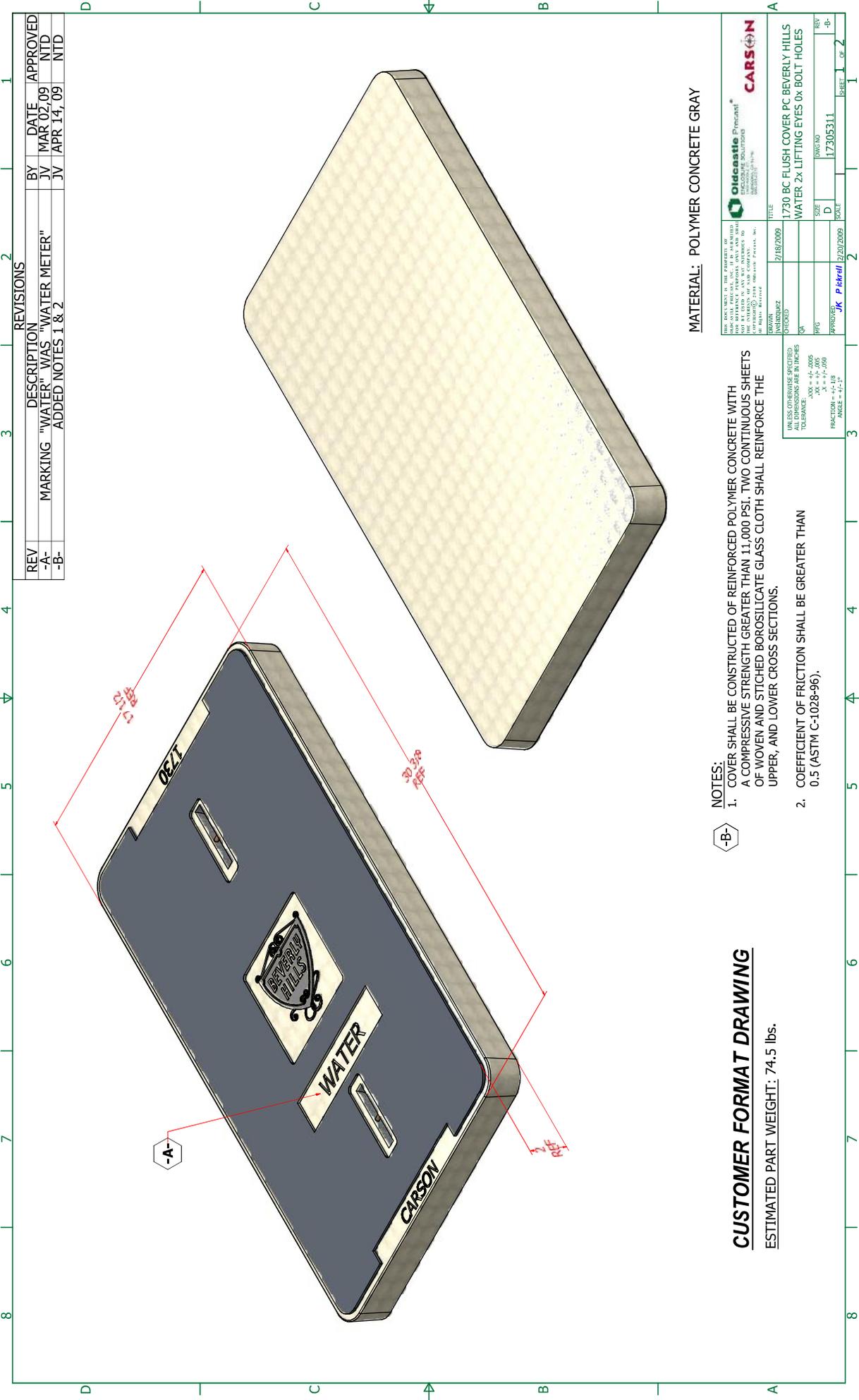


DETAIL B

CUSTOMER FORMAT DRAWING

THIS DOCUMENT IS THE PROPERTY OF OLDCASTLE PRECAST AND SHALL REMAIN THE PROPERTY OF OLDCASTLE PRECAST UNLESS OTHERWISE SPECIFIED.		OLDCASTLE Precast CONCRETE PRODUCTS		CARSON	
DRAWN	2/19/2009	TITLE	1324 BC FLUSH COVER PC BEVERLY HILLS WATER 2x LIFTING EYES 0 BOLT HOLES		
CHECKED		DATE	SIZE	DWG NO	REV
			D	13245067	-B-
APPROVED	JPK	SCALE	SHEET 2 OF 2		

UNLESS OTHERWISE SPECIFIED
ALL DIMENSIONS ARE IN INCHES
TOLERANCE:
XXX = +/- .005
XX = +/- .010
X = +/- .020
FRACTION = +/- .015
ANGLE = +/- .2°



REVISIONS			
REV	DESCRIPTION	BY	DATE
-A-	"WATER" WAS ADDED NOTES 1 & 2	JV	MAR 02, 09
-B-	"WATER METER" WAS ADDED NOTES 1 & 2	JV	APR 14, 09
			NTD
			NTD

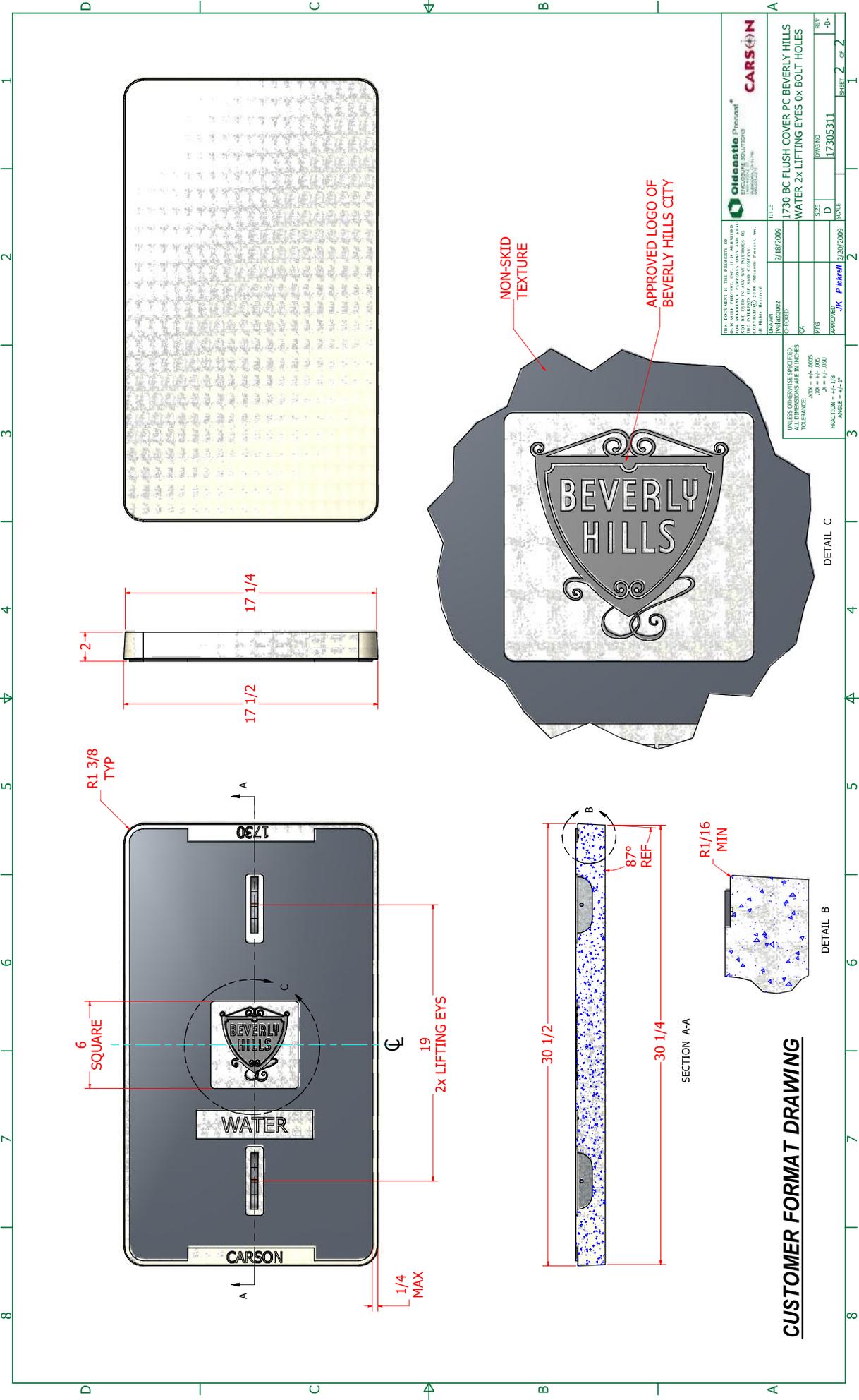
MATERIAL: POLYMER CONCRETE GRAY

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DATE	2/18/2009
DESIGNED BY	JK
CHECKED BY	JK
APPROVED BY	JK
SCALE	D
SHEET NO.	1
TITLE	1730 BC FLUSH COVER PC BEVERLY HILLS WATER 2x LIFTING EYES 0x BOLT HOLES
SIZE	D
PROJECT NO.	17306311

UNLESS OTHERWISE SPECIFIED, ALL DIMENSIONS ARE IN INCHES
 TOLERANCE:
 .XX = +.005
 .X = +.010
 FRACTION = +.015
 ANGLE = +.1°

- NOTES:
- COVER SHALL BE CONSTRUCTED OF REINFORCED POLYMER CONCRETE WITH A COMPRESSIVE STRENGTH GREATER THAN 11,000 PSI. TWO CONTINUOUS SHEETS OF WOVEN AND STITCHED BOROSILICATE GLASS CLOTH SHALL REINFORCE THE UPPER, AND LOWER CROSS SECTIONS.
 - COEFFICIENT OF FRICTION SHALL BE GREATER THAN 0.5 (ASTM C-1028-96).

CUSTOMER FORMAT DRAWING
 ESTIMATED PART WEIGHT: 74.5 lbs.



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Oidecaste Precast®
 PRECAST CONCRETE PRODUCTS
 17700 WILSON AVENUE
 BEVERLY HILLS, CA 91604

CARSON

DATE	2/18/2009
BY	JK
CHECKED	
DATE	2/20/2009
BY	JK
CHECKED	
DATE	12/20/2009
BY	JK
CHECKED	
DATE	12/20/2009
BY	JK
CHECKED	

TITLE: 1730 BC FLUSH COVER PC BEVERLY HILLS
 WATER 2x LIFTING EYES 0x BOLT HOLES

SCALE: 1" = 1'-0"

SHEET 2 OF 2

UNLESS OTHERWISE SPECIFIED
 ALL DIMENSIONS ARE IN INCHES

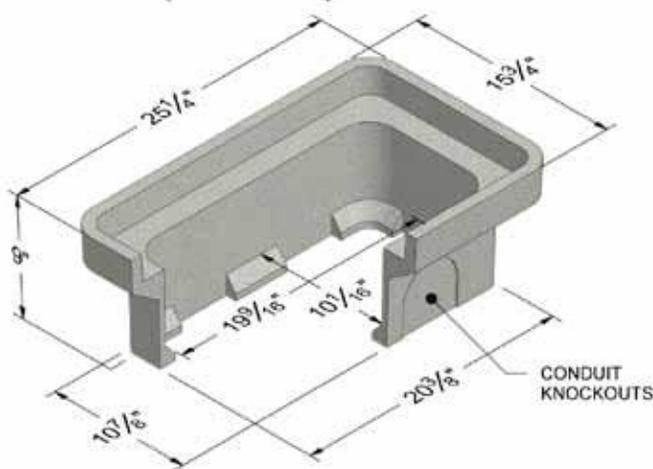
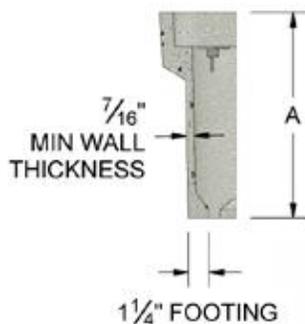
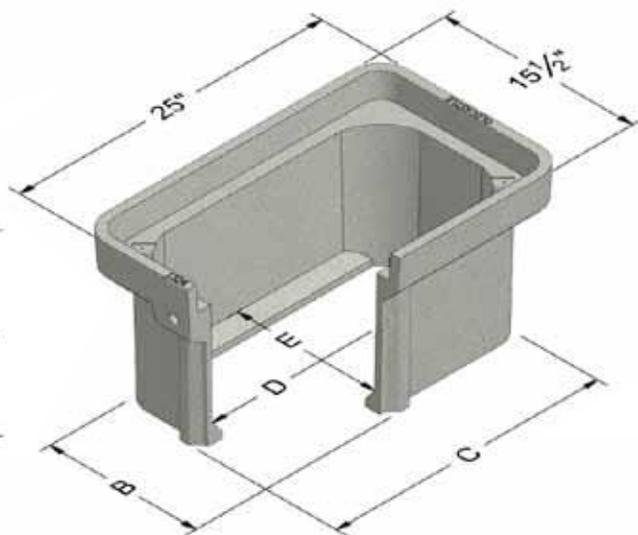
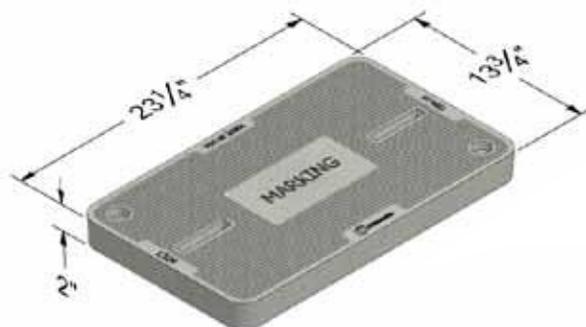
TOLERANCE:
 .XXX - +0, -0.005
 .XX - +0, -0.005
 .X - +0, -0.010
 FRACTION - +1/32"

CUSTOMER FORMAT DRAWING

1324



Bolt Down Detail



	A	B	C	D	E
1324-12	12"	13 1/2"	23"	20 7/8"	11 3/8"
1324-18	18"	13 3/8"	22 7/8"	20 5/8"	11 1/8"
1324-24	24"	13 1/4"	22 3/4"	20 3/8"	10 7/8"

COVER:

- Style: Flush Solid
- Material: Polymer Concrete
- Weight: Tier 15: 38 lbs
Tier 22: 51 lbs
- Std. Fasteners: 3/8-16 Stainless Steel Hex Head Bolt, Washer and Floating Nut
- Options: Logos and Special Markings
- Surface: Slip Resistant & Marked*

BODY:

- Material: Polymer Concrete
- Size: 13" x 24" (L x W)
- Weight: 12" Depth: 51 lbs
18" Depth: 69 lbs
24" Depth: 88 lbs
- Wall Type: Straight
- Performance: Tier 22, WUC Category 3, ASTM C857 A-16

EXTENSION:

- Material: Polymer Concrete
- Size: 13" x 24" (L x W)
- Weight: 9" Depth: 33 lbs



Heavy Duty:
Incidental, Non-deliberate Traffic
For use in non-vehicular traffic situations only.

Actual load rating is determined by the box and cover combination

Weights and dimensions may vary slightly

* Surface demonstrates a coefficient of friction, both wet and dry, > 0.6 when tested by ASTM C1028. Cover comes standard with permanent markings for manufacturer, load rating, model size and manufacturing location.

Contact your Oldcastle Precast Enclosure Solutions Distribution Center for specific information and additional options.

1324

Options:

Available Polymer Covers:

Flush Solid (Standard)

Available Steel Covers:

One Piece

Fastener Options for Polymer Covers:

- Penta Head Bolt
- Oldcastle Enclosures Vandal Proof Bolt
- Penta Coil Thread Bolt
- Captive Bolt Retainer

Custom Options for Polymer Covers:

- 4" x 8" Plate with Custom Markings
- EMS Markers

Custom Options for H-Series Bodies:

- Ground Bus
- Mouseholes/Knockouts
- Pulling Eye
- Dividers
- Solid Bottom
- Bodies are Stackable (with tallest body on bottom)



Polymer Cover



Steel Cover



Raw Material Specifications:

Standard Test Method	Properties of Raw Material	ASTM Designation	Test Results
Compressive Strength of Polymer Concretes	Compressive Strength	C 579	> 11,000 psi
Flexural Properties of Plastic Materials	Flexural Strength	D 790	> 3,000 psi
Resistance of Plastics to Chemical Reagents	Chemical Resistance	D 543	Retain > 75% of original strength
Impact Resistance by Means of a Falling Weight	Impact Resistance	D 2444	> 70 ft-lb
Static Coefficient of Friction	Friction Coefficient	C 1028	> 0.6

ASTM Specifications shall be the current revision
Test Reports available on request

The Rural Utility Service (RUS) is a department of the US Department of Agriculture organized to facilitate rural developments. You will find Oldcastle Enclosure Solutions brand enclosures listed by the RUS. All Oldcastle Enclosure Solutions brand enclosures conform to the RUS "Tamper Resistant" fastener design for buried pedestals.

Product Load Rating:



Heavy Duty : Non-deliberate Traffic

For use in non-vehicular traffic situations only.

Note:

Actual load rating is determined by the box and cover combination. Weights and dimensions may vary slightly

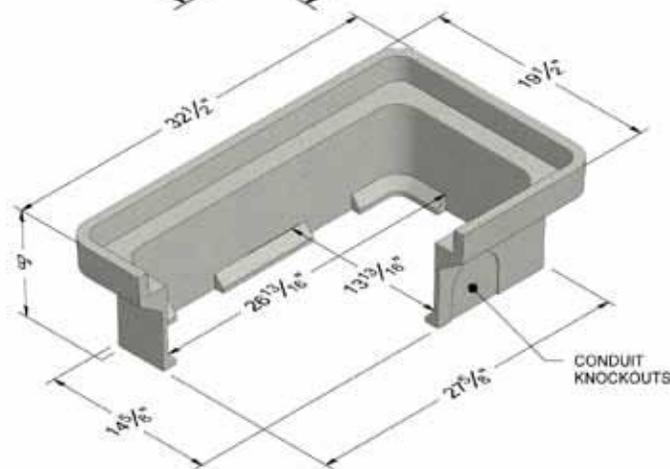
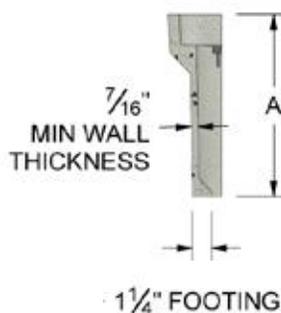
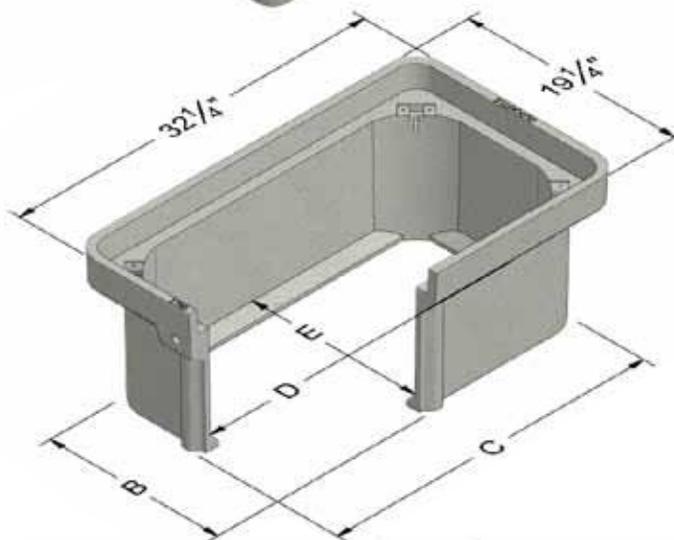
All information contained on this sheet is current at the time of printing. Because of Oldcastle Precast, Inc.'s policy of ongoing research and development, the Company reserves the right to discontinue or update product information without notice.



1730



Bolt Down Detail



	A	B	C	D	E
1730-12	12"	17 1/4"	30 1/4"	28 3/16"	15 3/16"
1730-18	18"	17 1/8"	30 1/8"	28"	15"
1730-24	24"	17"	30"	27 3/4"	14 3/4"

COVER:

- Style: Flush Solid
- Material: Polymer Concrete
- Weight: Tier 15: 62 lbs
Tier 22: 85 lbs
- Std. Fasteners: 3/8-16 Stainless Steel Hex Head Bolt, Washer and Floating Nut
- Options: Logos and Special Markings
- Surface: Slip Resistant & Marked*

BODY:

- Material: Polymer Concrete
- Size: 17" x 30" (L x W)
- Weight: 12" Depth: 65 lbs
18" Depth: 88 lbs
24" Depth: 114 lbs
- Wall Type: Straight
- Performance: Tier 22, WUC Category 3, ASTM C857 A-16

EXTENSION:

- Material: Polymer Concrete
- Size: 17" x 30" (L x W)
- Weight: 9" Depth: 45 lbs



Heavy Duty:
Incidental, Non-deliberate Traffic

For use in non-vehicular traffic situations only.

Actual load rating is determined by the box and cover combination

Weights and dimensions may vary slightly

* Surface demonstrates a coefficient of friction, both wet and dry, > 0.6 when tested by ASTM C1028. Cover comes standard with permanent markings for manufacturer, load rating, model size and manufacturing location.

Contact your Oldcastle Precast Enclosure Solutions Distribution Center for specific information and additional options.

1730

Options:

Available Polymer Covers:

- Flush Solid (Standard)
- Flush (2 Piece) Uni-Half
- Pedestal Provisions

Available Steel Covers:

- One Piece

Fastener Options for Polymer Covers:

- Penta Head Bolt
- Oldcastle Enclosures Vandal Proof Bolt
- Penta Coil Thread Bolt
- Captive Bolt Retainer

Custom Options for Polymer Covers:

- 4" x 8" Plate with Custom Markings
- EMS Markers

Custom Options for H-Series Bodies:

- Ground Bus
- Cable Rack
- Mouseholes/Knockouts
- Pulling Eye
- Universal Mounting Plate
- Dividers
- Solid Bottom
- Bodies are Stackable (with tallest body on bottom)



Polymer Cover



Steel Cover



Uni-Half Cover



Pedestal Provision



Uni-Half Detail



Raw Material Specifications:

Standard Test Method	Properties of Raw Material	ASTM Designation	Test Results
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APPENDIX C

**TECHNICAL SPECIFICATIONS FOR COATINGS BY CSI
SERVICES, INC. (REV. BY COBH)**

**TECHNICAL SPECIFICATIONS
GREYSTONE RESERVOIR
CITY OF BEVERLY HILLS, CA**

(revised by COBH)



**CSI Services, Inc.
P.O. Box 801357
Santa Clarita, CA 91380
877.274.2422**

August 22, 2015

**TECHNICAL SPECIFICATIONS
GREYSTONE RESERVOIR
CITY OF BEVERLY HILLS, CA**

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**TECHNICAL SPECIFICATIONS
GREYSTONE RESERVOIR
CITY OF BEVERLY HILLS, CA**

PART 1.0 - GENERAL

1.01 PURPOSE

- A. The purpose of this specification is to establish the requirements for the recoating of the ferrous components of the Greystone Reservoir, a concrete potable water reservoir owned and operated by the City of Beverly Hills, CA.

1.02 SCOPE OF WORK

- A. Provide and pay for all labor, equipment, materials, machinery, facilities, and services necessary to complete the work in accordance with these specifications.
- B. The work includes the surface preparation and application of protective coatings to the exterior of all ferrous appurtenances that are located within the reservoir. The work includes all costs for the proper removal and disposal of all waste generated on the project.
- C. The replacement coating shall be an ANSI NSF 61 certified immersion grade epoxy. As part of this effort the contractor shall apply caulking to any metal-to-metal or concrete-to-metal interfaces/crevices that preclude proper liquid coating application.
- D. As a result of concerns aver contaminating adjacent surfaces that are not to be coated, all dust emissions shall be contained to the immediate work area(s).

1.03 BACKGROUND

- A. The Greystone Reservoir is a below-grade concrete reservoir that sits below a parking lot adjacent to the historical Greystone Mansion. The reservoir was built in the late 1960's and has a nominal capacity of 19,300,000 gallons. The tank has various ferrous piping, valves, and appurtenances that are comprised of cast-iron, ductile-iron, and/or steel.

It is believed that the ferrous metals in the reservoir are coated with the original coatings applied and that no substantial maintenance coating work has been completed. Depending on the appurtenance, the existing coatings are believed to be comprised of various bitumastic systems.

Overall, the existing coatings are in poor condition with widespread areas of corrosion.

- C. Samples of the existing coatings have been analyzed and found to have relatively low levels of heavy metals. The results of this testing are reported in the following table.

Location	Lead (ppm)	Chromium (ppm)	Cadmium (ppm)
18-inch sump valve	28.3	<15.4	<6.16
12-inch piping, stilling well	887	72.0	18.8
18" Valve 90 Deg Elbow	20.0	17.0	10.1

- D. The above information is provided for bidding purposes only. The contractor shall conduct his own tests to assure that all work to be performed will be in strict accordance with all local, state and federal health, safety and environmental regulations. The results of this testing shall be taken into consideration when providing an environmental protection, worker protection, and waste disposal plan. No responsibility is assumed by the owner for the actual toxic metal content of the coating system(s). The Contractor is responsible to conduct appropriate testing of their own and comply with local, state and federal health, safety and environmental regulations.

1.04 REFERENCE SPECIFICATIONS AND STANDARDS

- A. Without limiting the general aspects or other requirements of this specification, work and equipment shall conform to applicable requirements of municipal, state and federal codes, laws and ordinances governing the work, American Water Works Association, SSPC: The Society of Protective Coatings, National Association of Pipe Fabricators, Inc., and the manufacturer's printed instructions, subject to Engineer's approval.
- B. The Engineer's decision shall be final as to interpretation and/or conflict between any of the referenced codes, laws, ordinances, specifications and standards contained herein.
- C. The latest edition of standards and regulations herein form a part of this specification.
- D. American Society for Testing and Materials (ASTM)
1. ASTM D4138, Standard Test Method for Measurement of Dry Paint Thickness of Protective Coating Systems by Destructive Means

2. ASTM D4285, Standard Test Method for Indicating Oil or Water in Compressed Air
 3. ASTM D4414, Standard Practice for Measurement of Wet Film Thickness by Notch Gages
 4. ASTM D4417, Standard Test Methods for Field Measurement of Surface Profile of Blast Cleaned Steel
 5. ASTM D5402, Standard Test Methods for Assessing the Solvent Resistance of Organic Coatings Using Solvent Rubs
 6. ASTM D7091, Standard Test Method for Measurement of Dry Film Thickness of Nonmagnetic Coatings Applied to Ferrous Metals and Nonmagnetic, Nonconductive Coatings Applied to Non-Ferrous Metals
 7. ASTM E337, Standard Test Method for Measuring Humidity with a Psychrometer
- E. American Water Works Association (AWWA)
1. AWWA C210, AWWA Standard for Liquid Epoxy Coating Systems for the Interior and Exterior of Steel Water Pipelines
 2. AWWA D102, AWWA Standard for Coating Steel Water Storage Tanks
 3. AWWA M42, AWWA Manual of Water Supply Practices, Steel Water Storage Tanks
- F. Code of Federal Regulations (CFR)
1. 29 CFR 1910, Occupational Safety and Health Regulations for General Industry
 2. 29 CFR 1926, Occupational Safety and Health Regulations for the Construction Industry
 3. Health and Safety Code, Div. 20, Chapter 6.5, 6.67, 6.7, 6.95, Hazardous Waste Control Law, Health and Safety Code
 4. 40 CFR 263, Standards Applicable to Transporters of Hazardous Waste
 5. 40 CFR 264, Standards for Owners and Operators of Hazardous

Waste Treatment, Storage, and Disposal Facilities.

6. 40 CFR 265, Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities.
 7. 40 CFR 268, Land Disposal Restrictions
 8. 40 CFR 302, Designation, Reportable Quantities and Notification
 9. 49 CFR 171-179, Hazardous Materials Regulations
- G. International Standard Organization (ISO)
1. ISO 8502-3, Preparation of Steel Substrates before Application of Paints and Related Products
- H. NACE International (NACE)
1. NACE SP 0188-06, Standard Practice for Discontinuity (Holiday) Testing of Protective Coatings
 2. NACE SP 0178-89, Standard Recommended Practice for Fabrication Details, Surface Finish Requirements, and Proper Design Considerations for Tanks and Vessels to be Lined for Immersion Service.
- I. National Association of Pipe Fabricators, Inc. (NAPF)
1. Surface Preparation Standard for Ductile Iron Pipe and Fittings in Exposed Locations Receiving Special External Coatings and/or Special Internal Linings
- A.
- J. SSPC: Society for Protective Coatings (SSPC)
1. SSPC-AB1, Mineral and Slag Abrasive
 2. SSPC-AB2, Specification for Cleanliness of Recycled Ferrous Metallic Abrasives
 3. SSPC-SP 1, Solvent Cleaning
 4. SSPC-SP 2/3, Hand/Power Tool Cleaning
 5. SSPC-SP 7, Brush-off Blast Cleaning

6. SSPC-SP 10, Near-White Blast Cleaning
 7. SSPC-SP 11, Power Tool Cleaning to Bare Metal
 8. SSPC-PA 2, Measurement of Dry Film Thickness with Magnetic Gages
 10. SSPC-VIS 1, Visual Standard for Abrasive Blast Cleaned Steel
 11. SSPC-VIS 3, Visual Standard for Hand and Power Tool Cleaned Steel
 12. SSPC Publication No. 91-12, Coating and Lining Inspection Manual
 18. SSPC-SSPC Visual Comparison Manual
 19. SSPC Technology Guide No. 12 for Illumination Of Industrial Painting Projects
- K. California Code of Regulations (CCR)
- L. General Industry Safety Orders (GISO)
- M. Construction Safety Orders (CSO)
- N. EPA Methods
1. SW 846, Test Methods for Evaluating Solid Waste - Physical/Chemical Methods
 2. Method 1311, Toxicity Characteristic Leaching Procedure (TCLP)
 3. Method 3050, Acid Digestion of Sediment, Sludge, and Soils
- O. Equipment and Coating Manufacturers' Published Instructions.

1.05 SUBMITTALS

- A. The successful Contractor must submit the following plans and programs for Engineer review and acceptance a minimum of 14 days prior to project start-up, and 7 days prior to the Pre-Job Conference.
1. The Contractor shall submit Manufacturers' Product Data Sheets and Material Safety Data Sheets on all materials to be used including, but not limited to coatings, thinners, solvents, inhibitors, and abrasive

media.

- B. Acceptance of the submittal does not relieve the Contractor from the responsibility to conduct the work in strict accordance with the requirements of this Specification, or to adequately protect the environment, health and safety of all workers involved in the project including any members of the public who may be affected by the project.
- C. Contractor shall maintain copies of submittal data at the jobsite at all times, and shall furnish a complete set of submittal data for use by the Inspector.

1.06 CONTRACTOR

- A. The contractor shall be a licensed Painting and Decorating Contractor in the State of California (C-33 Classification). They shall have a minimum of five (5) years practical experience and successful history in the application of specified products to surfaces of steel water storage tanks. Upon request, they shall substantiate this requirement by furnishing a written list of references.

1.07 DEFINITIONS

- A. "Lining" refers to protective materials used or applied to interior surfaces. "Coating" refers to protective materials used or applied on interior surfaces, or any protective material in general.
- B. "Engineer" refers to the Owner or his designated representative.

1.08 HOURS OF WORK – refer to Section 2 – Special Provisions

1.09 PRE-JOB CONFERENCE

- A. A Pre-Job Conference shall be scheduled prior to start of project. The Owner, Contractor and Engineer shall be present. A schedule of work to be accomplished and a list of labor, material and equipment rates for additional work will be established and maintained throughout the project. Contractor shall furnish a complete set of submittal data for use by Inspector. Resumes of personnel to be used on the project shall be also submitted.

1.10 QUALITY ASSURANCE

- A. General: Quality assurance procedures and practices shall be used to monitor all phases of surface preparation, application and inspection

throughout the duration of the project. Procedures or practices not specifically defined herein may be used provided they meet recognized and acceptable professional standards and are approved by the Engineer.

- B. All materials furnished and all work accomplished under the Contract shall be subject to inspection by the Engineer. The Contractor shall be held strictly to the true intent of the Specifications in regard to quality of materials, workmanship, and diligent execution of the Contract.
- C. Work accomplished in the absence of prescribed inspection may be required to be removed and replaced under the proper inspection. The entire cost of removal and replacement, including the cost of all materials which may be furnished by the Owner and used in the work thus removed, shall be borne by the Contractor regardless of whether the work removed is found to be defective or not. Work covered up without the authority of the Engineer, shall, upon order of the Engineer, be uncovered to the extent required. The Contractor shall similarly bear the entire cost of performing all the work and furnishing all the materials necessary for the removal of the covering and its subsequent replacement, as directed and approved by the Engineer. Except as otherwise provided herein, the Owner will pay the cost of inspection.
- D. The Engineer will make, or have made, such tests as deemed necessary to assure the work is being accomplished in accordance with the requirements of the Contract. Unless otherwise specified, the cost of such testing will be borne by the Owner. In the event such tests reveal non-compliance with the requirements of the Contract, the Contractor shall bear the cost of such corrective measures deemed necessary by the Engineer, as well as the cost of subsequent retesting. It is understood and agreed the making of tests shall not constitute an acceptance of any portion of the work, nor relieve the Contractor from compliance with the terms of the Contract.
- E. Ambient Conditions: no coating shall be applied when the surrounding air temperature or the temperature of the surface to be coated is below 50 degrees F. No coatings shall be applied at temperatures above 110 degrees F. No coatings shall be applied to wet or damp surfaces or in rain, snow, fog or mist, when the temperature is less than 5 degrees F. above the dewpoint, or when it is expected the air temperature will drop below 50 degrees F before the coating properly dries. Dewpoint shall be measured by the use of an instrument such as a Sling Psychrometer in conjunction with U.S. Department of Commerce Weather Bureau Psychrometer Tables or equivalent in accordance with ASTM E337. If unacceptable conditions are prevalent coating application shall be delayed or postponed until conditions are favorable. The day's coating application shall be completed in time to permit the film sufficient drying time prior to damage

though atmospheric conditions.

- F. Surface Preparation: surface preparation will be based upon comparison with: "Pictorial Surface Preparation Standards for Painting Steel Surfaces," SSPC-Vis 1 and as described herein. Anchor profile for prepared surfaces shall be measured by using a nondestructive instrument such as a Testex Press-0-Film System in accordance with ASTM D4417. Temperature and dewpoint requirements noted above and herein shall apply to all surface preparation operations, except low and high temperature limits.
- G. The Contractor shall conduct all operations so as to confine abrasive blasting debris and coating overspray to within the bounds of the immediate work area. The Contractor shall take all precautions necessary to prevent adverse off-site consequences of coating operations. Any complaints received by the Owner relating to any such potential offsite problems will be immediately delivered to the Contractor. The Contractor shall immediately halt work and shall take whatever corrective action is required to mitigate any such problems. All costs associated with protection of off-site properties and/or correction of damage to property as a result of coating operations shall be borne directly by the Contractor at no additional expense to the Owner.
- H. Film Thickness Testing: thickness of coatings shall be checked with a non-destructive film thickness gauge in accordance with ASTM D7091. An instrument such as Tooke Gage should be used in accordance with ASTM D4138 if a destructive tester is deemed necessary. The sampling of film thickness of flat (e.g. plate) surfaces shall be tested in accordance with SSPC-PA2. The sampling of structural members or irregular surfaces shall be tested in frequency and locations, as directed by the engineer.
- I. Holiday Detection: coating integrity of all new interior coated surfaces shall be tested with an approved inspection device in accordance with NACE SP 0188. All pinholes shall be repaired in accordance with the manufacturer's printed recommendations and retested. No pinholes or other irregularities will be permitted in the final coating.
- J. Inspection Devices: Contractor shall furnish, until final acceptance of coating, inspection devices in good working condition for detection of holidays and measurement of dry-film thickness of coatings. They shall also furnish National Institute of Standards and Technology/National Bureau of Standards (NIST/NBS) certified thickness calibration plates to test accuracy of thickness gauges. Dry film thickness gauges and holiday detectors shall be available at all times until final acceptance of application. Inspection devices shall be operated by, or in the presence of the Engineer with location and frequency basis determined by the

Engineer. The Engineer is not precluded from furnishing his own inspection devices and rendering decisions based solely upon these quality assurance tests. Should in the opinion of the Engineer a 24-hour, continuous reading surface temperature gauge be required to assure that maximum recoat windows are observed, the contractor shall provide a working calibrated instrument to meet this need. The gauge shall be digital and capable of providing instantaneous average measurements of the temperatures recorded.

- K. Acceptable Inspection Devices: acceptable devices for ferrous metal surfaces include, but are not limited to Tinker-Razor Models AP and AP-W holiday detectors and SSPC, Type II units for dry film thickness gauging. Inspection devices shall be calibrated and operated in accordance with specified requirements. Any high-voltage testing shall require the contractor to obtain written acceptance from the lining manufacturer.
- L. Warranty Inspection: warranty inspection shall be conducted between the eleventh and seventeenth months following acceptance of all coating work. All personnel present at the Pre-Job Conference should be present at this inspection. All defective work shall be repaired in strict accordance with this specification and to the satisfaction of the Engineer.
 - 1. Notification: The Owner shall establish the date for the inspection and shall notify the Contractor at least 30 days in advance. The Owner will drain the tank and Contractor shall provide, at his own expense, suitable lighting and ventilation for the inspection. At the Owner's option, warranty inspection may be accomplished by diving operations.
 - 2. Inspection: all surfaces of the coating systems shall be visually inspected. All defective coatings, as well as damage or rusting spots, shall be satisfactorily repaired by and at the sole expense of the Contractor. Defective coating shall be any of those defined by SSPC's Visual Comparison Manual.
 - 3. Inspection Report: the Engineer shall prepare and deliver to the Contractor an inspection report covering the warranty inspection. The report shall set forth the number and type of failures observed, the percentage of the surface area where failure has occurred, and the names of the persons making the inspection.
 - 4. Schedule: upon completion of the inspection and receipt of Inspection Report as noted herein, Owner shall establish a date for Contractor to proceed with remedial work. Any delay on part of Contractor to meet schedule established by Owner shall constitute breach of this Contract and Owner may proceed to have defects

remedied through other means, and these costs may be charged to the Contractor.

5. Remedial Work: any location where coating is defined as defective shall be considered to be a failure of the system at that location. The Contractor shall make repairs at all points where failures are observed by removing the deteriorated coating, cleaning the surface, and recoating with the same system specified herein. Any spot repairs to defective areas will require feathering at least 3 inches into sound adjacent coating. If an area of failure exceeds 25 percent of a specific coated surface (i.e. item or component), the entire coating system from that specific item may be required to be removed and recoated in accordance with the original specification.
6. Upon completion of remedial work, the Contractor shall disinfect the tank as specified herein.
7. Should any coated component above require removal and replacement, the owner has the option to charge all costs associated with the owner appointed inspection of the rework to the Contractor.

1.11 SAFETY AND HEALTH REQUIREMENTS

- A. General: ventilation, electrical grounding, and care in handling coatings, paints, solvents and equipment are important safety precautions during coating projects. Contractor shall conform with safety requirements set forth by regulatory agencies applicable to the construction industry and manufacturer's printed instructions and appropriate technical bulletins and manuals. The Contractor shall provide and require use of personal protective life saving equipment for all persons working in or about the project site.
- B. Access Facilities: all ladders, scaffolding and rigging shall be designed for their intended uses. Ladders and scaffolding shall be erected where requested by Engineer to facilitate inspection and be moved by the Contractor to locations requested by the Engineer.
- C. Ventilation: where ventilation is used to control hazardous exposure, all equipment shall be explosion-proof, of industrial design and shall be approved by the Engineer. Ventilation shall reduce the concentration of air contaminant to the degree a hazard does not exist by educting air, vapors, etc. from the confined space. Air circulation and exhausting of solvent vapors shall be continued until coatings have fully cured. Forced air eduction during blast cleaning and coating application operations is mandatory. If dehumidification equipment is used, equipment must be

operated on a continuous basis during all blasting and coating operations, including shifts during which no work is being accomplished.

1. Ventilation system shall be furnished and installed by the Contractor in accordance with these specifications. The Contractor shall make modifications to the ventilation system as directed by the Engineer to insure a safe working environment and complete removal of all solvent vapors. Upon completion of the final curing period, as determined by the Engineer, the Contractor shall remove the ventilation system.
 2. The exhaust blower capacity shall be sufficient to maintain air changes within tank interiors in accordance with OSHA, the coating manufacturer's recommendations, and the South Coast Air Quality Management District (SCAQMD) regulations.
 3. If Contractor uses dehumidification equipment, or any other alternative ventilation systems, Contractor must submit, in advance, for approval by the Engineer, a complete list of equipment and procedures for its use.
- D. Head and Face Protection and Respiratory Devices: equipment shall include protective helmets, which shall be worn by all persons while in the vicinity of the work. During abrasive blasting operations, nozzle-men shall wear U.S. Bureau of Mines approved air-supplied helmets and all other persons who are exposed to blasting dust shall wear approved filter-type respirators and safety goggles. When coatings are applied in confined areas all persons exposed to toxic vapors shall wear approved respiratory protection.
- E. Grounding: blasting, spray and air hoses shall be grounded to prevent accumulation of charges of static electricity.
- F. Illumination: spark proof artificial lighting shall be provided for all work in confined spaces. Light bulbs shall be guarded to prevent breakage. Lighting fixtures and flexible cords shall comply with the requirements of NFPA 70 "National Electric Code" for the atmosphere in which they will be used. Whenever required by the Engineer, the Contractor shall provide additional illumination and necessary supports to cover all areas to be inspected. The level of illumination shall be in accordance with SSPC Technology Guide No. 12 for Illumination of Industrial Painting Projects.
- G. Toxicity and Explosiveness: the solvents used with specified protective coatings are explosive at low concentrations and are highly toxic. The maximum allowable concentration of vapor shall be kept below the maximum safe concentration for eight-hour exposure, plus Lower Explosive Limit must be strictly adhered to. If coatings contain lead or

other hazardous materials, all regulations related to safety of personnel and handling of such materials shall be strictly adhered to.

- H. Protective Clothing: coating materials may be irritating to the skin and eyes. When handling and mixing coatings workmen shall wear appropriate covering gloves and eye shields.
- I. Fire: during mixing and application of coatings, all flames, welding and smoking shall be prohibited in the vicinity. Appropriate type fire extinguishers shall be provided by Contractor and kept at the jobsite during all operations.
- J. Sound Levels: whenever the occupational noise exposure exceeds the maximum allowable sound levels, the Contractor shall provide and require the use of approved ear protective devices. General sound levels for project shall be those that will not affect routine facility or neighborhood activities. Whenever any levels are objectionable, they shall be adjusted as directed by the Engineer. Adjustments to noise levels required may include the relocation of equipment or the installation of a sound barrier, as required by the Engineer.
- K. Compliance with California Code of Regulations: Contractor shall submit a notarized letter signed by a principal officer of the Corporation certifying the Contractor fully complies with California Code of Regulations pertaining to the work including, but not limited to, the following:
 - 1. Illness Injury Prevention Program CSO/GISO 1508/3203
 - 2. Confined Space Plan GISO 5156/5159
 - 3. Respiratory CSO/GISO 1531/5144
 - 4. Hazard Communication GISO 5194
 - 5. Rolling Scaffolds CSO 1646
 - 6. Employee Safety Instruction CSO 1510
 - 7. Emergency Medical Service CSO 5112
 - 8. Dusts, Fumes, Mists, Vapors & Gases CSO 1528
- L. Protective Coverings, Containment, and Ventilation Materials/Equipment: The Contractor shall Provide all protective coverings needed to protect those surfaces that are not designated to be prepared or coated. Provide all materials needed for the implementation of a containment/ventilation system around the operation to control emissions and exposures in accordance with the provisions of this Section. This includes, but is not limited to, rigging, scaffolding, planking, tarpaulins, dust collectors and vacuums. Verify that all materials are free of lead, chromium, loose dust and debris when brought onto the Owner's property and upon removal from the site.

2.0 COATING AND DISINFECTION MATERIALS

2.01 GENERAL

- A. Materials specified are those which have been evaluated for the specific service. Products are listed to establish a standard of quality. Standard products of manufacturers other than those specified will be accepted when proven to the satisfaction of the Engineer they are equal in composition, durability, usefulness and convenience for the purpose intended. Substitutions will be considered provided the following minimum conditions are met:
1. The proposed coating system shall have a dry film thickness equal to or greater than that of the specified system.
 2. The proposed coating system shall employ an equal or greater number of separate coats.
 3. The proposed coating system shall employ coatings of the same generic type.
 4. All requests for substitution shall carry full descriptive literature and directions for application, along with complete information on generic type, non-volatile content by volume and a list of 10 similar projects, all at least three years old, where the coatings have been applied to similar exposure. Substitutions shall be endorsed in writing from the materials manufacturer that these substituted materials will provide equivalent performance as those specified.
 5. If the above mentioned data appears to be in order, the Engineer may require that the Contractor provide certified laboratory data sheets showing the results of complete spectrographic and durability tests accomplished on the proposed substitute. An independent testing laboratory satisfactory to the Engineer shall accomplish tests and all costs incurred in the testing program shall be borne by the Contractor. In any case, the Engineer shall be sole and final judge of the acceptability of any proposed substitution. Requests for substitution must be approved in writing.
- B. All materials shall be brought to the jobsite in the original sealed containers. They shall not be opened or used until Engineer has physically inspected contents and obtained necessary data from information printed on containers or labels. Materials exceeding storage life recommended by the manufacturer shall be rejected.
- C. Flammability, toxicity, allergenic properties, and any other characteristic

requiring field precautions shall be identified and specific safety practices shall be stipulated.

- D. All coating and disinfection materials shall be stored in enclosed structures to protect them from weather and excessive heat or cold. Flammable coatings must be stored to conform with local, county, state and federal safety codes for flammable coating materials. At all time coatings shall be protected from freezing.
- E. Contractor shall use products of the same manufacturer for all coats.

2.02 INTERIOR COATING MATERIALS

- A. Interior coating materials for immersed surfaces of the tank must appear on the current National Sanitation Foundation (ANSI/NSF) Standard 61-1999. They shall conform to the regulations and applicable requirements of local, state and federal air pollution and health regulatory agencies.
 - 1. Epoxy coatings shall be similar or equal to AWWA Standard D102-11 Inside Coating System No. 2 (ICS-2). Materials have been listed herein as standards of quality.
 - 2. Epoxy coatings shall be similar or equal to AWWA Standard C210. Materials have been listed herein as standards of quality.
 - 3. Joint sealant shall be a flexible polyurethane or polysulfide product, similar or equal to Federal Specification TT-S-230.

2.03 DISINFECTION MATERIALS

- A. Disinfection materials shall conform to all requirements of AWWA Standard C652-92.

3.0 EXECUTION

3.01 GENERAL

- A. All surface preparation and coating application shall conform to applicable standards of SSPC, NAPF, and the coating manufacturer's printed instructions. Material applied prior to approval of the surface by the Engineer shall be removed and reapplied to the satisfaction of the Engineer at the expense of the Contractor.
- B. All work shall be performed by skilled craftsmen qualified to accomplish the required work in a manner comparable with the best standards of practice. Continuity of personnel shall be maintained and transfer of key personnel shall be coordinated with the Engineer.
- C. The Contractor shall provide a supervisor to be at the work site during cleaning, application and disinfection operations. The supervisor shall have the authority to sign any change orders, coordinate work and make other decisions pertaining to the fulfillment of their contract.
- D. Contractor shall provide approved sanitary facilities for all project personnel, as no existing facilities will be available to the Contractor. Facilities shall be maintained during the project to complete standards established by Owner, and shall be removed prior to Contractor's departure from the site at completion of the project.
- E. Dust, dirt, oil, grease or any foreign matter which will affect the adhesion or durability of the finish must be removed by washing with clean rags dipped in an approved commercial cleaning solvent, rinsed with clean water and wiped dry with clean rags.
- F. The Contractor's coating equipment shall be designed for application of materials specified and shall be maintained in first class working condition. Compressors shall have suitable traps and filters to remove water and oils from the air. Blotter test shall be accomplished at each start-up period and as deemed necessary by the Engineer. Contractor's equipment shall be subject to approval of the Engineer.
 - 1. Cleanliness of compressed air supply shall be verified daily, and as deemed necessary by Engineer, by directing a stream of air, without abrasive, from the blast nozzle onto a white blotter or cloth for twenty seconds in accordance with ASTM D4285. If air contamination is evident, change filters, clean traps, add moisture separators or filters, or make adjustments as necessary to achieve clean, dry air.

- G. Application of the first coat shall follow immediately after surface preparation and cleaning within an eight-hour working day. Any cleaned areas not receiving first coat within an eight-hour period shall be recleaned prior to application of first coat.
 - 1. If dehumidification equipment is used, cleaned areas may have the first coat applied during the last shift of the week, provided dehumidification equipment has run continuously during the complete week and surface meets all requirements of the specification.
- H. Because of the presence of moisture and possible contaminants in the working atmosphere, care shall be taken to ensure previously coated or coated surfaces are protected or recleaned prior to application of subsequent coat(s). The Engineer shall approve methods of protection and recleaning.
 - 1. The project is subject to intermittent shutdown if, in the opinion of the Engineer, cleaning, and coating operations are creating a localized condition detrimental to ongoing facility activities, personnel, or adjacent property.
 - 2. In the event of emergency shutdown by the Engineer, Contractor shall immediately correct deficiencies. All additional costs created by shutdown shall be borne by Contractor.
- I. The Contractor shall provide, at his own expense, all necessary power for his operations under the contract.
- J. Inspection: all operations will be monitored 100% by an Owner-appointed quality assurance inspector.

3.02 SURFACE PREPARATION, GENERAL

- A. The latest revision of the following surface preparation specifications of SSPC and/or NAPF, where applicable shall form a part of this specification.
- B. Steel Surfaces:
 - 1. Solvent Cleaning (SSPC-SP1): Removal of oil, grease, soil and other contaminants by use of solvents, emulsions, cleaning compounds, steam cleaning or similar materials and methods, which involve a solvent or cleaning action.
 - 2. Near-White Blast Cleaning (SSPC-SP10): Blast cleaning to near-

white metal cleanliness, until at least ninety-five percent of each element of surface area is free of all visible residues.

- C. All steel surfaces within the tank shall be abrasively blast cleaned to "Near-White Blast Cleaning" in conformance to SSPC's Surface Preparation Specification No. 10 (SSPC-SP10) and have a surface profile or anchor pattern of 2 to 3 mils (.002" - .003").
- D. Non-Steel, Ferrous Surfaces:
 - 1. Solvent Cleaning (NAPF 500-03-01): Removal of oil, grease, soil and other contaminants.
 - 2. Abrasive Blast Cleaning of Ductile Iron Pipe Internal Pipe Surfaces (NAPF 500-03-04): Abrasive Blast Cleaning is a method of preparing ductile iron pipe surfaces which, when viewed without magnification, shall result in the surface being free of all visible dirt, dust, loose annealing oxide, loose rust, loose mold coating and other foreign matter. The entire surface to be coated shall be struck by the blast media.
 - 3. All non-steel, ferrous surfaces shall be abrasively blast cleaned in conformance to NAPF's Surface Preparation Specification No. 500-03-04. In addition to this level of cleanliness, all surfaces shall be free of any rust, rust staining, and annealing oxide. Special care shall be given to not damage substrates by excessive abrasive blast cleaning. Ductile iron pipe, in some cases, can be damaged by excessive abrasive blast cleaning beyond this standard. The surface profile or anchor pattern shall be at least 2 to 3 mils (.002" - .003").

3.03 SURFACE PREPARATION, SPECIFIC

- A. Slag, weld spatter, mold coating, sharp edges, or laminations shall be removed by chipping and grinding. All sharp edges shall be ground or otherwise blunted as required by the Engineer in accordance with NACE SP0178. The rolled edges of angles do not normally require further rounding unless specifically directed by the Engineer.
- B. Abrasive blasting nozzles shall be equipped with "deadman" emergency shut-off nozzles. Blast nozzle pressure shall be a minimum of 95 P.S.I. and shall be verified by using an approved nozzle pressure gage at each start-up period or as directed by the Engineer.
- C. All blast hose connections shall be connected with external couplings. These connections shall be taped with duct tape prior to pressurizing. All

taped connections shall be visually inspected for leaks within five minutes after start of blast cleaning operations and at the end of blast cleaning operations. Leaking connections shall be immediately repaired to prevent further damage.

- D. Particle size of abrasives used in blast cleaning shall be that which will produce a surface profile or anchor pattern specified herein, or in accordance with recommendations of the manufacturer of the specified coating system to be applied, subject to approval of Engineer.
- E. Abrasive used in blast cleaning operations shall be new, washed, graded and free of contaminants, which would interfere with adhesion of coatings and shall not be reused unless specifically approved by the Engineer. Abrasives shall be certified for unconfined dry blasting pursuant to the California Administrative Code, Section 92520 of Subchapter 6, title 17, and shall appear on the current listing of approved abrasives.
- F. The Contractor shall select an abrasive media that is proper for the quality of surface preparation specified. Should it be determined that the production rate and quality of the surface preparation is less than specified, it shall be the Contractor's responsibility to use other types and/or sizes of abrasive to meet the requirements of this contract. At no time shall considerations of extra effort be considered by the Owner unless, in the opinion of the Engineer the Contractor has explored all alternative means of abrasive blasting during their operations.
- G. Blast cleaning from rolling scaffolds shall only be performed within the confines of the interior perimeter of the scaffold. Reaching beyond the limits of the perimeter will be allowed only if blast nozzle is maintained in a position, which will produce a profile acceptable to the Engineer.
- H. The Contractor shall keep the area of work in a clean condition and shall not permit blasting materials to accumulate as to constitute a nuisance or hazard to the prosecution of the work or the operation of the existing facilities. Spent abrasives and other debris shall be removed at the Contractor's expense as directed by the Engineer. If waste is determined to be hazardous, disposal by Contractor shall meet requirements of all regulatory agencies for handling such wastes.
- I. Blast cleaned surfaces shall be cleaned prior to the application of specified coatings through a combination of blowing with clean dry air, brushing/brooming and/or vacuuming as directed by the Engineer. Air hose for blowing shall be at least 1/2" in diameter and shall be equipped with a shut-off device.
- J. The surfaces of any specialty finished items (i.e. galvanized, anodized,

etc.) shall be properly treated and prepared prior to any coating operations in accordance with the coating manufacturer's written recommendations, subject to approval of the engineer.

3.04 CONTROL OF VISIBLE EMISSIONS

- A. Emissions from dust producing operations or equipment are to be restricted to the immediate confines of the work to be completed. Special care shall be implemented to not contaminate tank surfaces that are not included within the scope of this project.
- B. Visible emissions from dust producing operations or equipment are restricted to no greater than Level 1 (1% of work day) as defined in SSPC Guide 6. Assess visible emissions in accordance with 40 CFR 60, App A, Method 22.
- C. Do not permit any visible emissions to extend beyond the regulated area(s). Visible emissions extending beyond the regulated area are cause for immediate project shut down until the cause of the emissions is corrected.

3.05 APPLICATION, GENERAL

- A. Coating application shall conform to the requirements of the SSPC's Paint Application Specification No. 1 (SSPC-PA1), latest revision, for "Shop, Field and Maintenance Painting," the manufacturer of the coating materials printed literature, and as specified herein.
- B. Thinning shall only be permitted as recommended by the manufacturer and approved by the Engineer, and shall not exceed the limits set by applicable regulatory agencies.
 - 1. If the Contractor applies any coatings which have been modified or thinned to such a degree as to cause them to exceed established VOC levels, Contractor shall be responsible for any fines, costs, remedies, or legal action and costs which may result.
- C. Each application of coating shall be applied evenly with a uniform appearance. The system shall be free of brush marks, unfeathered edges, sags, runs, and evidence of poor workmanship, or any aesthetic defects, as defined by SSPC. Care should be exercised to avoid lapping on glass or hardware. Coating shall be sharply cut to lines. Finish surfaces shall be uniform in appearance and shall be free from defects or blemishes.
- D. Protective coverings or drop cloths shall be used to protect areas such as concrete, fixtures, equipment, prepared surface and applied coatings.

Care shall be exercised to prevent coating from being spattered onto surfaces, which are not to be coated. Surfaces from which such material cannot be removed satisfactorily shall be replaced or recoated as required to produce a finish satisfactory to the Engineer.

- E. All welds and irregular surfaces, as defined by the engineer shall receive a brush coat of the specified product prior to application of each complete coat. Coating shall be brushed in multiple directions to insure penetration and coverage, as directed by the Engineer. These areas include, but are not limited to welds, nuts, bolts, ends, and flanges of rafters, etc.
- F. Special care shall be made to not damage any internal pipe components.
- G. At the conclusion daily coating operations, a 6" wide strip of blast cleaned substrate shall remain uncoated to facilitate locating the point of origin for successive blast cleaning/priming operations.
- H. Coating which has endured an excessive time element beyond manufacturer's recommended recoat cycle, shall be scarified by Brush-off Blast Cleaning (SSPC-SP7) or methods approved by the Engineer, prior to application of additional coating. Scarified coating shall have sufficient depth to assure a mechanical bond of subsequent coat.
- I. All attachments, accessories, and appurtenances to be coated shall be prepared and finished in the same manner as specified for adjacent sections.

3.06 COATING APPLICATION

- A. After completion of surface preparation as specified, all surfaces shall receive one of the coating systems noted under 2.02 "INTERIOR COATING MATERIALS" and listed below. Each coat shall be of a contrasting color and topcoats shall be white.
- B. Due to different potential substrates, different levels of surface roughness may be achieved following surface preparation. It is the intent of this specification to provide a holiday free surface to all areas prepared. On this basis, two different coating systems may be used. The selection of the coating system(s) shall take this holiday free requirement into consideration. The total system shall include one of the two following systems:
 - 1. Tnemec Company
 - a. Series L140F PotaPox, 4-6 mils Prime Coat
 - b. Series L140F PotaPox, 4-6 mils Intermediate Coat
 - c. Series L140F PotaPox, 4-6 mils Topcoat

- d. 15 mils (.015") shall be the nominal DFT of the system.
- 2. Tnemec Company
 - a. Series L140F PotaPox, 4-6 mils Prime Coat
 - b. Series 22 Epoxoline, 16-40 mils Topcoat

3.07 QUALITY CONTROL

- A. All coating components shall be mixed in exact proportions specified by the manufacturer. Care shall be exercised to insure all material is removed from containers during mixing and metering operations.
- B. All coatings shall be thoroughly mixed utilizing an approved slow-speed power mixer until all components are thoroughly combined and are of a smooth consistency. Catalyzed coatings shall not be applied beyond pot-life limits specified by manufacturer. Any required induction requirements shall be strictly followed.
- C. Thinners shall be added to coating materials only as required in accordance with manufacturer's printed literature and in the presence of the Engineer. Quantities of thinner shall not exceed limits set by applicable regulatory agencies.
- D. Application shall be by airless spray method except as otherwise specified, or approved by the Engineer. Drying time between coats shall be strictly observed as stated in the manufacturer's printed instructions.
- E. When two or more coats are specified, where possible, each coat shall be of contrasting color.
- G. Care shall be exercised during spray operations to hold the spray nozzle perpendicular and sufficiently close to surfaces being coated to avoid excessive evaporation of volatile constituents and loss of material into the air or the bridging of cracks and crevices. Reaching beyond limits of scaffold perimeter will not be permitted. All dryspray or overspray shall be removed as directed by Engineer and the area recoated.
- H. Upon completion of the interior coating operations and after the required curing intervals, holiday detection shall be accomplished on all coated surfaces below the overflow. The instrument shall be set at 2,000 volts, include a wire brush electrode, and be properly grounded. Repairs shall be retested. The contractor shall obtain a letter from the coating manufacturer approving this test procedure, prior to any testing. Should the manufacturer not approve of this device, an 67.5 volt device Tinker and Razor M-1 device shall be used, unless the applied film is in excess of 21 mils, at which time NACE SP0188 shall be implemented.

- I. All holiday detection of coatings shall be performed in the presence of the Engineer.
- J. A time element equivalent to 7 days curing time at 70 degrees and 50% relative humidity, or as required by the coating manufacturer and approved by Engineer, shall be required before placing the epoxy coating system into service, as determined in 3.08" FINAL CURING OF EPOXY COATING."

3.08 FINAL CURING OF EPOXY COATING

- A. Upon completion and acceptance of applied coating system, Contractor shall furnish an approved exhaust fan or blower of sufficient capacity to insure removal of solvent vapors during curing process. The fan or blower, after approval by Engineer, shall be installed as directed by the Engineer and shall remain in continuous operation until coating is completely cured as determined by the manufacturer of the coating system.
- B. After completion of curing cycle as noted above, the Contractor shall test the applied coating with a solvent rub test performed in accordance with ASTM D 5402 to verify adequate curing has been attained.
 - 1. If final cure has not been attained, ventilation shall be continued until applied lining passes the solvent wipe test.
- C. After final cure is approved by Owner, Contractor shall remove fan or blower.

3.09 DISINFECTION

- A. Disinfecting of interior surfaces of the tank shall be accomplished in the presence of the Engineer, in conformance to AWWA Standard C652 Section 4.2 Chlorination Method 2 as modified herein:
 - 1. Disinfection shall be accomplished after protective coating has been applied to the interior surfaces and has been totally cured as required in 3.08 "FINAL CURING OF EPOXY COATINGS."
- B. Prior to disinfecting, the complete interior shall be cleaned by the Contractor with an approved cleaner or detergent applied via high pressure or hot solution method. Residual water and contamination removed during washing process shall be thoroughly flushed from the tank. This operation shall be accomplished after completion of interior coating work as directed by the Engineer

- C. After completion of cleaning cycles as noted above, interior surfaces shall be jet washed with a chlorine solution having a content of 200 P.P.M. Chlorine solution which accumulates on the bottom shall be dechlorinated and then drained to waste. Contractor shall obtain approval of the Owner prior to draining any high strength chlorinated water to waste. Rinsing with clean water is not required unless directed by Owner.
- D. Once the tank has been completely filled, the tank will be isolated for the water system and the Owner will conduct Bac-T tests. Should the Bac-T test fail, the Contractor will be responsible for reimbursing the Owner for the water required to rechlorinate the tank as described above until the Bac-T tests are negative.

3.10 TESTING FOR VOLATILE ORGANIC COMPOUNDS (VOC's)

- A. In order to monitor the presence of excessive levels of VOC's leached into the water from the coating process, the following procedure shall be utilized:
 - 1. After satisfactory curing and disinfection, the Owner in accordance with standard filling procedures shall fill the tank. Water shall then be retained for a period of 5 days.
 - 2. On the sixth day following completion of filling of tank, samples of the water shall be removed by Owner in accordance with latest Health Department memoranda. Samples shall then be forwarded, by Owner, to an approved test laboratory for testing to determine presence of VOC'S.
 - 3. After testing of samples, results must show levels of leached organics to be in accordance with levels established by the Health Department for various VOC'S. Health Department will verify results and tank will be then placed into operating service.
 - 4. If levels of leached organics exceed those acceptable to the Health Department, the tank shall be drained, flushed, refilled and retested; all at the Contractor's expense. Failure of the tank to attain levels acceptable to the Health Department shall be the responsibility of the Contractor and remedial measures to attain such levels shall be at his sole expense.

3.11 CLEAN-UP

- A. Upon completion of the work, all staging, scaffolding and containers shall be removed from the site or destroyed in a manner approved by the

Engineer. Coating spots upon adjacent surfaces shall be removed and the entire jobsite cleaned. All damage to surfaces resulting from the work of this section shall be cleaned, repaired, or refinished to the complete satisfaction of the Engineer at no cost to the Owner.

3.12 OMISSIONS

- A. Care has been taken to delineate herein those surfaces to be coated. However, if coating requirements have been inadvertently omitted from this section or any other section of the specifications, it is intended that all metal surfaces, unless specifically exempted herein, shall receive a first-class protective coating equal to that given the same type surface pursuant to these specifications.

APPENDIX D

REPORT BY CANNON – SPECIFICATIONS FOR CONCRETE REPAIR



August 18, 2015

Tristan D. Malabanan, P.E.
Beverly Hills Public Works
345 Foothill Road
Beverly Hills, CA 90210

Subject: Greystone Reservoir Corrosion Review

Tristan,

The Greystone Reservoir site was purchased in 1965 by the City of Beverly Hills and the Greystone Reservoir (Reservoir) constructed soon thereafter. The Reservoir has a total storage capacity of 19.4 million gallons. The western section has a storage capacity of 10.2 million gallons. Forty-five percent of water used by Beverly Hills passes through the Reservoir.

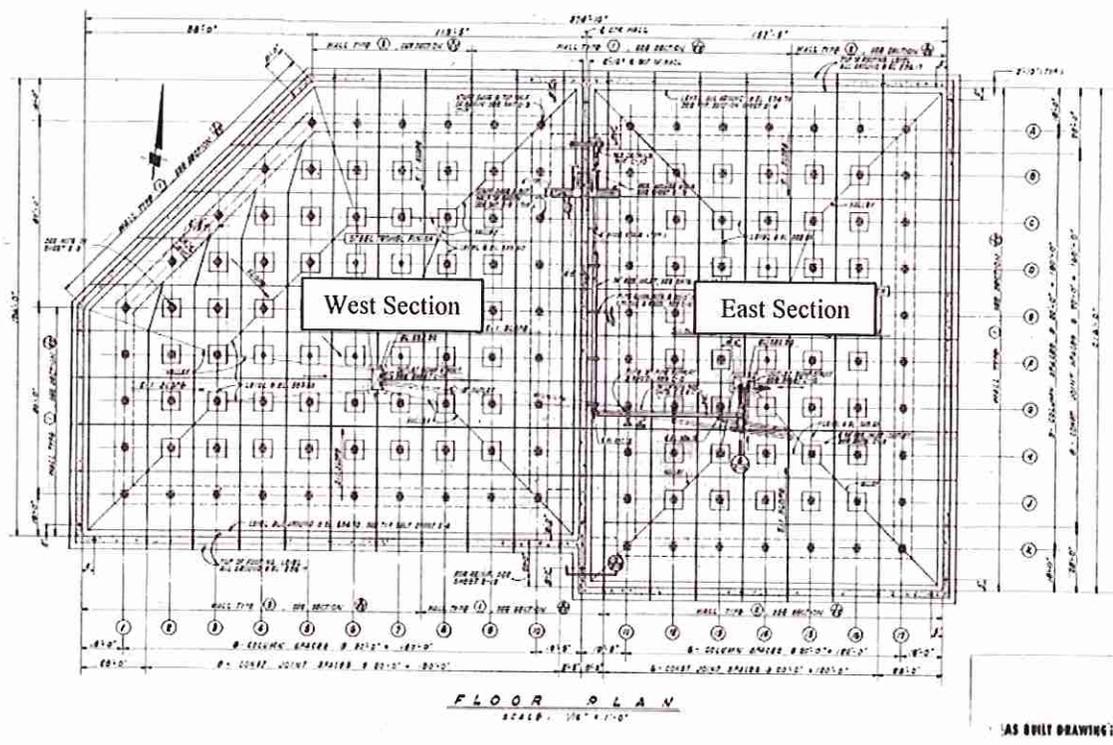
Description

The Reservoir is an underground reservoir constructed of poured-in-place, reinforced concrete. The western section has a plan area of approximately 38,000 square feet. The perimeter walls provide retaining from soil forces on the exterior above the level of the stored water. There are 80 interior cast-in-place concrete columns on twenty foot grids. The floor of the reservoir is sloped to a collection point. The roof over the reservoir is cast in place concrete that supports a parking lot above.



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Document Review

A copy of the original Reservoir as-built construction plans were provided and reviewed. We reviewed a report by KEC, which noted "sporadic and visible rust markings on the reservoir walls and columns." We also reviewed inspection reports prepared by the Department of Water Resources Division of Safety of Dams, with the most recent inspection report dated 11/10/2011.

The east reservoir was full at the time of our site visit. The west reservoir was drained in 2014 for inspection stemming from water quality problems in 2013. Prior reservoir inspections were conducted in 2013, 2011, 2010, and in 2007.



Site visit

Our site visit was conducted on 7/27/15 to inspect areas of corrosion inside of the western section of the Reservoir. During our site visit, the entire interior of the western reservoir was walked. A key plan and selected photos that were taken during our site visit are included in Appendix A. We observed isolated "spot" corrosion on the concrete in numerous locations (see photos 2 & 4). More severe corrosion was observed on the concrete in eight locations (refer to key plan and photos). In an attempt to detect substrate delamination, a hammer was used to "sound" the concrete in areas of corrosion to detect substrate delamination. No evidence of delamination was found. Unprotected steel was observed to be severely corroded (see photo 7).

Discussion

Corrosion can be effected by many variables and their combinations include pH, alkalinity, temperature, dissolved oxygen, natural organic matter, and type of scale that is formed. The general condition of the concrete in the western section of the Reservoir is good. The observed corrosion of the concrete is limited to areas where inadequate concrete cover was provided for the steel reinforcement and/or accessory steel such as tie wire.

Water treatment can be very complicated. Water molecules naturally support minerals. "Hard" water contains heavy amounts of minerals that are typically calcium and magnesium carbonates. Hard water can damage equipment through the formation of lime scale and reduces the effectiveness of soaps. Softening water removes minerals from the water. However, since the water is a natural host, softening the water too much can cause damage to systems as the water attempts to acquire minerals from pipes and equipment. Chemicals used to treat water can also affect the structures containing the water.

It is our understanding that Chloramine disinfection has been used in the Reservoir in lieu of Chlorine. Chloramine is pH neutral and an oxidizing agent. While Chloramine is not as strong an oxidizer as Chlorine, both will naturally corrode exposed steel elements over time.

Recommendations

Repairs are warranted for the corroded areas of concrete. The surface of the concrete shall be thoroughly cleaned, including the removal of loose coatings, corrosion, and degraded concrete.

- Delaminated Concrete Repairs: For areas where the depth to sound substrate is ½" or less, coat with Sika Sikatop 123 Plus per manufacturer's written instructions. Coat substrate a minimum of 8" beyond signs of corrosion or damage. See Appendix B.



- Concrete Spall Repair: For areas where the depth to sound substrate exceeds 1/2", repair per attached Appendix C concrete repair detail which includes a Sika Armatex 110 EpoCem bonding agent and Sika SikaRepair 224 repair mortar.

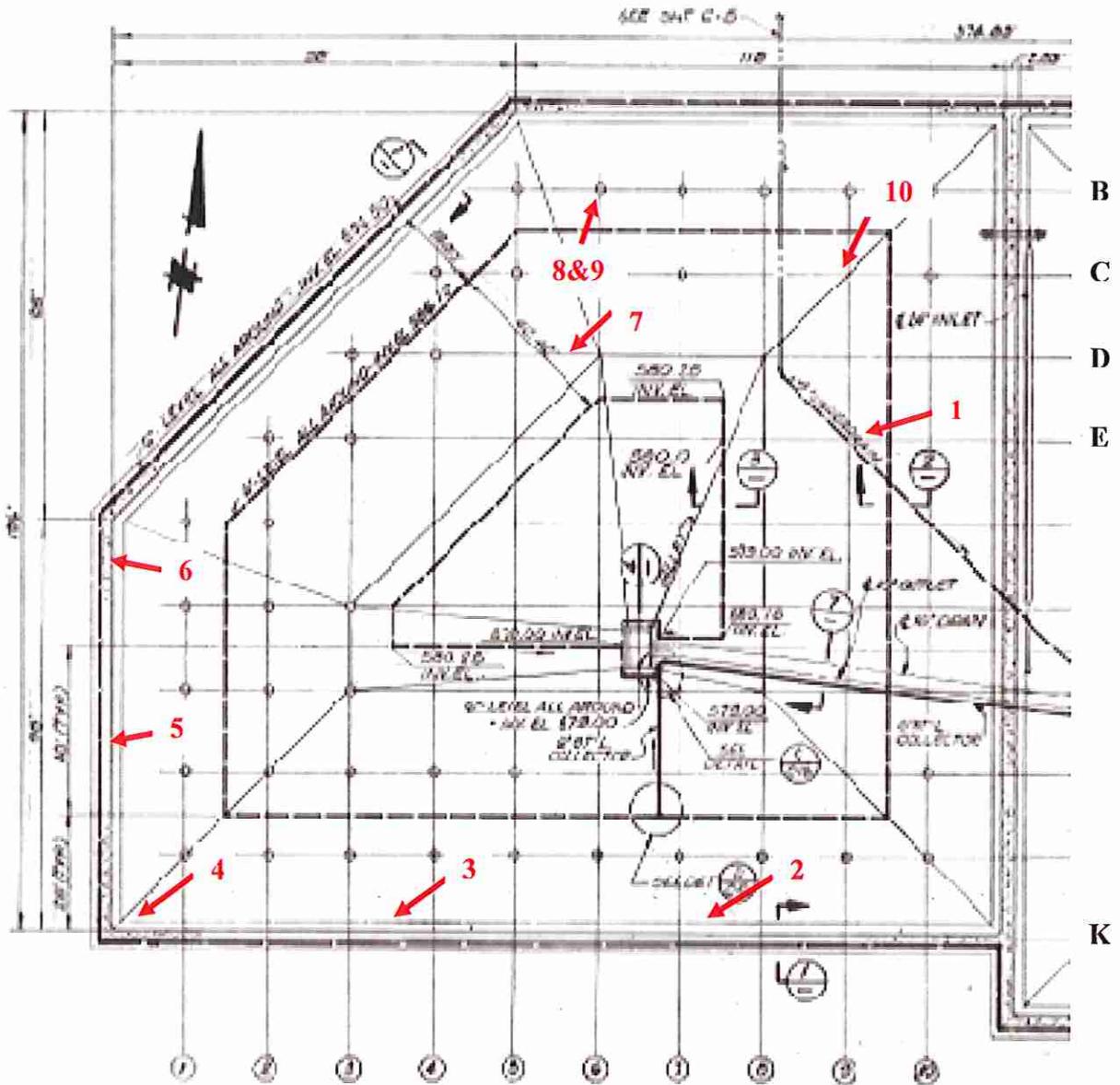
We appreciate the opportunity to assist in this matter.

Sincerely,

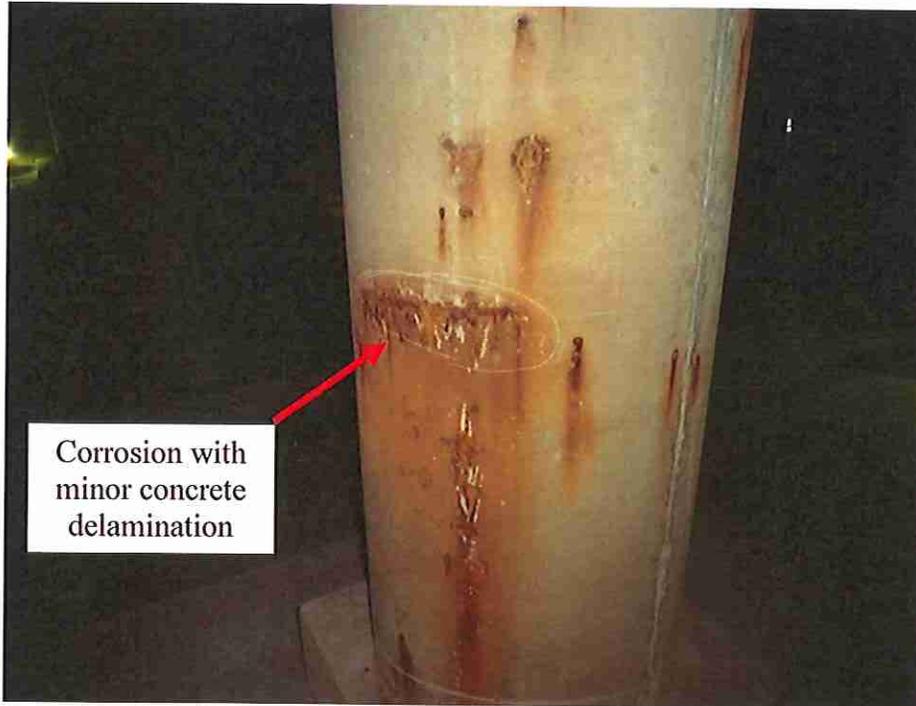
A handwritten signature in blue ink, appearing to read "Marshall Pihl".

Marshall Pihl, SE
Structural Director

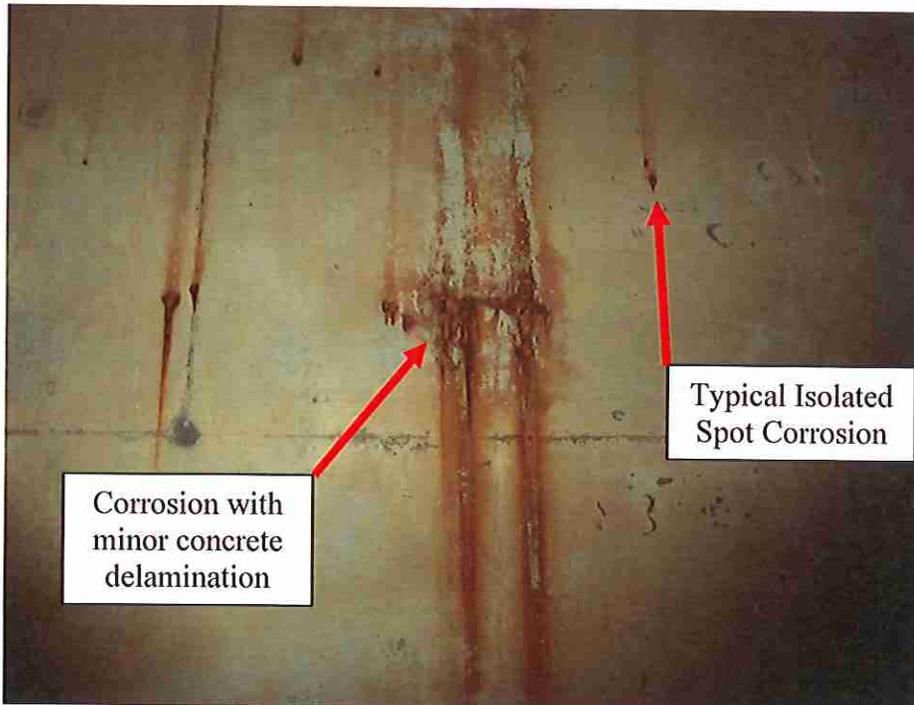
Appendix A West Section Pictures



Appendix A West Section Pictures



Location 1 – Grid location E/9



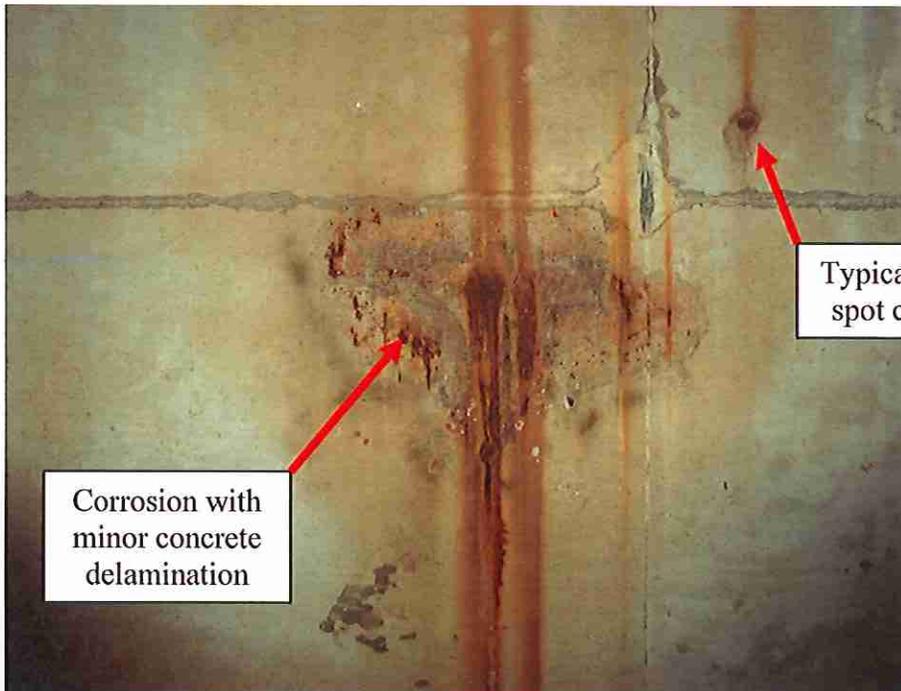
Location 2 – Grid location K/7.5

Appendix A West Section Pictures



Corrosion with
minor concrete
delamination

Location 3 – Grid location K/3.5



Typical isolated
spot corrosion

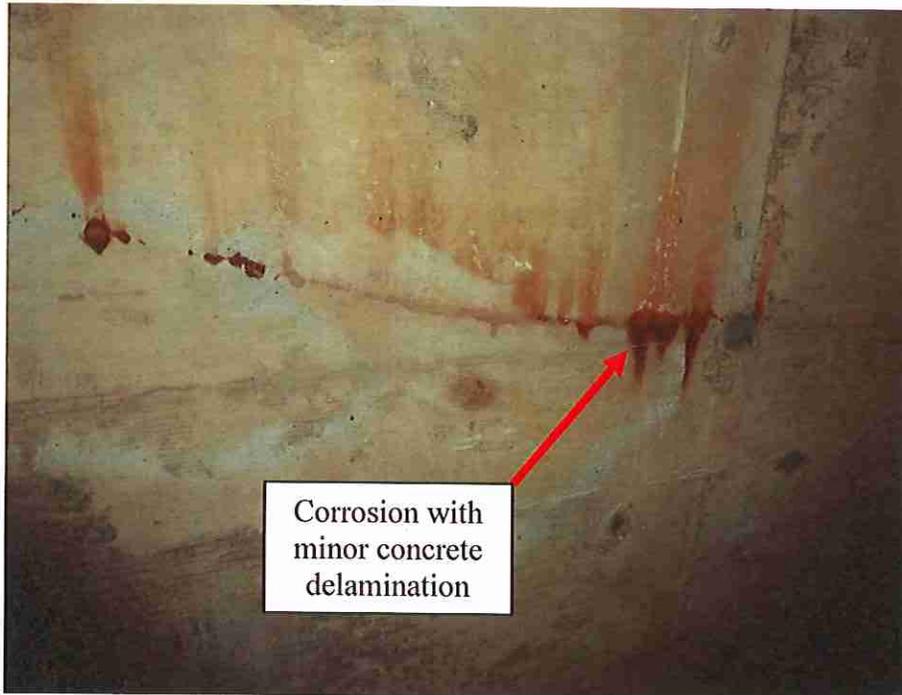
Corrosion with
minor concrete
delamination

Location 4 – Grid location K/0.5

Appendix A West Section Pictures

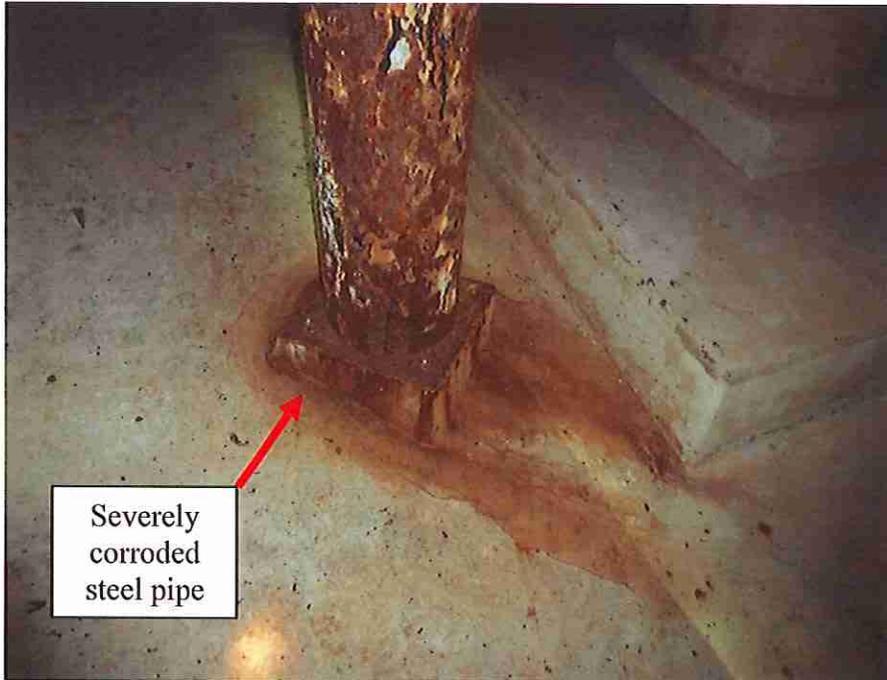


Location 5 – Grid location G.5/0

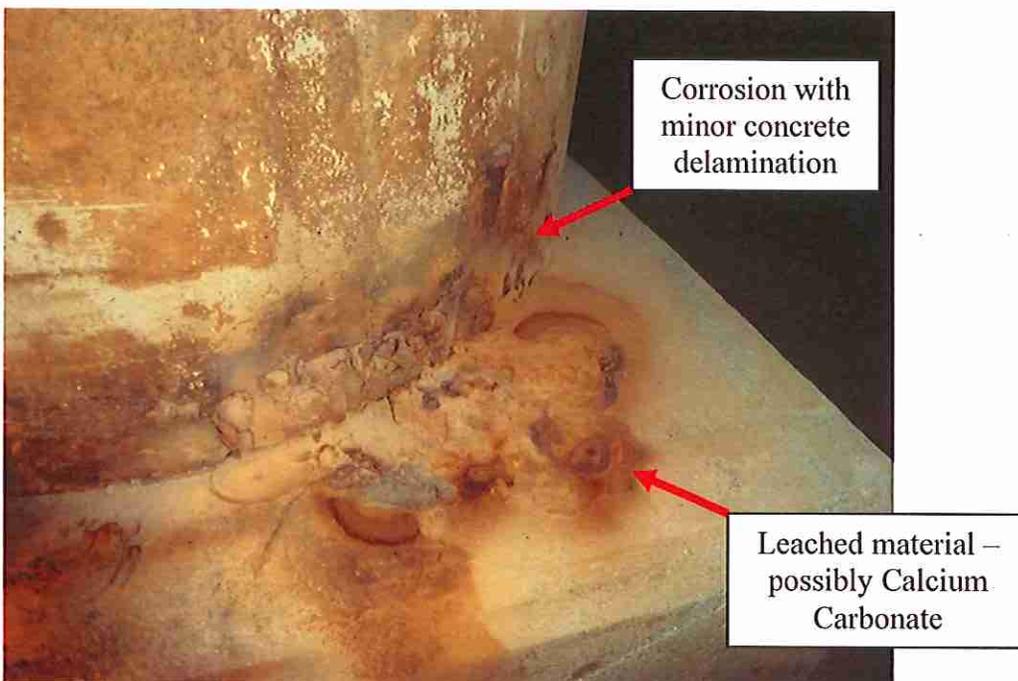


Location 6 – Grid location E.5/0

Appendix A West Section Pictures



Location 7 – Grid location C/6

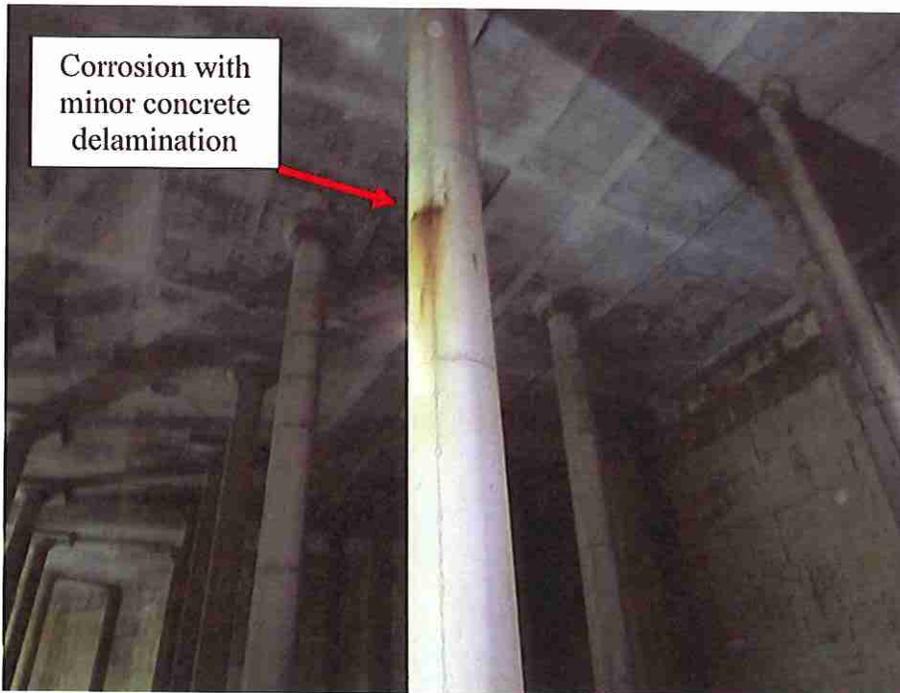


Location 8 – Grid location A/6

Appendix A West Section Pictures



Location 9 – Grid location A/6



Location 10 – Grid location D/9

Appendix B Delamination Repair

Product Data Sheet
Edition 4.10.2015
SikaTop® 123 PLUS

**TESTED PER ICRI GUIDELINE FOR
INORGANIC REPAIR MATERIAL DATA
SHEET PROTOCOL GUIDELINE NO.
300.3R**

SikaTop® 123 PLUS

Two-component, polymer-modified, cementitious, non-sag mortar plus Sika FerroGard® 901 penetrating corrosion inhibitor

Description	SikaTop® 123 PLUS is a two-component, polymer-modified, Portland cement-based, fast-setting, non-sag mortar. It is a high performance repair mortar for vertical and overhead surfaces and offers the additional benefit of Sika FerroGard® 901, a penetrating corrosion inhibitor included in its formulation.
Where to Use	<ul style="list-style-type: none"> On grade, above and below grade on concrete and mortar. On vertical and overhead surfaces. As a structural repair material for parking structures, industrial plants, walkways, bridges, tunnels, dams and ramps. Approved for repairs over cathodic protection systems.
Advantages	<ul style="list-style-type: none"> Extremely low shrinkage proven by four industry standard test methods. High compressive and flexural strengths. Increased freeze/thaw durability and resistance to deicing salts. Compatible with coefficient of thermal expansion of concrete - Passes ASTM C 664. Increased density - Improved carbon dioxide resistance (carbonation) without adversely affecting water vapor transmission (not a vapor barrier). Enhanced with Sika FerroGard® 901, a penetrating corrosion inhibitor - reduces corrosion even in the adjacent concrete. USDA-certifiable for incidental food contact. ANSI NSF Standard G1 potable water approved complaint.
Coverage	0.35 cu ft/unit
Packaging	Component 'A' - 1-gal. plastic jug; 4/carton. Component 'B' - 44-lb. multi-wall bag.

Construction

Typical Data (Material and curing conditions @ 73°F (23°C) and 60% R.H.)
RESULTS MAY DIFFER BASED UPON STATISTICAL VARIATIONS DEPENDING UPON MIXING METHODS AND EQUIPMENT, TEMPERATURE, APPLICATION METHODS, TEST METHODS, ACTUAL SITE CONDITIONS AND CURING CONDITIONS.

Shelf Life	One year in original, unopened packaging.		
Storage Conditions	Store dry at 40°-65°F. Condition material to 65°-75°F before using. Protect Component 'A' from freezing. If frozen, discard.		
Color	Concrete gray when mixed.		
Mixing Ratio	Plant-proportioned kit, mix entire unit.		
Application Time	Approximately 15 minutes.		
Finishing Time	20-60 minutes.		
Note:	All areas start after adding Component 'B' to Component 'A' and are highly affected by temperature, relative humidity, substrate temperature, wind, sun and other job site conditions.		
Density (wet mix)	ASTM C 133		132 lb./ft ³ (2.2 kg./l)
Flexural Strength	ASTM C 293	28 days	1,500 psi
Split Tensile	ASTM C 496	28 days	900 psi
Bond Strength	ASTM C 602 (modified)	28 days	2,000 psi
Compressive Strength	ASTM C 109	1 day 7 days 28 days	3,000 psi 4,000 psi 6,000 psi
Shrinkage	ASTM C 157 (mod. ICRI 300.3R)		
Specimen Size	1x1x11-14"		28 days 0.05%
Specimen Size	3x3x11-14"		28 days 0.036%
Ring Test (days)	ASTM C 1581		>70 days
Ring Test - Average Max Strain	ASTM C 1581		<30 µm/m
Ring Test - Average Stress Strain	ASTM C 1581		4.82 psi/day
Ring Test - Potential for Cracking	ASTM C 1581		Low
Beer-Linger Block		90 days	No cracking
Freeze/Thaw Durability (300 cycles)	ASTM C 666		90%
Cl Permeability (coef)	ASTM C 1202		<500 Coulombs
Direct Bond Strength	ASTM C 1583	28 days	500 psi (substrate failure)
Modulus of Elasticity	ASTM C 631		2.84 x 10 ⁶ psi
Initial Set Time (min)	ASTM C 266		20-40
Final Set Time (min)	ASTM C 266		>75



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Appendix B Delamination Repair

Construction

How to Use	
Substrate	Concrete, mortar, and masonry products.
Surface Preparation	Remove all deteriorated concrete, dirt, oil, grease and all bond inhibiting materials from surface. Ensure repair area is not less than 1/8 inch in depth. Preparation work should be done by high pressure water blast, scabber, or other appropriate mechanical means to obtain an exposed aggregate surface with a minimum surface profile of 1/16 inch (CSP-5). Saturate surface with clean water. Substrate should be saturated surface dry (SSD) with no standing water during application. Reinforcing Steel: Steel reinforcement should be thoroughly prepared by mechanical cleaning to remove all traces of rust. Where corrosion has occurred due to the presence of chlorides, the steel should be high-pressure washed with clean water after mechanical cleaning. For priming of reinforcing steel use Sika® Armotec® 110 Epo-Cem (consult Product Data Sheet). Priming Concrete Substrate: Prime the prepared substrate with a brush or sprayed applied coat of Sika® Armotec® 110 Epo-Cem (consult Product Data Sheet). Alternatively, a scrub coat of SikaTop® 123 PLUS can be applied prior to placement of the mortar. The repair mortar has to be applied into the wet scrub coat before it dries.
Mixing	Four Component 'A' into mixing container. Add Component 'B' while mixing continuously. Mix mechanically with a low-speed drill (400 - 600 rpm) and mixing paddle or mortar mixer. Mix to a uniform consistency, maximum 3 minutes. Manual mixing can be limited only for less than a full unit. Thorough mixing and proper proportioning of the two components is necessary.
Application	SikaTop® 123 PLUS must be scrubbed into the substrate, filling all pores and voids. Force material against edge of repair, working toward center. After filling repair, consolidate, then screed. Material may be applied in multiple lifts. The thickness of each lift, not to be less than 1/8 inch minimum or more than 1.5 inches maximum. Where multiple lifts are required, score top surface of each lift to produce a roughened surface for next lift. Allow preceding lift to reach initial set, 30 minutes minimum, before applying fresh material. Saturate surface of the lift with clean water. Scrub fresh mortar into preceding lift. Allow mortar or concrete to set to desired stiffness, then finish with wood or sponge float for a smooth surface.
Tooling & Finishing	As per ACI recommendations for portland cement concrete, curing is required. Moist cure with wet burlap and polyethylene, a fine mist of water or a water based*, compatible curing compound (ASTM C 309 compliant). Curing compounds adversely affect the adhesion of following lifts of mortar, leveling mortar or protective coatings. Moist curing should commence immediately after finishing. If necessary protect newly applied material from direct sunlight, wind, rain and heat. *Pre-treating of curing compound is recommended.
Limitations	<ul style="list-style-type: none"> Application thickness: Minimum 1/8 inch (3 mm), Maximum in one lift - 1.5 in. (38 mm). Minimum ambient and surface temperatures 45°F (7°C) and rising at time of application. Do not use solvent-based curing compound. Size, shape and depth of repair must be carefully considered and consistent with practices recommended by ACI or ICRI. For additional information, contact Technical Service. For additional information on substrate preparation, refer to ICRI Guidelines No. 310.2R re: Polymer Overlays and Concrete Repair. If aggressive means of substrate preparation is employed, substrate strength should be tested in accordance with ACI 503 Appendix A prior to the repair application. As with all cement based materials, avoid contact with aluminum to prevent adverse chemical reaction and possible product failure. Insulate potential areas of contact by coating aluminum bars, nails, posts etc. with an appropriate epoxy such as Sikadur® 30, II-Mod.

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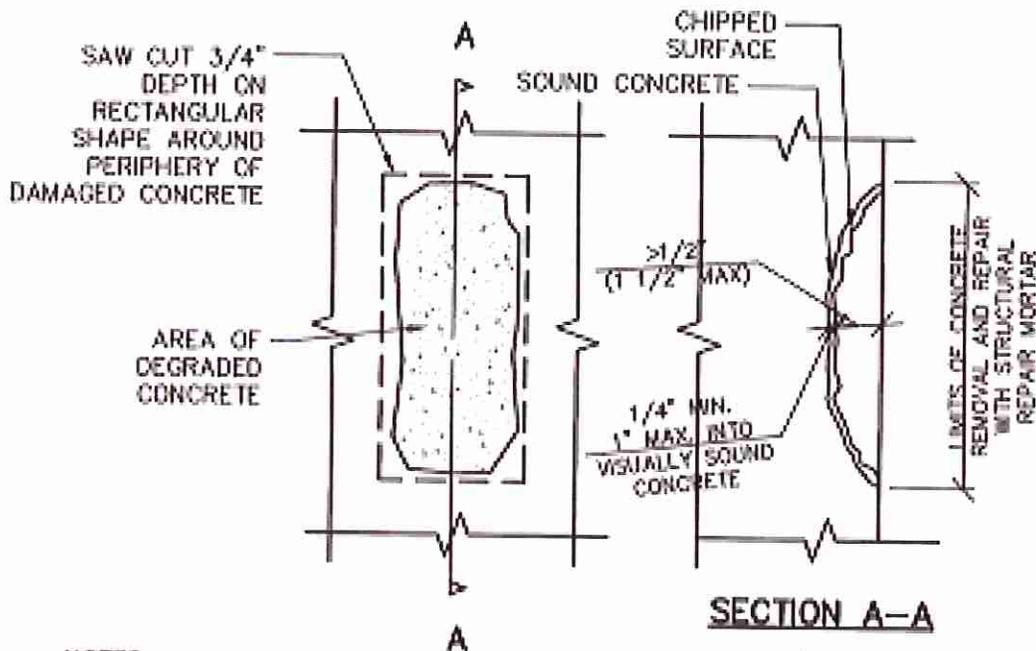
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Appendix C Concrete Spall Repair



NOTES

1. REMOVE DEGRADED CONCRETE PRIOR TO SAWCUT AND FINAL CONCRETE REMOVAL.
2. SAWCUTS SHOULD BE STOPPED AT CORNERS TO PREVENT OVERCUTTING, HAND CHIP CORNERS.
3. REMOVE ALL UNSOUND CONCRETE. MECHANICALLY ABRASE THE CONCRETE SURFACE TO REMOVE ALL BOND-INHIBITING MATERIALS AND TO PROVIDE ADDITIONAL MECHANICAL BOND.
4. THOROUGHLY CLEAN CONCRETE.
5. REMOVE ALL OXIDATION AND SCALE FROM EXPOSED STEEL.
6. COAT SUBSTRATE WITH SIKA ARMATEC 110 EPOCEM OR APPROVED EQUIVALENT. APPLY PER MANUFACTURERS WRITTEN INSTRUCTIONS.
7. MIX AND APPLY REPAIR MORTAR PER THE MANUFACTURERS WRITTEN INSTRUCTIONS. USE SIKAREPAIR 224 OR APPROVED EQUIVALENT.

CONCRETE REPAIR

SCALE: 1" = 1'-0"



Appendix C Concrete Spall Repair

Construction

Product Data Sheet
Edition 10.6.2014
Sika® Armatec® 110 EpoCem

Sika® Armatec® 110 EpoCem Bonding Agent and Reinforcement Protection

Description	Sika® Armatec® 110 EpoCem is a 3-component, solvent-free, moisture-tolerant, epoxy-modified, cementitious product specifically formulated as a bonding agent and anti-corrosion coating.
Where to Use	<ul style="list-style-type: none"> As an anti-corrosion coating for reinforcing steel in concrete restoration. As added protection to reinforcing steel in areas of thin concrete cover. As a bonding agent for repairs to concrete and steel. As a bonding agent for placing fresh, plastic concrete to existing hardened concrete.
Advantages	<ul style="list-style-type: none"> Excellent adhesion to concrete and steel. Acts as an effective barrier against penetration of water and chlorides. Long open time - up to 16 hours. Not a vapor barrier. Can be used exterior on-grade. Contains corrosion inhibitors. Excellent bonding bridge for cement or epoxy based repair mortars. High strength, unaffected by moisture when cured. Spray, brush or roller application. Non-flammable, solvent free.
Coverage	<p>Bonding agent: minimum (theoretical) on smooth, even substrate 60 ft.²/gal. (~20 mils thickness). Coverage will vary depending on substrate profile and porosity.</p> <p>Reinforcement Protection: 40 ft.²/gal. (~20 mils thickness) (2 coat application).</p>
Packaging	<p>3.5 gal. unit. (47.6 fl. oz. Comp. A + 122.1 fl. oz. Comp. B + 46.62 lb. Comp. C) Comp. A + B in carton, Comp. C in multi-wall bag.</p> <p>1.65 gal. unit. (22.7 fl. oz. A + 57.6 fl. oz. B + 4 bags @ 5.5 lb.) Factory-proportioned units in a pallet.</p>

Typical Data (Material and curing conditions @ 73°F and 50% R.H.)

RESULTS MAY DIFFER BASED UPON STATISTICAL VARIATIONS DEPENDING UPON MIXING METHODS AND EQUIPMENT, TEMPERATURE, APPLICATION METHODS, TEST METHODS, ACTUAL SITE CONDITIONS AND CURING CONDITIONS.

Shelf Life	1 year in original, unopened packaging.		
Storage	Store dry at 40°-95°F (4°-35°C). Condition material to 65°-75°F (18°-24°C) before using. If components A and B are frozen, discard. Protect Component C from humidity.		
Color	Concrete gray		
Density (Mixed)	125 lb./ft. ³ (2.0 kg.)		
Pot Life	Approximately 90 minutes		
Compressive Strength (ASTM C-109)	3 days	4500 psi	(31.0 MPa)
	7 days	6500 psi	(44.8 MPa)
	28 days	8500 psi	(58.6 MPa)
Flexural Strength (ASTM C-348)	28 days	1250 psi	(8.6 MPa)
Splitting Tensile Strength (ASTM C-496)	28 days	600 psi	(4.1 MPa)
Important Data for Sika Armatec 110 as a Corrosion Protective Coating			
Water	Water Permeability at 10 bar (145 psi)	8.92 x 10 ⁻¹³	ft./sec.
	Control	7.32 x 10 ⁻¹³	ft./sec.
	Water vapor diffusion coefficient μ H ₂ O	110	
Carbon Dioxide	Carbon dioxide diffusion coefficient μ CO ₂	14000	

TEST DATA: Time-to-Corrosion Study
 - Sika® Armatec® 110 more than tripled the time to corrosion
 - Reduced corrosion rate by over 40%



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Appendix C Concrete Spall Repair

Construction

Important Data for Sika® Armatec® 110 as a Bonding Agent

Bond Strength (ASTM C882)		
14 days moist cure, plastic concrete to hardened concrete:		
Wet on Wet	2800 psi	(19.3 MPa)
24 hr. Open Time	2600 psi	(17.9 MPa)
Bond of Steel Reinforcement to Concrete (Pullout Test):		
Sika® Armatec® 110 Coated	625 psi	(4.3 MPa)
Epoxy Coated	508 psi	(3.5 MPa)
Plain Reinforcement	573 psi	(3.95 MPa)

How to Use

Surface Preparation Cementitious substrates: Should be cleaned and prepared to achieve a clean and contaminant-free surface prepared in accordance with the requirements specified by the overlay or repair material by blast cleaning or equivalent mechanical means. Substrate must be saturated surface dry (SSD) with no standing water.
Steel: Should be cleaned and prepared thoroughly by blast cleaning.

Mixing Shake contents of both Component 'A' and Component 'B'. Empty entire contents of both Component 'A' and Component 'B' into a clean, dry mixing pail. Mix thoroughly for 30 seconds with a Sika paddle on a low speed (400-600 rpm) drill. Slowly add the entire contents of Component 'C' while continuing to mix for 3 minutes until blend is uniform and free of lumps. Mix only that quantity that can be applied within its pot life.

Application As a bonding agent - Apply by stiff-bristle brush or broom. Spray apply with Goldblatt Pattern Pistol or equal equipment. For best results, work the bonding slurry well into the substrate to ensure complete coverage of all surface irregularities. Apply the freshly mixed patching mortar or concrete wet on wet, or up to the maximum recommended open time, onto the bonding slurry.

Maximum recommended open time between application of Armatec® 110 and patching mortar or concrete:

80°-95°F (26°-35°C)	6 hours
65°-79°F (18°-26°C)	12 hours
50°-64°F (10°-17°C)	16 hours
40°-49°F (4°-9°C)	wet-on-wet

For corrosion protection only - Apply by stiff-bristle brush or spray at 80 ft.²/gal. (20 mils). Take special care to properly coat the underside of the totally exposed steel. Allow coating to dry 2-3 hours at 73°F, then apply a second coat at the same coverage. Allow to dry again before the repair mortar or concrete is applied. Pour or place repair within 7 days.

Limitations

- Substrate and ambient temperature: Minimum 40°F (5°C).
- Maximum 95°F (35°C).
- Minimum thickness: As a bonding agent 20 mils.
- For reinforcement protection 40 mils.
- (2 coats, 20 mils each).
- Not recommended for use with expansive grouts.
- Use of semi-dry mortars onto Sika® Armatec® 110 EpoCem must be applied "wet on wet".
- When used in overhead applications with hand placed patching mortars, use "wet on wet" for maximum mortar built thickness.
- Substrate profile as specified by the overlay or repair material is still required.
- As with all cement based materials, avoid contact with aluminum to prevent adverse chemical reaction and possible product failure. Insulate potential areas of contact by coating aluminum bars, rails, posts etc. with an appropriate epoxy such as Sikadur® HI-Mod 32.

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Appendix C Concrete Spall Repair

Construction

Product Data Sheet
Edition 7.14.2014
SikaRepair® 224

SikaRepair® 224

One-component, cementitious,
sprayable mortar for structural repairs

Description	SikaRepair® 224 is a one-component, pre-packaged, ready-to-use, cementitious, silica fume, fiber reinforced, high strength shrinkage-compensated mortar. Formulated for application by trowel or low pressure spray. It is designed especially for repair of overhead and vertical surfaces.
Where to Use	A high performance repair mortar for wet spray application. Suitable for new construction, repairs, and maintenance work. Typical applications include: <ul style="list-style-type: none"> Structural repair material for water and wastewater treatment plants, parking structures, industrial plants, bridges, tunnels and dams, etc. Use on vertical and overhead surfaces. Use on grade, above, and below grade on concrete and mortar. Potable water tank. (NSF approved in Marion, OH and Santa Fe Springs, CA)
Advantages	<ul style="list-style-type: none"> Ready-for-use, one-component material. Easy to use; just add water. Sprayable system. Potable water approved. Superior workability. Can be troweled and screeded after application. Labor-saving system. Superior abrasion resistance over conventional Portland cement mortar. Bond strength ensures superior adhesion. Not a vapor barrier. Compatible with coefficient of thermal expansion of concrete. Increased resistance to de-icing salts. Good freeze/thaw resistance. High early strengths. Very low shrinkage. Silica Fume enhanced. Fiber reinforced.
Coverage	Yield in service will vary. Average yield is approximately 0.40 cu. ft./bag. Estimating should be based on prior experience or actual field evaluation.
Packaging	50-lb. (22.7 kg) multi-wall bags.

Typical Data (Material and curing conditions @ 73°F and 100% R.H.)

RESULTS MAY DIFFER BASED UPON STATISTICAL VARIATIONS DEPENDING UPON MIXING METHODS AND EQUIPMENT, TEMPERATURE, APPLICATION METHODS, TEST METHODS, ACTUAL SITE CONDITIONS AND CURING CONDITIONS.

Shelf Life	1 year in original, unopened bags.	
Storage Conditions	Store dry at 40°-95°F (4°-35°C). Condition material to 65°-75°F before using.	
Color	Dark gray.	
Mixing Ratio	3/4 gallon to 7/8 gallon liquid per 50 lb. bag of material	
Density (wet mix)	125 lbs./cu. ft. (2.0 kg/l.)	
Compressive Strength (ASTM C-109)	73°F	
	1 day	4,500 psi (31 MPa)
	7 day	8,000 psi (55 MPa)
	28 day	10,000 psi (69 MPa)
Flexural Strength (ASTM C-348)	28 day	1,100 psi (7.6 MPa)
Tensile Strength (ASTM C-496)	28 day	735 psi (5.0 MPa)
Direct Tensile Pull off (ACI 503)	28 day	greater than 350 psi (Failure in substrate. Substrate prepared with 20,000 psi hydroblasting)
Slant Shear (ASTM C-882 modified)	28 day	>2,500 psi (24.1 MPa)
Chloride Permeability (ASTM C1202/AASHTO T277)	28 day	less than 500 coulombs
Sulfate Resistance (ASTM C-1012)	1 year	less than 0.06%
Setting Time (ASTM C 266)	Initial: 2 to 3 hours. Final: 5 to 6.5 hours.	



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Appendix C Concrete Spall Repair

Construction

How to Use	
Surface Preparation	Substrate must be sound, clean, and free from oil, grease, loose material, surface contaminants and other bond-inhibiting materials. Steel reinforcement must be clean and free from any rust. Be sure repair area is not less than 3/8 in. in depth. Preparation work should be done by high pressure water blast, or other appropriate mechanical means, to obtain an exposed aggregate surface (OSP-6). Saturate surface with clean water. Substrate should be saturated surface dry (SSD) with no standing water during application. Reinforcing Steel: Steel reinforcement should be thoroughly prepared by mechanical cleaning to remove all traces of rust. Where corrosion has occurred due to the presence of chlorides, the steel should be high-pressure washed with clean water after mechanical cleaning. For priming of reinforcing steel, use Sika® Armotec® 110 EpoCem (consult Technical Data Sheet).
Priming	Concrete Substrate: Prime the prepared substrate with a brush or sprayed applied coat of Sika® Armotec® 110 EpoCem (consult Technical Data Sheet). Alternatively, a scrub coat of Sika Repair 224 can be applied prior to placement of the mortar. The repair mortar has to be applied into the wet scrub coat before it dries.
Mixing	With water: Add the water (approx. 3/4 gal.) directly into mixer. Start the mixer in motion and add the SikaRepair® 224 mortar while continuing to mix. Mix to uniform consistency using a maximum of 7/8 gallons of water per 50 lb. (22.7 kg.) bag (approx. 3 minutes). With Latex R: Four 6-7 pints of SikaLatex® R into the mixing container. Slowly add powder and mix as above. With diluted Latex R: SikaLatex® R may be diluted up to 5:1 (water: SikaLatex® R) for projects requiring minimal polymer-modification. Pour 6-7 pints of the mixture into the mixing container. Slowly add powder and mix as above. SikaRepair 224 Concrete: For horizontal applications greater than 1 inch deep, add 3/8 inch coarse aggregate. Aggregate must be non-reactive (reference ASTM C1260, C227 and C289), clean, well-graded, saturated surface dry (SSD), have low absorption and high density, and comply with ASTM C33 size number 8 per Table 2. Addition rate must not exceed 25 lbs. of aggregate/bag of SikaRepair® 224 (25 lbs. of 3/8 in. aggregate is approximately 2.0 to 2.5 gal. by loose volume of aggregate). If the placement is vertical or overhead, temporary support of the material is required. Contact Sika Technical Service for application details.
Application	Conventional wet-process shotcrete equipment such as a low-pressure or a high-pressure machine should be used. At time of application, surfaces should be saturated surface dry but hold no standing water. Apply SikaRepair® 224 mortar by low pressure spraying or troweling for repairing vertical or overhead surfaces. Shoot the shotcrete perpendicular to the surface. This minimizes rebound, creates the smoothest pattern (reduces bumps) and properly encases the rebars. The velocity of the shotcrete is sufficient if, at a distance of 18 to 24 in., the shotcrete pattern flattens out on contact with the surface and the rebars are encased. After applying the shotcrete, allow it to stiffen for about 10 minutes before removing bumpy areas with a trowel. Before applying the next layer, allow the shotcrete to reach initial set. This will take anywhere from 45 minutes to several hours, depending on mix consistency, mix and ambient temperature, wind conditions and humidity. Begin and finish a given patch on the same day.
Tooling and Finishing	As per ACI recommendations for portland cement mortar, curing is required when jobsite conditions warrant. Moist cure with wet burlap and polyethylene, a fine mist of water or a water based* compatible curing compound. Curing compounds adversely affect the adhesion of following layers of mortar, leveling mortar or protective coatings. Moist curing should commence immediately after finishing. Protect newly applied material from direct sunlight, wind, rain and frost. *Preventing of curing compound is recommended.
Limitations	Application thickness: ■ Minimum 3/8 inch (9 mm). Vertical applications: ■ SikaRepair® 224 can be spray applied up to 2" thickness in one lift. Overhead applications: ■ The thickness should be no more than 1 to 1.5" per pass. If repair requires several lifts (over 1.5"), each lift should be applied as soon as the previous lift will support it. General: ■ For additional information, consult Technical Service. ■ Minimum ambient and surface temperatures 40°F (4°C) and rising at the time of application. ■ As with all cement based materials, avoid contact with aluminum to prevent adverse chemical reaction and possible product failure. Insulate potential areas of contact by coating aluminum bars, rails, posts etc. with an appropriate epoxy such as Sikadur® Hi-Mod 32.

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