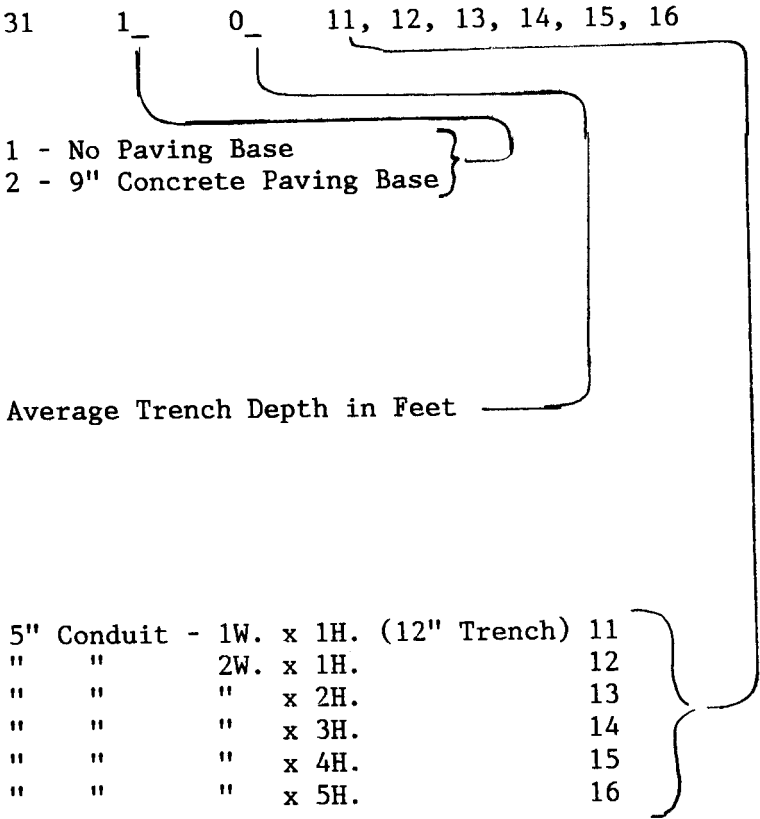


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NOTES:

1. For construction details for standard and reinforced ducts, refer to Dist. Std. 31 10 01 00 and 31 10 02 00.

* Key Sheet for Dist. Std. 31 11 ** ** and 31 12 ** **.

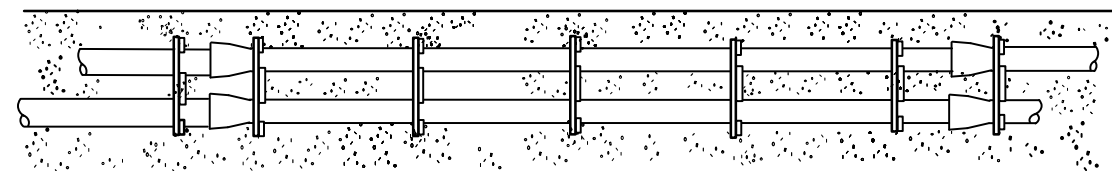
STRUCTURES – CONDUIT

Standard Duct Construction

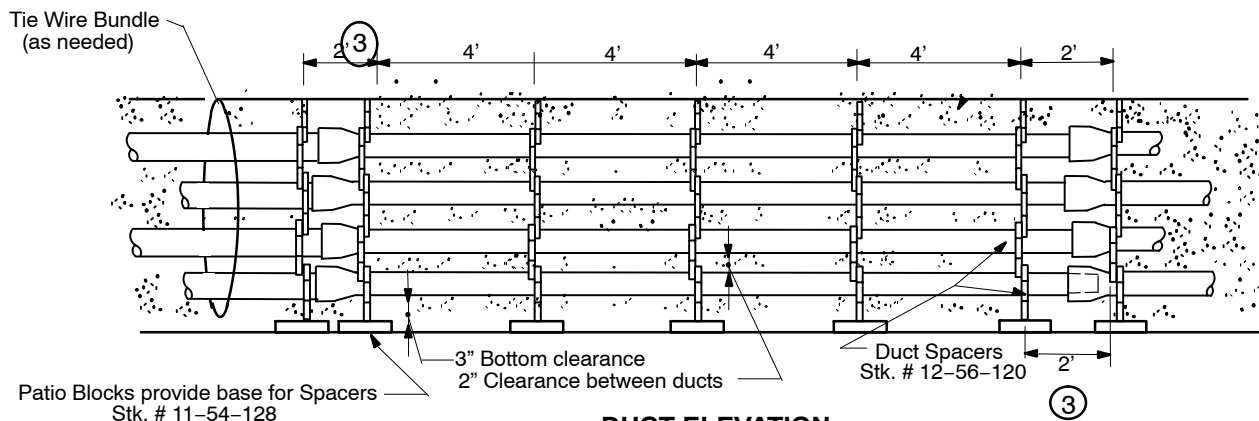
5" EB35 CONDUIT

31 10 01 **

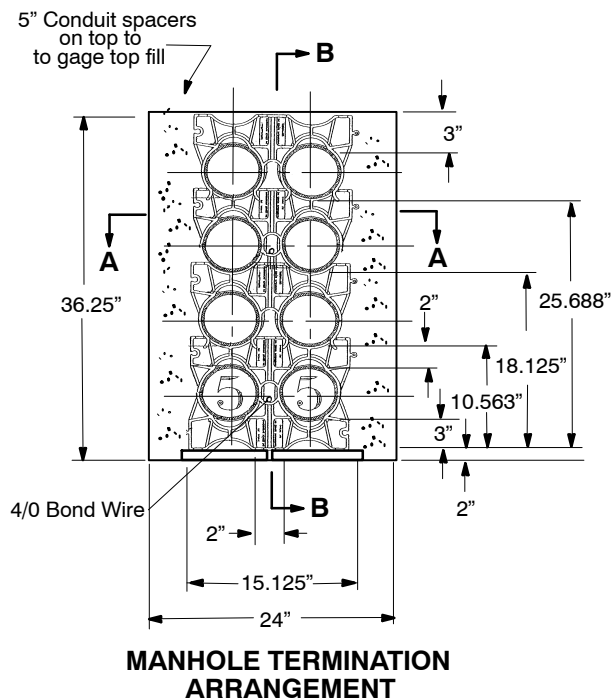
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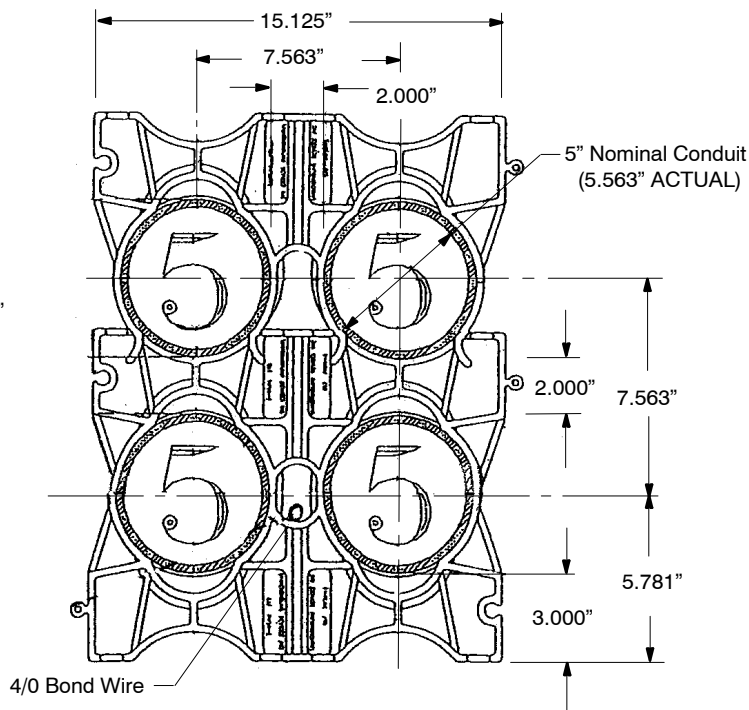
Section A A



DUCT ELEVATION
Section B B



MANHOLE TERMINATION
ARRANGEMENT



Enlarged View of Spacers

NOTES:

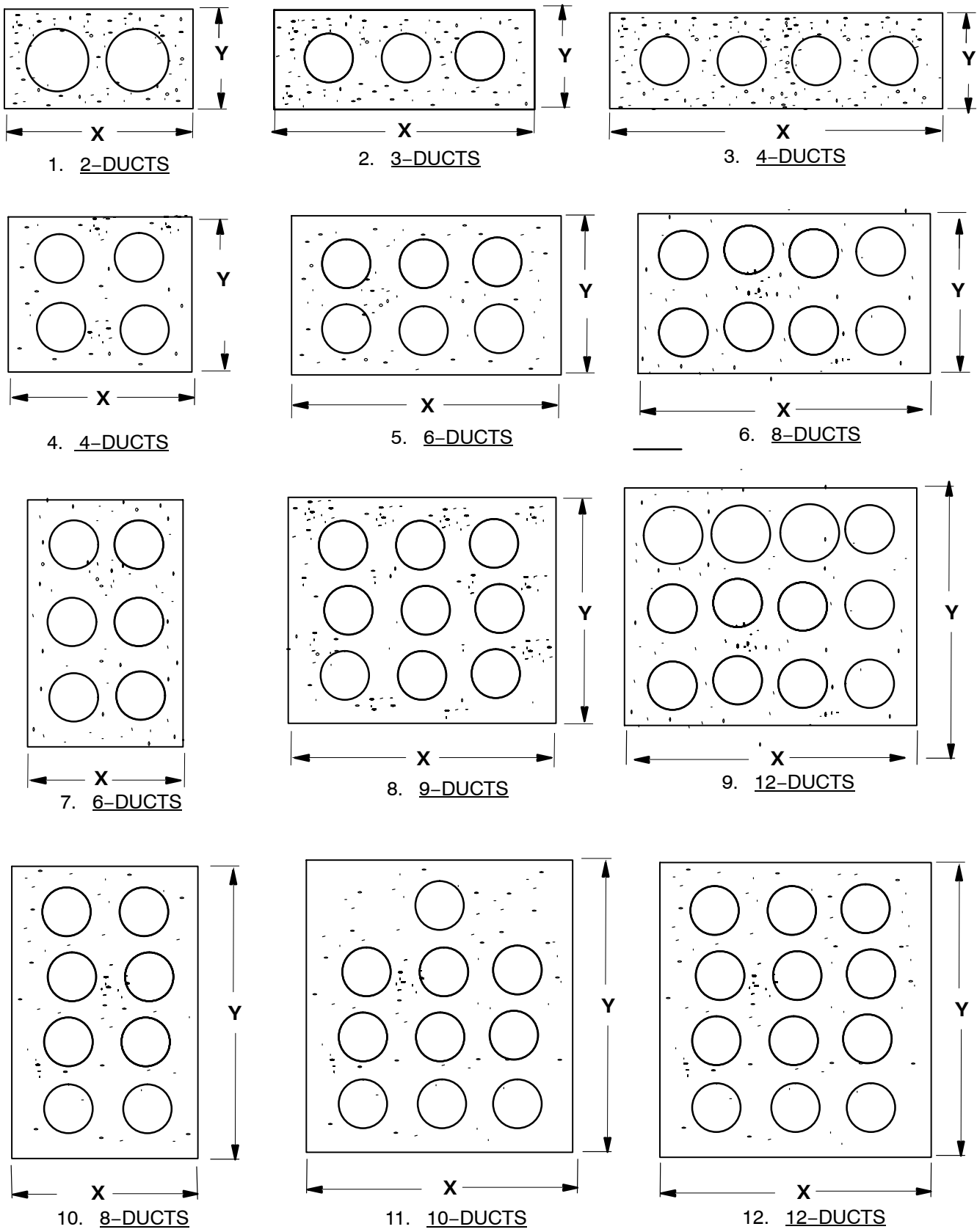
1. Conduit standards will not explode. See Dist. Std. 31 10 00 00 through 31 12 08 ** for construction by appropriate material and non-material operators.
2. If in level terrain a minimum fall of 6" per 100" shall be provided.
3. Reduce this dimension to 1 ft. on each end when using 10 ft. conduit. 4 ft. spacing stays the same.

**DISTRIBUTION
CONSTRUCTION STANDARDS**



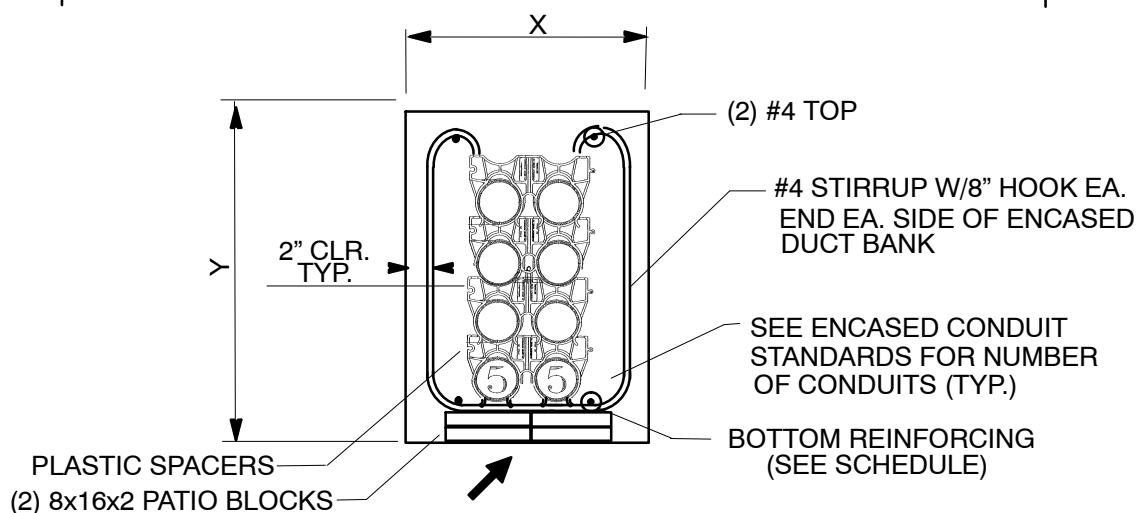
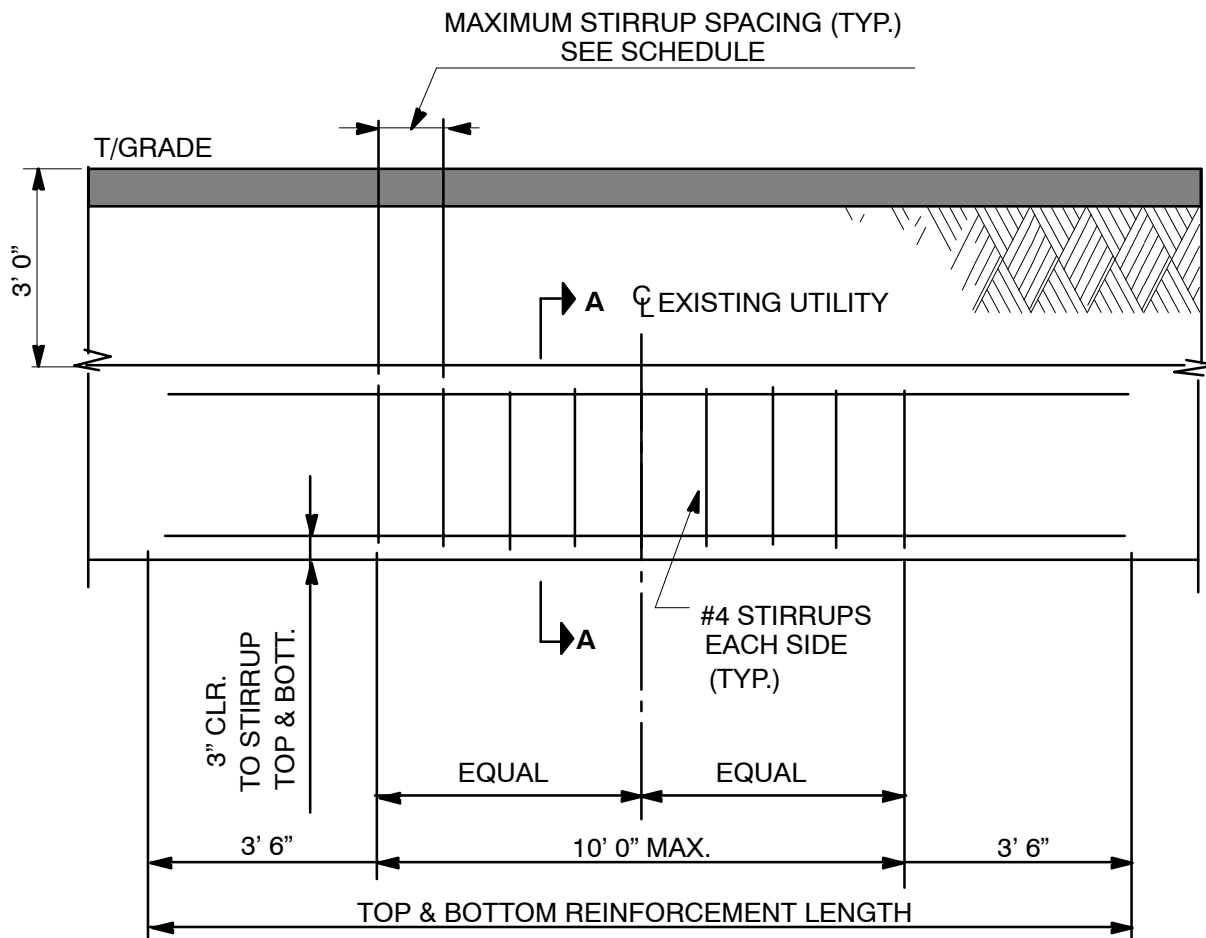
ENG: EJB
REV. NO: 7
REV. DATE: 07/04/15

5" EB35 CONDUIT



ENCASED DUCT BANK OVER EXISTING UTILITY

SCALE: $\frac{3}{8}" = 1' 0"$



SECTION A-A

SCALE: $\frac{3}{4}" = 1' 0"$

NOTES:

1. DESIGN BASED ON HS20 TRUCK LOADING.
2. $f_c = 2,500$ PSI $f_y = 60,000$ PSI

STRUCTURES – CONDUIT
Standard Duct Construction
5" EB35 CONDUIT

31 10 01 **

Sheet 4 of 4

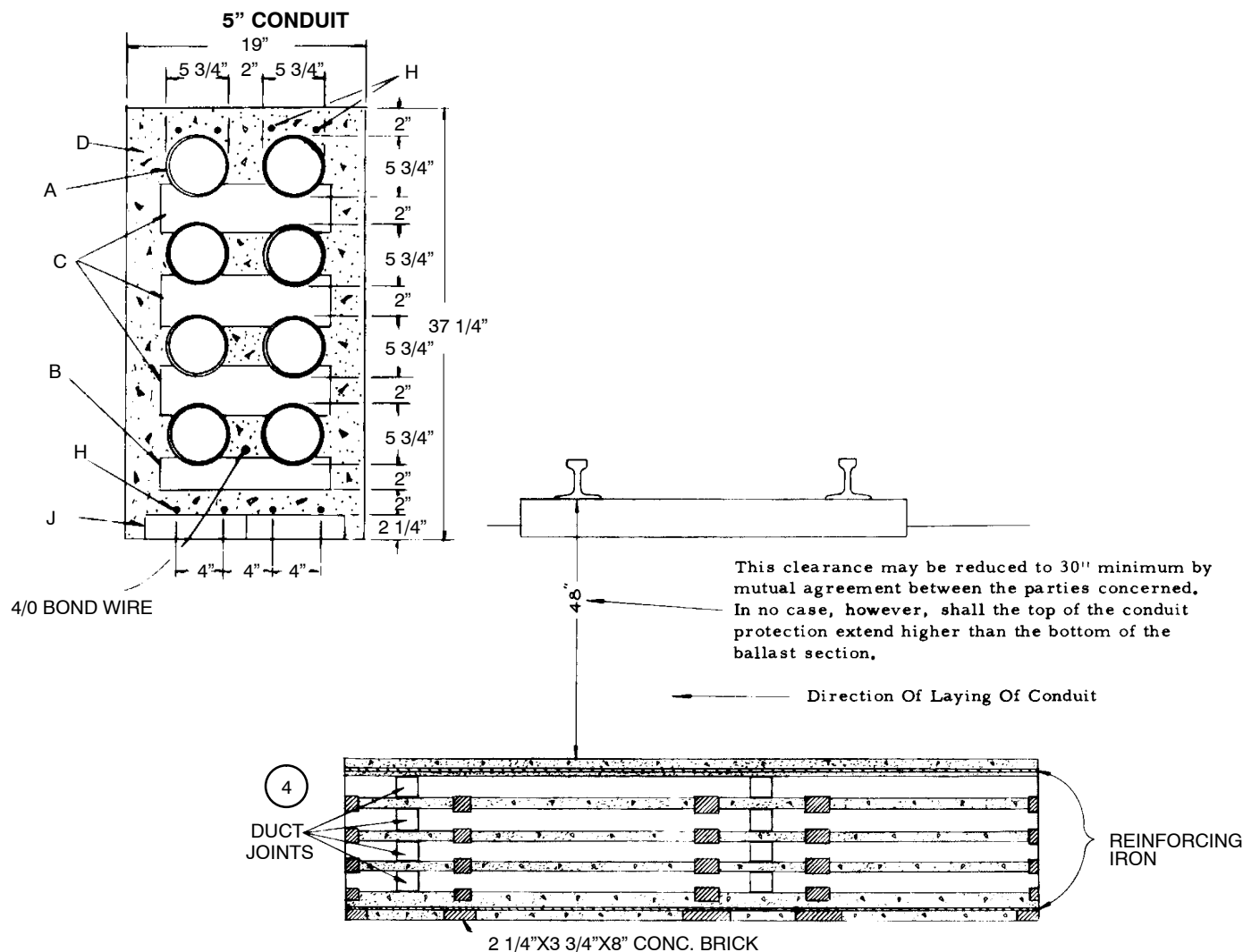
FIG.	STANDARD NUMBER	NUMBER OF DUCTS	DIMENSIONS			CROSSING EXISTING UTILITY STIRRUP REINFORCING	
			X MIN	* X	Y	BOTTOM REINFORCING	STIRRUP SPACING
1.	31 10 01 01	2	18"	24"	13"	3-#7	3 ½"
2.	31 10 01 02	3	25"	30"	13"	4-#7	3 ½"
3.	31 10 01 03	4	33"	36"	13"	5-#7	3 ½"
4.	31 10 01 04	4	18"	24"	21"	3-#7	6"
5.	31 10 01 05	6	25"	30"	21"	4-#7	6"
6.	31 10 01 06	8	33"	36"	21"	3-#7	9"
7.	31 10 01 07	6	18"	24"	28"	5-#7	6"
8.	31 10 01 08	9	25"	30"	28"	3-#7	12"
9.	31 10 01 09	12	33"	36"	28"	4-#7	9"
10.	31 10 01 10	8	18"	24"	36"	4-#7	12"
11.	31 10 01 11	10	25"	30"	36"	5-#7	9"
12.	31 10 01 12	12	25"	30"	36"	4-#7	12"

* Based on standard 24" or 36" bucket size used to dig trench.

NOTES:

- Each standard includes material for a 20 ft. duct formation.
- Spacers should be installed every 4 ft. for straight runs.
- Call for extra spacers to use on large sweeps in a duct run. Sweeps need more spacers placed closer together.
- If floatation is a concern, install restraint as necessary per installers' direction. Wood is not an acceptable material for restraint.
- For duct banks stacked higher than 4 conduits, must be built with multiple concrete pours to prevent ducts from collapsing.
- Upon completion of duct bank, the integrity of each duct must be verified by pulling a mandrel through each duct.
- In situations where the duct bank crosses sewers greater than 2 ft. Diameter, reinforcing the duct bank will be required per Ameren's direction.

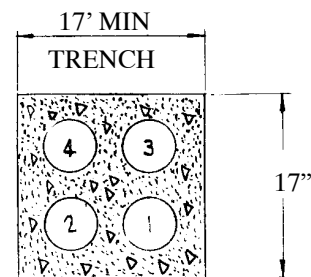
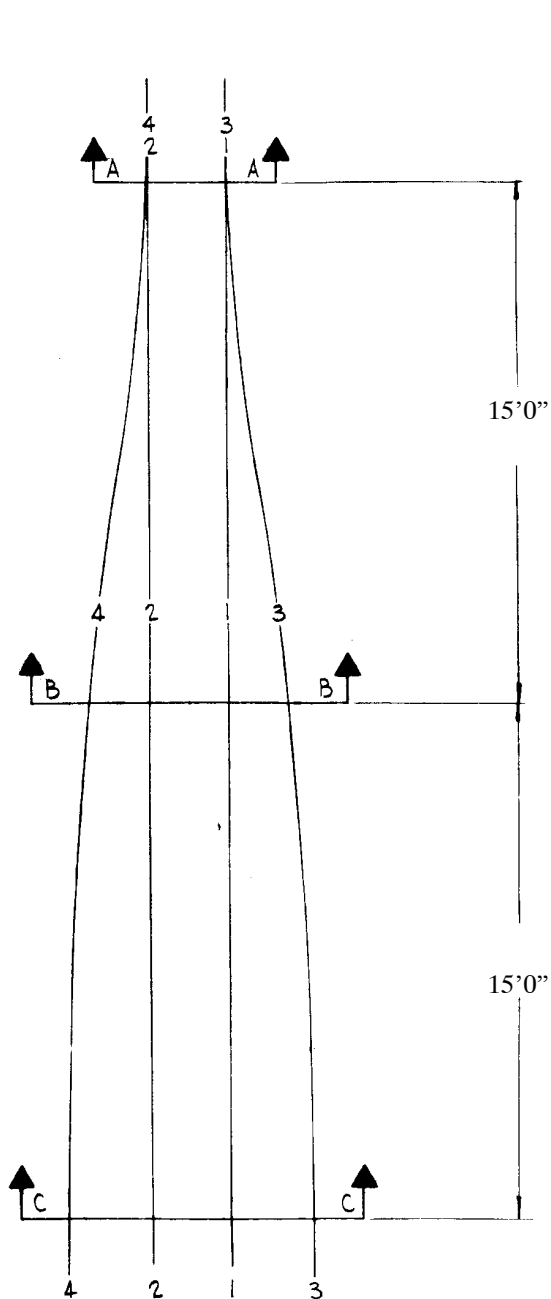
	Std. / Stk. No.	Description	31 10 01 **	01	02	03	04	05	06	07	08	09	10	11	12
A	12 01 335	Conduit – Plastic, 5", EB (ft.)		40	60	80	80	120	160	120	180	240	160	200	240
B	12 56 120	Spacer – Conduit		10	20	20	15	30	30	20	40	40	25	45	50
C	98 00 007	Concrete-Conduit (Cu. Yd.)		1	2	2	2	3	3	3	4	4	3	5	5



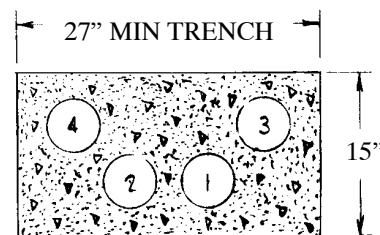
NOTES:

1. Reinforcing rods shall be set parallel to duct run as shown. Cross rods shall not be used due to heating from induced currents
2. A 2" concrete pad shall be poured on top of the concrete block to hold reinforcing rods in place. Base block is to rest on concrete pad.
3. Conduit standards will not explode. See Dist. Std. 31 10 00 00 through 31 12 08 ** for construction by appropriate material and non-material operators.
4. Reinforcing under railroad tracks shall extend the full width of the railroad right-of-way.

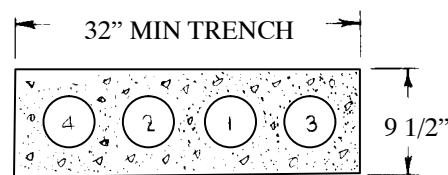
		Std. / Stk. No.	Description	Req'd
→	A	12 01 182	Conduit–Plastic 5"	As Req'd.
	B	12 56 042	Block–Base, 5"	As Req'd.
	C	12 56 043	Spacer–Conduit, 5"	As Req'd.
	D	99 00 007	Concrete–Conduit (C.Y.)	As Req'd.
	H	27 02 101	Iron–Reinforcing– 1/2"	As Req'd.
→	J	11 01 006	Brick–10 Hole, 2–1/4" x 3–1/4" x 8–1/4"	As Req'd.



SECTION AA



SECTION BB



SECTION CC

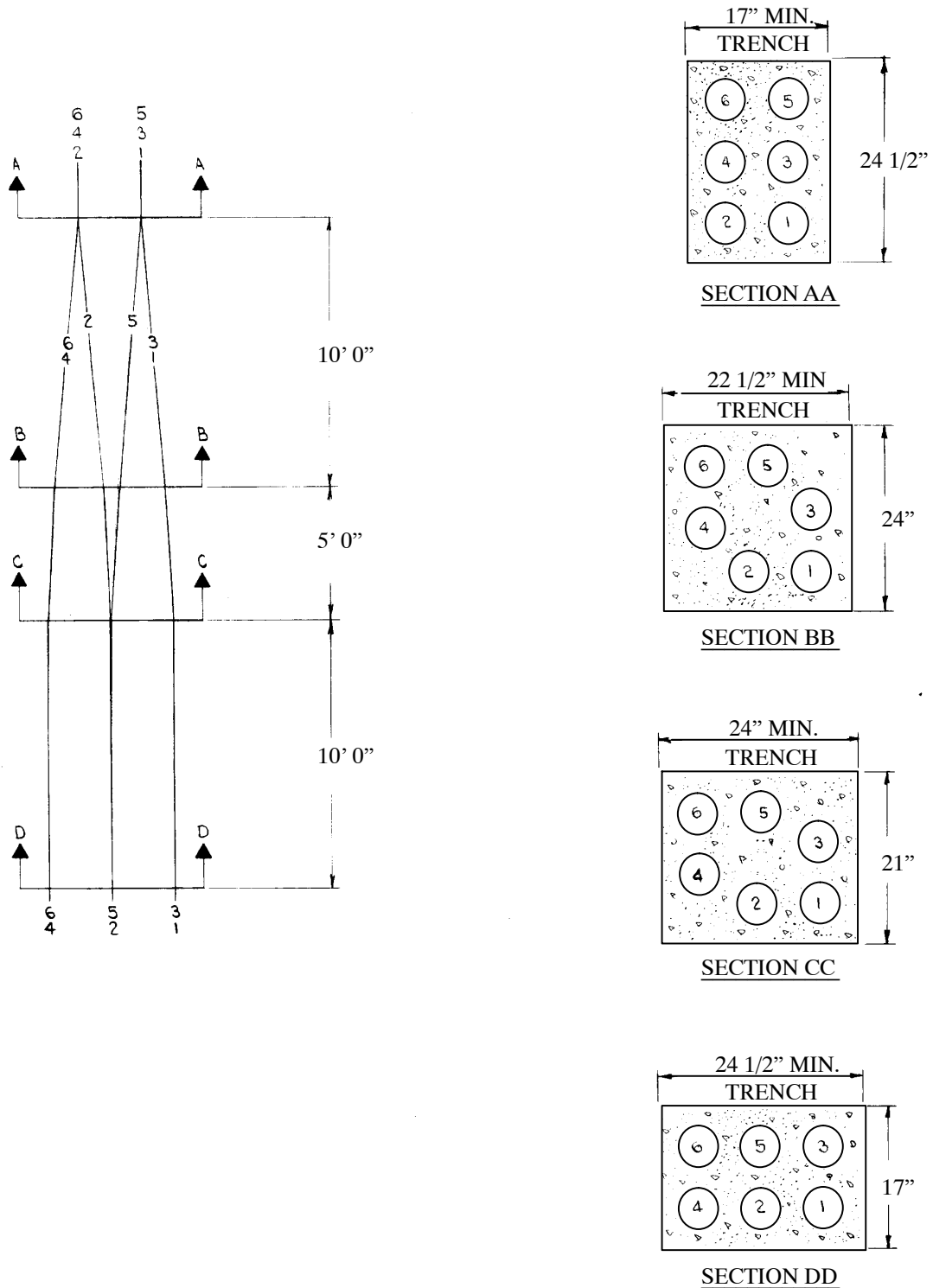
NOTES:

1. Dimensions based on 5" conduit, 5' lengths.
2. Spacer blocks shall be used to maintain conduit spacing during transposition.

STRUCTURES – CONDUIT
6 Duct Transposition
Standard to Horizontal Position

31 10 04 00

Sheet 1 of 1



NOTES:

1. Dimensions based on 5" conduit, 5' lengths.
2. Spacer blocks shall be used to maintain conduit spacing during transposition.

**DISTRIBUTION
CONSTRUCTION STANDARDS**

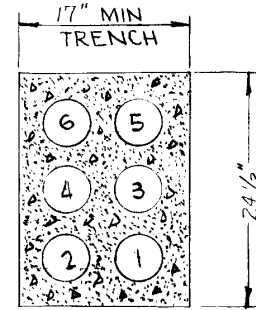
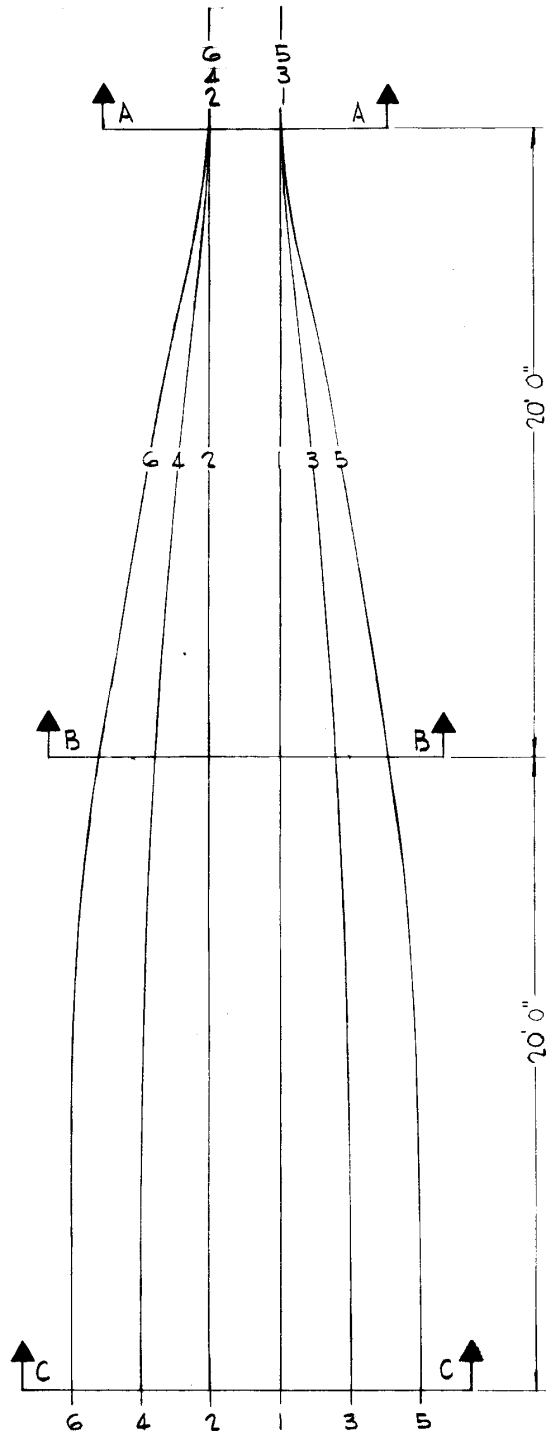


ENG: DDG
REV. NO: 0
REV. DATE: 05/03/94
REAFFIRMED DATE: 03/13/09

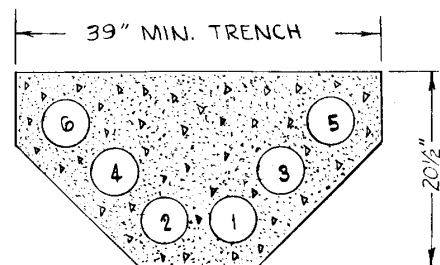
STRUCTURES – CONDUIT
6 Duct Transposition
Standard to Flat Position

31 10 05 00

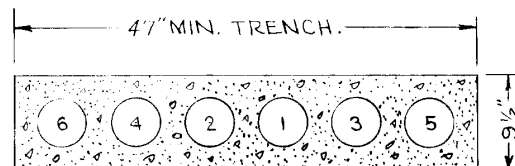
Sheet 1 of 1



SECTION A-A



SECTION B-B



SECTION C-C

NOTES:

1. Dimensions based on 5" conduit, 5' lengths.
2. Spacer blocks shall be used to maintain conduit spacing during transposition.

DISTRIBUTION
CONSTRUCTION STANDARDS

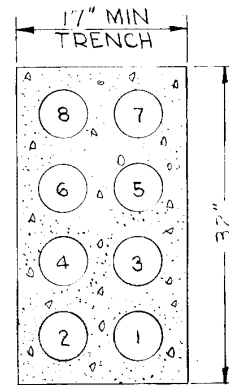
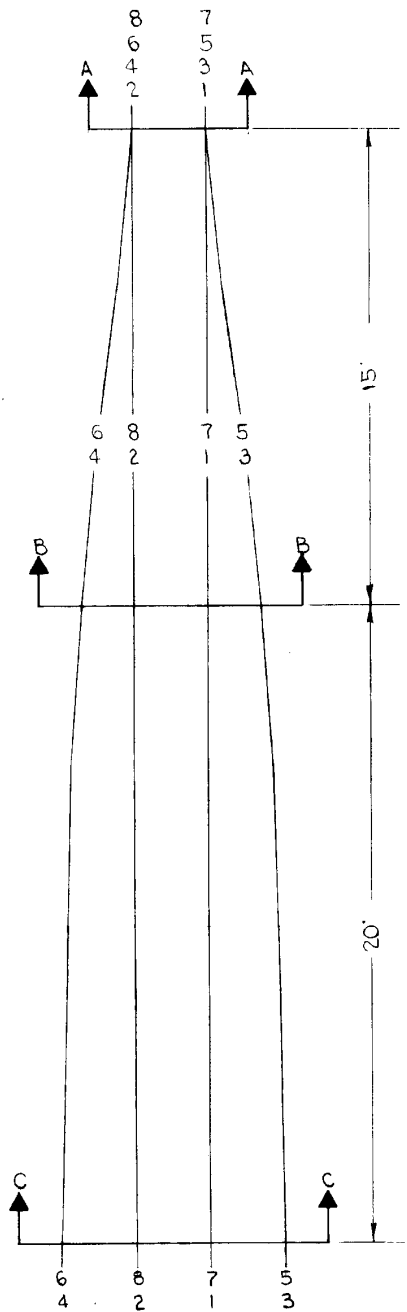


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 REV. NO: 0
 REV. DATE: 05/03/94
 REAFFIRMED DATE: 03/13/09

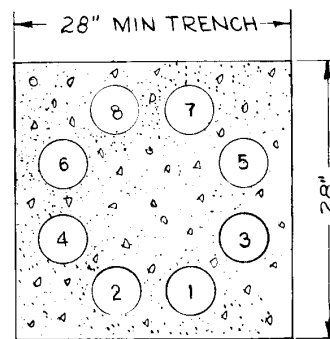
STRUCTURES – CONDUIT
8 Duct Transposition
Standard to Horizontal Position

31 10 06 00

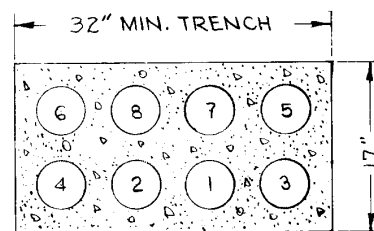
Sheet 1 of 1



SECTION A-A



SECTION B-B



SECTION C-C

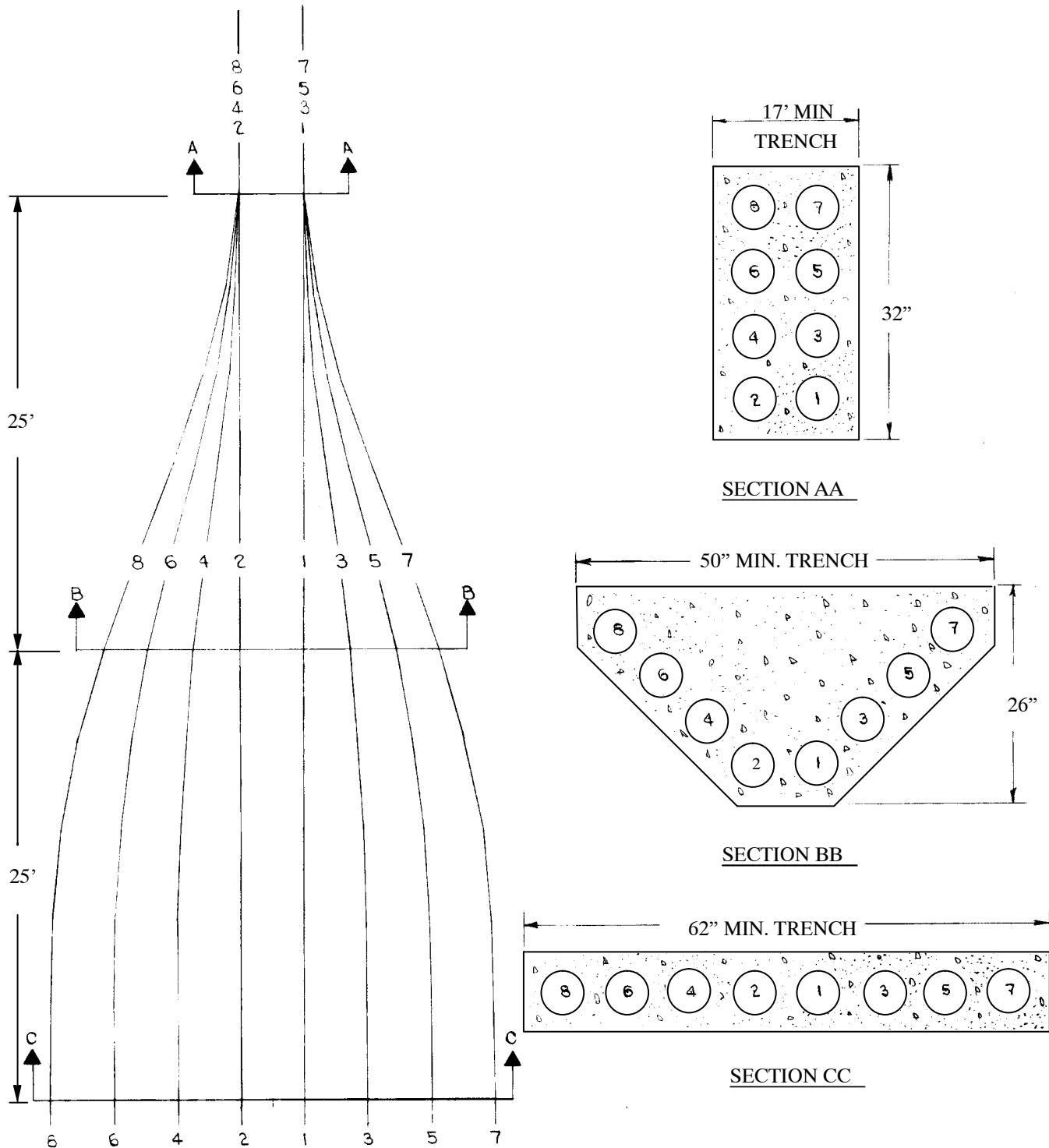
NOTES:

1. Dimensions based on 5" conduit, 5' lengths.
2. Spacer blocks shall be used to maintain conduit spacing during transposition.

STRUCTURES – CONDUIT
8 Duct Transposition
Standard to Flat Position

31 10 07 00

Sheet 1 of 1



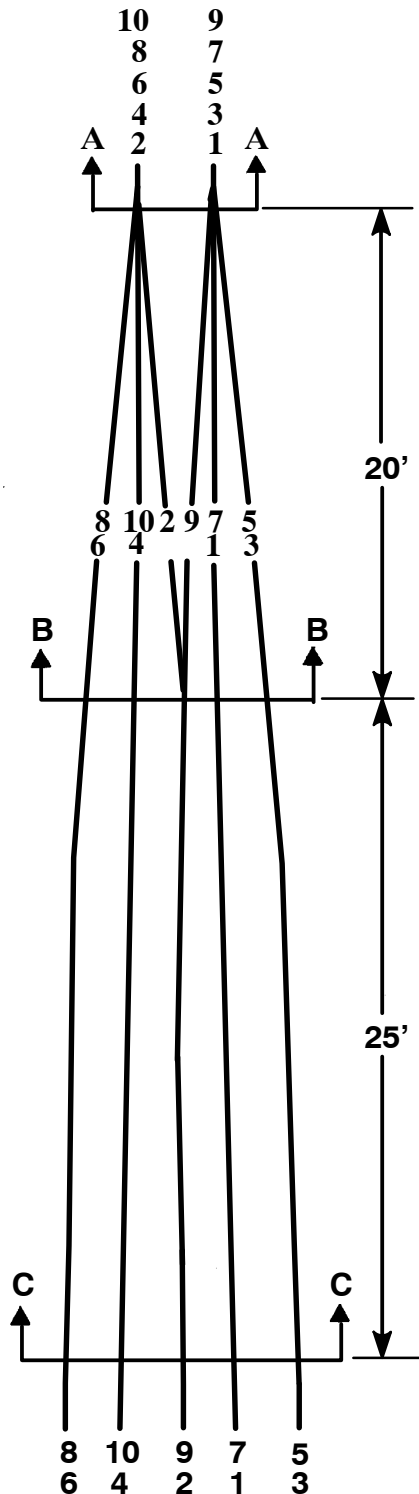
NOTES:

1. Dimensions based on 5" conduit, 5' lengths.
2. Spacer blocks shall be used to maintain conduit spacing during transposition.

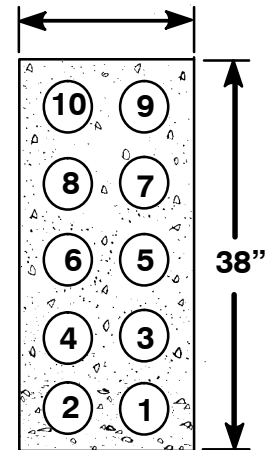
STRUCTURES – CONDUIT
10 Duct Transposition
Standard to Horizontal Position

31 10 08 00

Sheet 1 of 1

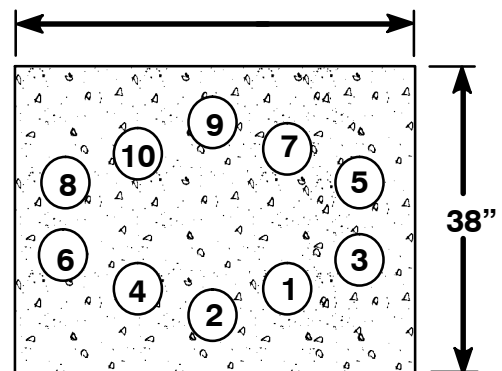


17" MIN TRENCH



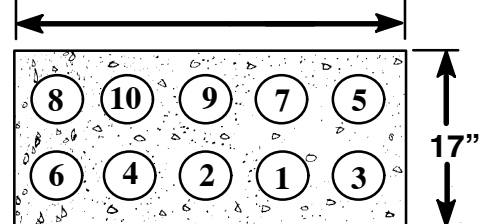
SECTION A-A

38" MIN TRENCH



SECTION B-B

38" MIN TRENCH



SECTION C-C

NOTES:

1. Dimensions based on 5" conduit, 5' lengths.
2. Spacer blocks shall be used to maintain conduit spacing during transposition.

DISTRIBUTION
CONSTRUCTION STANDARDS



ENG: DDG
 REV. NO: 0
 REV. DATE: 05/03/94
 REAFFIRMED DATE: 03/13/09

STRUCTURES – CONDUIT
3 Ft. Average Trench Depth
No Paving Base

31 11 03 **

Sheet 1 of 1

NOTE:

1. Estimator to show duct construction in units of "Feet", i.e., 180 Ft. duct run, should be shown as 180 in quan. column. Computer will interpret 180 as 180% and multiply units listed above by 1.8 to obtain desired results.
2. The quantity shown in the adder item is for a duct run of 100'. For a duct run other than 100', the quantity of the adder item (@) must be adjusted by the estimator.
3. For a complete listing of adder items (@), refer to the underground conduit estimating (Operation Codes) sheets.
4. For duct construction (stacking) refer to key sheet standard 31 10 00 00.

Quantity Per 100' of Duct Run

	Std. / Stk. No.	Description	31 11 03 **			
			11	12	13	14
			5"			
A	12 01 335	Conduit – Plastic, 5" x 20', EB 35	100	200	400	600
B	11 54 128	Block – Concrete Patio	25	50	50	50
C	12 56 120	Plastic Spacer – Conduit, 5"	50	50	75	100
D	98 00 014	Crushed Limestone	16	33	24	14
E	98 00 007	Concrete – Conduit (C.Y.)	3	4	6	9
F	18 52 030	Wire – 4/0 Tinned S.D. (Ft.)	100	100	100	100
	RFIN	Rough Finish Concrete (s.f.)	100	160	160	160
@		Surface Removal (S.F.)	200	260	260	260
	36 CBTRN	Backhoe Trenching (L.F.)	100	100	100	100
	835	Hauling Spoil	2	4	4	4
	ATMP	Tamping (S.F.)	200	320	320	320
@		Surface Replacement (S.F.)	200	260	260	260
	831	Rodding (Duct Feet)	100	200	400	600

STRUCTURES – CONDUIT
4 Ft. Average Trench Depth
No Paving Base

31 11 04 **

Sheet 1 of 1

NOTE:

1. Estimator to show duct construction in units of "Feet", i.e., 180 Ft. duct run, should be shown as 180 in quan. column. Computer will interpret 180 as 180% and multiply units listed above by 1.8 to obtain desired results.
2. The quantity shown in the adder item is for a duct run of 100'. For a duct run other than 100', the quantity of the adder item (@) must be adjusted by the estimator.
3. For a complete listing of adder items (@), refer to the underground conduit estimating (Operation Codes) sheets.
4. For duct construction (stacking) refer to key sheet standard 31 10 00 00.

Quantity Per 100' of Duct Run

	Std. / Stk. No.	Description 31 11 04 **	11	12	13	14	15	16
			5"					
A	12 01 335	Conduit – Plastic, 5" x 20', EB 35	100	200	400	600	800	1000
B	11 54 128	Block – Concrete Patio	25	50	50	50	50	50
C	12 56 120	Plastic Spacer – Conduit, 5"	50	50	75	100	125	150
D	98 00 014	Crushed Limestone	24	48	38	28	19	10
E	98 00 007	Concrete – Conduit (C.Y.)	3	4	6	9	11	14
F	18 52 030	Wire – 4/0 Tinned S.D. (Ft.)	100	100	100	100	100	100
	RFIN	Rough Finish Concrete (s.f.)	100	160	160	160	160	160
@		Surface Removal (S.F.)	200	260	260	260	260	260
	48 CBTRN	Backhoe Trenching (L.F.)	100	100	100	100	100	100
	835	Hauling Spoil	3	6	6	6	6	6
	ATMP	Air Tamping (S.F.)	200	320	320	320	320	320
@		Surface Replacement (S.F.)	200	260	260	260	260	260
	831	Rodding (Duct Feet)	100	200	400	600	800	1000

STRUCTURES – CONDUIT
5 Ft. Average Trench Depth
No Paving Base

31 11 05 **

Sheet 1 of 1

NOTE:

1. Estimator to show duct construction in units of "Feet", i.e., 180 Ft. duct run, should be shown as 180 in quan. column. Computer will interpret 180 as 180% and multiply units listed above by 1.8 to obtain desired results.
2. The quantity shown in the adder item is for a duct run of 100'. For a duct run other than 100', the quantity of the adder item (@) must be adjusted by the estimator.
3. For a complete listing of adder items (@), refer to the underground conduit estimating (Operation Codes) sheets.
4. For duct construction (stacking) refer to key sheet standard 31 10 00 00.

Quantity Per 100' of Duct Run

	Std. / Stk. No.	Description	31 11 05 **					
			11	12	13	14	15	16
			5"					
A	12 01 335	Conduit – Plastic, 5" x 20', EB 35	100	200	400	600	800	1000
B	11 54 128	Block – Concrete Patio	25	50	50	50	50	50
C	12 56 120	Plastic Spacer – Conduit, 5"	50	50	75	100	125	150
D	98 00 014	Crushed Limestone	31	62	52	43	33	24
E	98 00 007	Concrete – Conduit (C.Y.)	3	5	8	11	14	17
F	18 52 030	Wire – 4/0 Tinned S.D. (Ft.)	100	100	100	100	100	100
	RFIN	Rough Finish Concrete (s.f.)	100	185	185	185	185	185
@		Surface Removal (S.F.)	200	285	285	285	285	285
	60 CBTRN	Backhoe Trenching (L.F.)	100	100	100	100	100	100
	835	Hauling Spoil	4	7	7	7	7	7
	ATMP	Tamping (S.F.)	200	370	370	370	370	370
@		Surface Replacement (S.F.)	200	285	285	285	285	285
	831	Rodding (Duct Feet)	100	200	400	600	800	1000

STRUCTURES – CONDUIT
6 Ft. Average Trench Depth
No Paving Base

31 11 06 **

Sheet 1 of 1

NOTE:

1. Estimator to show duct construction in units of "Feet", i.e., 180 Ft. duct run, should be shown as 180 in quan. column. Computer will interpret 180 as 180% and multiply units listed above by 1.8 to obtain desired results.
2. The quantity shown in the adder item is for a duct run of 100'. For a duct run other than 100', the quantity of the adder item (@) must be adjusted by the estimator.
3. For a complete listing of adder items (@), refer to the underground conduit estimating (Operation Codes) sheets.
4. For duct construction (stacking) refer to key sheet standard 31 10 00 00.

Quantity Per 100' of Duct Run

	Std. / Stk. No.	Description	31 11 06 **	11	12	13	14	15	16
				5"					
A	12 01 335	Conduit – Plastic, 5" x 20', EB 35		100	200	400	600	800	1000
B	11 54 128	Block – Concrete Patio		25	50	50	50	50	50
C	12 56 120	Plastic Spacer – Conduit, 5"		50	50	75	100	125	150
D	98 00 014	Crushed Limestone		38	76	66	56	47	38
E	98 00 007	Concrete – Conduit (C.Y.)		3	5	8	11	14	17
F	18 52 030	Wire – 4/0 Tinned S.D. (Ft.)		100	100	100	100	100	100
	RFIN	Rough Finish Concrete (s.f.)		100	185	185	185	185	185
@		Surface Removal (S.F.)		200	285	285	285	285	285
	72 CBTRN	Backhoe Trenching (L.F.)		100	100	100	100	100	100
	835	Hauling Spoil		5	9	9	9	9	9
	ATMP	Tamping (S.F.)		200	370	370	370	370	370
@		Surface Replacement (S.F.)		200	285	285	285	285	285
	831	Rodding (Duct Feet)		100	200	400	600	800	1000

STRUCTURES – CONDUIT
7 Ft. Average Trench Depth
No Paving Base

31 11 07 **

Sheet 1 of 1

NOTE:

1. Estimator to show duct construction in units of "Feet", i.e., 180 Ft. duct run, should be shown as 180 in quan. column. Computer will interpret 180 as 180% and multiply units listed above by 1.8 to obtain desired results.
2. The quantity shown in the adder item is for a duct run of 100'. For a duct run other than 100', the quantity of the adder item (@) must be adjusted by the estimator.
3. For a complete listing of adder items (@), refer to the underground conduit estimating (Operation Codes) sheets.
4. For duct construction (stacking) refer to key sheet standard 31 10 00 00.

Quantity Per 100' of Duct Run

	Std. / Stk. No.	Description	31 11 07 **					
			11	12	13	14	15	16
			5"					
A	12 01 335	Conduit – Plastic, 5" x 20', EB 35	100	200	400	600	800	1000
B	11 54 128	Block – Concrete Patio	25	50	50	50	50	50
C	12 56 120	Plastic Spacer – Conduit, 5"	50	50	75	100	125	150
D	98 00 014	Crushed Limestone	45	90	81	71	62	52
E	98 00 007	Concrete – Conduit (C.Y.)	3	5	8	11	14	17
F	18 52 030	Wire – 4/0 Tinned S.D. (Ft.)	100	100	100	100	100	100
	RFIN	Rough Finish Concrete (s.f.)	100	185	185	185	185	185
@		Surface Removal (S.F.)	200	285	285	285	285	285
	84 CBTRN	Backhoe Trenching (L.F.)	100	100	100	100	100	100
	835	Hauling Spoil	5	10	10	10	10	10
	ATMP	Tamping (S.F.)	200	370	370	370	370	370
@		Surface Replacement (S.F.)	200	285	285	285	285	285
	831	Rodding (Duct Feet)	100	200	400	600	800	1000

STRUCTURES – CONDUIT
8 Ft. Average Trench Depth
No Paving Base

31 11 08 **

Sheet 1 of 1

NOTE:

1. Estimator to show duct construction in units of "Feet", i.e., 180 Ft. duct run, should be shown as 180 in quan. column. Computer will interpret 180 as 180% and multiply units listed above by 1.8 to obtain desired results.
2. The quantity shown in the adder item is for a duct run of 100'. For a duct run other than 100', the quantity of the adder item (@) must be adjusted by the estimator.
3. For a complete listing of adder items (@), refer to the underground conduit estimating (Operation Codes) sheets.
4. For duct construction (stacking) refer to key sheet standard 31 10 00 00.

Quantity Per 100' of Duct Run

	Std. / Stk. No.	Description	31 11 08 **					
			11	12	13	14	15	16
			5"					
A	12 01 335	Conduit – Plastic, 5" x 20', EB 35	100	200	400	600	800	1000
B	11 54 128	Block – Concrete Patio	25	50	50	50	50	50
C	12 56 120	Plastic Spacer – Conduit, 5"	50	50	75	100	125	150
D	98 00 014	Crushed Limestone	52	105	95	86	76	67
E	98 00 007	Concrete – Conduit (C.Y.)	3	5	8	11	14	17
F	18 52 030	Wire – 4/0 Tinned S.D. (Ft.)	100	100	100	100	100	100
	RFIN	Rough Finish Concrete (s.f.)	100	185	185	185	185	185
@		Surface Removal (S.F.)	200	285	285	285	285	285
	96 CBTRN	Backhoe Trenching (L.F.)	100	100	100	100	100	100
	835	Hauling Spoil	6	12	12	12	12	12
	ATMP	Tamping (S.F.)	200	370	370	370	370	370
@		Surface Replacement (S.F.)	200	285	285	285	285	285
	831	Rodding (Duct Feet)	100	200	400	600	800	1000

STRUCTURES – CONDUIT
3 Ft. Average Trench Depth
With Paving Base (9" Concrete)

31 12 03 **

Sheet 1 of 1

NOTE:

1. Estimator to show duct construction in units of "Feet", i.e., 180 Ft. duct run, should be shown as 180 in quan. column. Computer will interpret 180 as 180% and multiply units listed above by 1.8 to obtain desired results.
2. The quantity shown in the adder item is for a duct run of 100'. For a duct run other than 100', the quantity of the adder item (@) must be adjusted by the estimator.
3. For a complete listing of adder items (@), refer to the underground conduit estimating (Operation Codes) sheets.
4. For duct construction (stacking) refer to key sheet standard 31 10 00 00.

Quantity Per 100' of Duct Run

	Std. / Stk. No.	Description	31 12 03 **		
			11	12	13
			5"		
A	12 01 335	Conduit – Plastic, 5" x 20', EB 35	100	200	400
B	11 54 128	Block – Concrete Patio	25	50	50
C	12 56 120	Plastic Spacer – Conduit, 5"	50	50	75
D	98 00 014	Crushed Limestone	10	19	10
E	98 00 007	Concrete – Conduit (C.Y.)	3	4	6
F	98 00 001	Concrete–Paving Base	3	5	5
G	18 52 030	Wire – 4/0 Tinned S.D. (Ft.)	100	100	100
	RFIN	Rough Finish Concrete (s.f.)	200	320	320
@		Surface Removal (S.F.)	200	260	260
	36 CBTRN	Backhoe Trenching (L.F.)	100	100	100
	835	Hauling Spoil	2	4	4
	ATMP	Tamping (S.F.)	200	320	320
@		Surface Replacement (S.F.)	200	260	260
	831	Rodding (Duct Feet)	100	200	400

STRUCTURES – CONDUIT
4 Ft. Average Trench Depth
With Paving Base (9" Concrete)

31 12 04 **

Sheet 1 of 1

NOTE:

1. Estimator to show duct construction in units of "Feet", i.e., 180 Ft. duct run, should be shown as 180 in quan. column. Computer will interpret 180 as 180% and multiply units listed above by 1.8 to obtain desired results.
2. The quantity shown in the adder item is for a duct run of 100'. For a duct run other than 100', the quantity of the adder item (@) must be adjusted by the estimator.
3. For a complete listing of adder items (@), refer to the underground conduit estimating (Operation Codes) sheets.
4. For duct construction (stacking) refer to key sheet standard 31 10 00 00.

Quantity Per 100' of Duct Run

	Std. / Stk. No.	Description	31 12 04 **	11	12	13	14	15
				5"				
A	12 01 335	Conduit – Plastic, 5" x 20', EB 35		100	200	400	600	800
B	11 54 128	Block – Concrete Patio		25	50	50	50	50
C	12 56 120	Plastic Spacer – Conduit, 5"		50	50	75	100	125
	98 00 014	Crushed Limestone		17	33	24	14	4
D	98 00 007	Concrete – Conduit (C.Y.)		3	4	6	9	11
E	98 00 001	Concrete–Paving Base		3	5	5	5	5
F	18 52 030	Wire – 4/0 Tinned S.D. (Ft.)		100	100	100	100	100
	RFIN	Rough Finish Concrete (s.f.)		200	320	320	320	320
@		Surface Removal (S.F.)		200	260	260	260	260
	48 CBTRN	Backhoe Trenching (L.F.)		100	100	100	100	100
	ATMP	Tamping (S.F.)		200	320	320	320	320
@		Surface Replacement (S.F.)		200	260	260	260	260
	831	Rodding (Duct Feet)		100	200	400	600	800
	835	Hauling Dirt		3	6	6	6	6

STRUCTURES – CONDUIT
5 Ft. Average Trench Depth
With Paving Base (9" Concrete)

31 12 05 **

Sheet 1 of 1

NOTE:

1. Estimator to show duct construction in units of "Feet", i.e., 180 Ft. duct run, should be shown as 180 in quan. column. Computer will interpret 180 as 180% and multiply units listed above by 1.8 to obtain desired result.
2. The quantity shown in the adder item is for a duct run of 100'. For a duct run other than 100', the quantity of the adder item (@) must be adjusted by the estimator.
3. For a complete listing of adder items (@), refer to the underground conduit estimating (Operation Codes) sheets.
4. For duct construction (stacking) refer to key sheet standard 31 10 00 00.

Quantity Per 100' of Duct Run

	Stnd. / Stk. No.	Description	31 12 05 **					
			11	12	13	14	15	16
			5"					
A	12 01 335	Conduit – Plastic, 5" x 20', EB 35	100	200	400	600	800	1000
B	11 54 128	Block – Concrete Patio	25	50	50	50	50	50
C	12 56 120	Plastic Spacer – Conduit, 5"	50	50	75	100	125	150
D	98 00 014	Crushed Limestone	24	48	38	29	19	10
E	98 00 007	Concrete – Conduit (C.Y.)	3	5	8	11	14	17
F	98 00 001	Concrete–Paving Base	3	6	6	6	6	6
G	18 52 030	Wire – 4/0 Tinned S.D. (Ft.)	100	100	100	100	100	100
	RFIN	Rough Finish Concrete (s.f.)	200	370	370	370	370	370
		Surface Removal (S.F.)	200	285	285	285	285	285
	60 CBTRN	Backhoe Trenching (L.F.)	100	100	100	100	100	100
	835	Hauling Spoil	4	7	7	7	7	7
	ATMP	Tamping (S.F.)	200	370	370	370	370	370
		Surface Replacement (S.F.)	200	285	285	285	285	285
	831	Rodding (Duct Feet)	100	200	400	600	800	1000

STRUCTURES – CONDUIT
6 Ft. Average Trench Depth
With Paving Base (9" Concrete)

31 12 06 **

Sheet 1 of 1

NOTE:

1. Estimator to show duct construction in units of "Feet", i.e., 180 Ft. duct run, should be shown as 180 in quan. column. Computer will interpret 180 as 180% and multiply units listed above by 1.8 to obtain desired results.
2. The quantity shown in the adder item is for a duct run of 100'. For a duct run other than 100', the quantity of the adder item (@) must be adjusted by the estimator.
3. For a complete listing of adder items (@), refer to the underground conduit estimating (Operation Codes) sheets.
4. For duct construction (stacking) refer to key sheet standard 31 10 00 00.

Quantity Per 100' of Duct Run

	Stnd. / Stk. No.	Description	31 12 06 **					
			11	12	13	14	15	16
			5"					
A	12 01 335	Conduit – Plastic, 5" x 20', EB 35	100	200	400	600	800	1000
B	11 54 128	Block – Concrete Patio	25	50	50	50	50	50
C	12 56 120	Plastic Spacer – Conduit, 5"	50	50	75	100	125	150
D	98 00 014	Crushed Limestone	31	62	52	43	33	24
E	98 00 007	Concrete – Conduit (C.Y.)	3	5	8	11	14	17
F	98 00 001	Concrete–Paving Base	3	6	6	6	6	6
G	18 52 030	Wire – 4/0 Tinned S.D. (Ft.)	100	100	100	100	100	100
	RFIN	Rough Finish Concrete (s.f.)	200	370	370	370	370	370
@		Surface Removal (S.F.)	200	285	285	285	285	285
	72 CBTRN	Backhoe Trenching (L.F.)	100	100	100	100	100	100
	835	Hauling Spoil	5	9	9	9	9	9
	ATMP	Tamping (S.F.)	200	370	370	370	370	370
@		Surface Replacement (S.F.)	200	285	285	285	285	285
	831	Rodding (Duct Feet)	100	200	400	600	800	1000

STRUCTURES – CONDUIT
7 Ft. Average Trench Depth
With Paving Base (9" Concrete)

31 12 07 **

Sheet 1 of 1

NOTE:

1. Estimator to show duct construction in units of "Feet", i.e., 180 Ft. duct run, should be shown as 180 in quan. column. Computer will interpret 180 as 180% and multiply units listed above by 1.8 to obtain desired results.
2. The quantity shown in the adder item is for a duct run of 100'. For a duct run other than 100', the quantity of the adder item (@) must be adjusted by the estimator.
3. For a complete listing of adder items (@), refer to the underground conduit estimating (Operation Codes) sheets.
4. For duct construction (stacking) refer to key sheet standard 31 10 00 00.

Quantity Per 100' of Duct Run

	Stnd. / Stk. No.	Description	31 12 07 **					
			11	12	13	14	15	16
			5"					
A	12 01 335	Conduit – Plastic, 5" x 20', EB 35	100	200	400	600	800	1000
B	11 54 128	Block – Concrete Patio	25	50	50	50	50	50
C	12 56 120	Plastic Spacer – Conduit, 5"	50	50	75	100	125	150
D	98 00 014	Crushed Limestone	38	76	67	57	48	38
E	98 00 007	Concrete – Conduit (C.Y.)	3	5	8	11	14	17
F	98 00 001	Concrete–Paving Base	3	6	6	6	6	6
G	18 52 030	Wire – 4/0 Tinned S.D. (Ft.)	100	100	100	100	100	100
	RFIN	Rough Finish Concrete (s.f.)	200	370	370	370	370	370
@		Surface Removal (S.F.)	200	285	285	285	285	285
	84 CBTRN	Backhoe Trenching (L.F.)	100	100	100	100	100	100
	835	Hauling Spoil	5	10	10	10	10	10
	ATMP	Tamping (S.F.)	200	370	370	370	370	370
@		Surface Replacement (S.F.)	200	285	285	285	285	285
	831	Rodding (Duct Feet)	100	200	400	600	800	1000

STRUCTURES – CONDUIT
8 Ft. Average Trench Depth
With Paving Base (9" Concrete)

31 12 08 **

Sheet 1 of 1

NOTE:

1. Estimator to show duct construction in units of "Feet", i.e., 180 Ft. duct run, should be shown as 180 in quan. column. Computer will interpret 180 as 180% and multiply units listed above by 1.8 to obtain desired results.
2. The quantity shown in the adder item is for a duct run of 100'. For a duct run other than 100', the quantity of the adder item (@) must be adjusted by the estimator.
3. For a complete listing of adder items (@), refer to the underground conduit estimating (Operation Codes) sheets.
4. For duct construction (stacking) refer to key sheet standard 31 10 00 00.

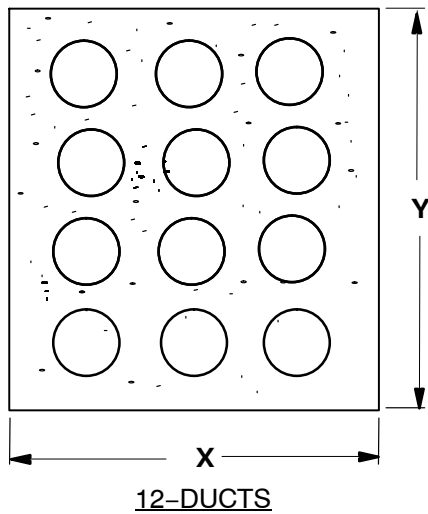
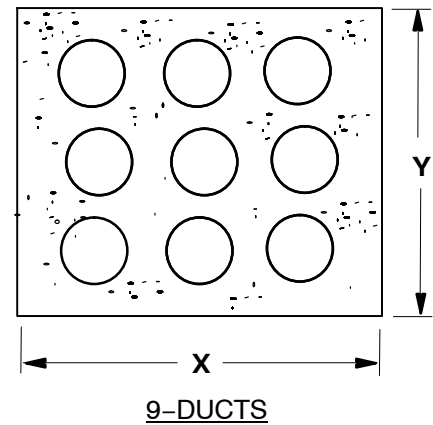
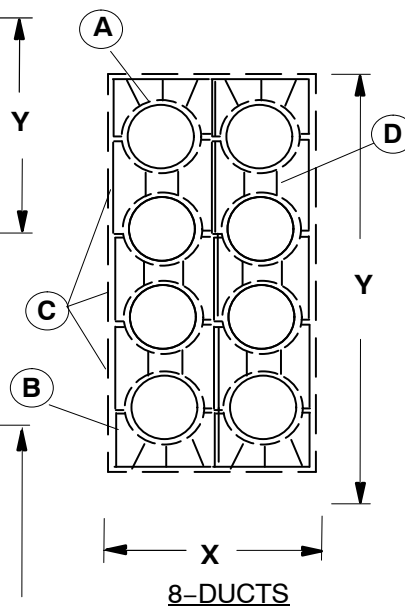
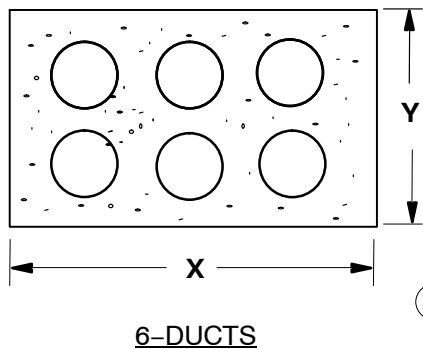
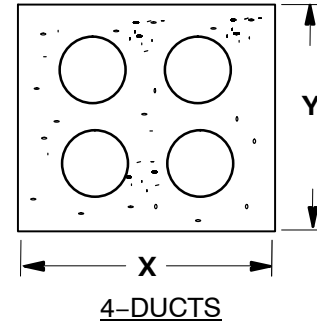
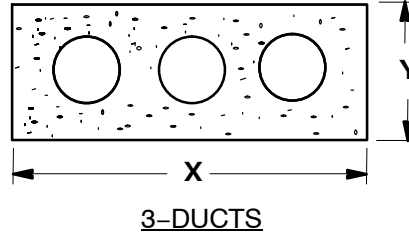
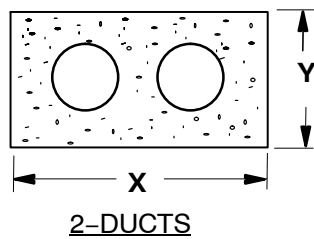
Quantity Per 100' of Duct Run

	Std. / Stk. No.	Description	31 12 08 **					
			11	12	13	14	15	16
			5"					
A	12 01 335	Conduit – Plastic, 5" x 20', EB 35	100	200	400	600	800	1000
B	11 54 128	Block – Concrete Patio	25	50	50	50	50	50
C	12 56 120	Plastic Spacer – Conduit, 5"	50	50	75	100	125	150
D	98 00 014	Crushed Limestone	46	90	81	72	60	52
E	98 00 007	Concrete – Conduit (C.Y.)	3	5	8	11	14	17
F	98 00 001	Concrete–Paving Base	3	6	6	6	6	6
G	18 52 030	Wire – 4/0 Tinned S.D. (Ft.)	100	100	100	100	100	100
	RFIN	Rough Finish Concrete (s.f.)	200	370	370	370	370	370
@		Surface Removal (S.F.)	200	285	285	285	285	285
	96 CBTRN	Backhoe Trenching (L.F.)	100	100	100	100	100	100
	835	Hauling Spoil	6	12	12	12	12	12
	ATMP	Tamping (S.F.)	200	370	370	370	370	370
@		Surface Replacement (S.F.)	200	285	285	285	285	285
	831	Rodding (Duct Feet)	100	200	400	600	800	1000

STRUCTURES – CONDUIT
Encased Conduit Formations
5" EB Conduit (ILLINOIS)

31 13 01 **

Sheet 1 of 2



STANDARD NUMBER	NUMBER OF DUCTS	DIMENSIONS	
		X	Y
31 13 01 02	2	17 3/4"	10 3/4"
31 13 01 03	3	24 3/4"	10 3/4"
31 13 01 04	4	17 1/4"	17 3/4"
31 13 01 06	6	24 3/4"	17 3/4"
31 13 01 08	8	17 1/4"	31 3/4"
31 13 01 09	9	24 3/4"	24 3/4"
31 13 01 12	12	24 3/4"	31 3/4"

STRUCTURES – CONDUIT
Encased Conduit Formations
5" EB Conduit (ILLINOIS)

31 13 01 **

Sheet 2 of 2

NOTE:

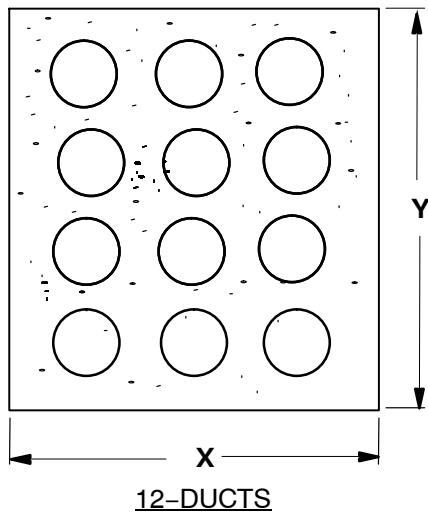
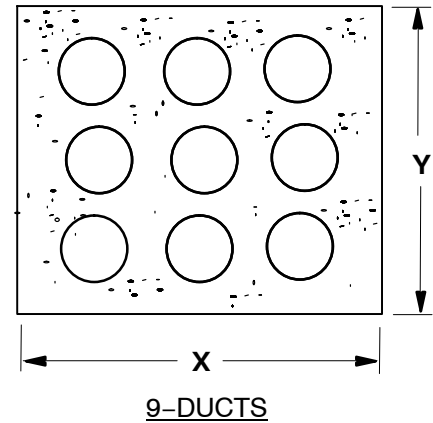
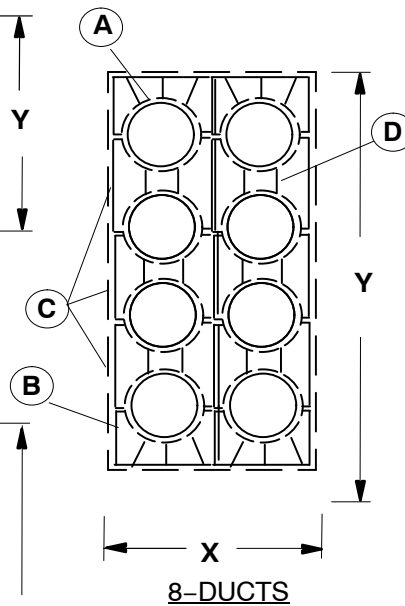
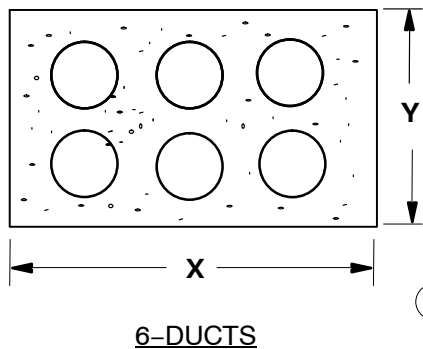
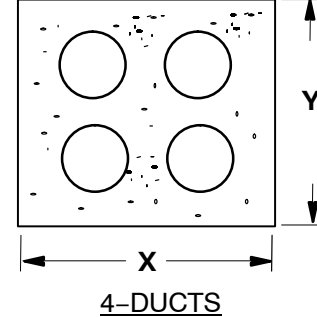
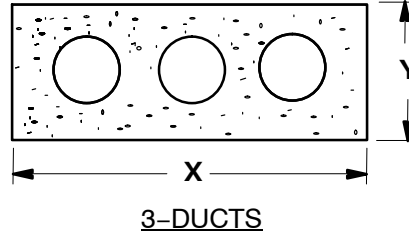
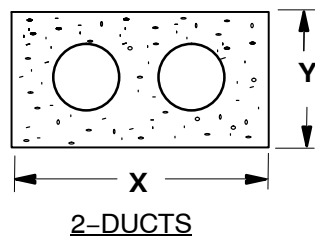
1. Each standard includes material for a 20 ft. duct formation.
2. Spacers should be installed every 10 ft. for straight runs.
3. Call for extra spacers to use on large sweeps in a duct run. Sweeps need more spacers placed closer together.
4. To keep conduits from floating when the concrete is poured, attach the duct bank to rebar stakes with rebar tie wire. Contractors usually supply the rebar and tie wire.

		Std. / Stk. No.	Description	31 13 01 **	02	03	04	06	08	09	12
	A	12 01 335	Conduit – Plastic, 5" x 20', EB 35		40	60	80	120	160	180	240
	B	40 83 015	Spacer – Conduit, 5", Base		4	6	4	6	4	6	6
	C	40 83 016	Spacer – Conduit, 5", Intermediate				4	6	12	12	18
	D	98 00 007	Concrete–Conduit (Cu. Yd.)		.740	1.01	1.10	1.53	1.85	2.05	2.58

STRUCTURES – CONDUIT
Encased Conduit Formations
4" EB Conduit (ILLINOIS)

31 13 02 **

Sheet 1 of 2



STANDARD NUMBER	NUMBER OF DUCTS	DIMENSIONS	
		X	Y
31 13 02 02	2	15"	9 1/2"
31 13 02 03	3	21 1/2"	9 1/2"
31 13 02 04	4	15"	15 1/2"
31 13 02 06	6	21 1/2"	15 1/2"
31 13 02 08	8	15"	27 1/2"
31 13 02 09	9	21 1/2"	21 1/2"
31 13 02 12	12	21 1/2"	27 1/2"

STRUCTURES – CONDUIT
Encased Conduit Formations
4" EB Conduit (ILLINOIS)

31 13 02 **

Sheet 2 of 2

NOTE:

1. Each standard includes material for a 20 ft. duct formation.
2. Spacers should be installed every 10 ft. for straight runs.
3. Call for extra spacers to use on large sweeps in a duct run. Sweeps need more spacers placed closer together.
4. To keep conduits from floating when the concrete is poured, attach the duct bank to rebar stakes with rebar tie wire. Contractors usually supply the rebar and tie wire.

		Std. / Stk. No.	Description	31 13 02 **	02	03	04	06	08	09	12
	A	12 01 337	Conduit – Plastic, 4" x 20', EB 35	40	60	80	120	160	180	240	
	B	40 83 014	Spacer – Conduit, 4", Base	4	6	4	6	4	6	6	
	C	40 83 013	Spacer – Conduit, 4", Intermediate			4	6	12	12	18	
	D	98 00 007	Concrete–Conduit (Cu. Yd.)	.570	.810	.870	1.22	1.47	1.65	2.06	

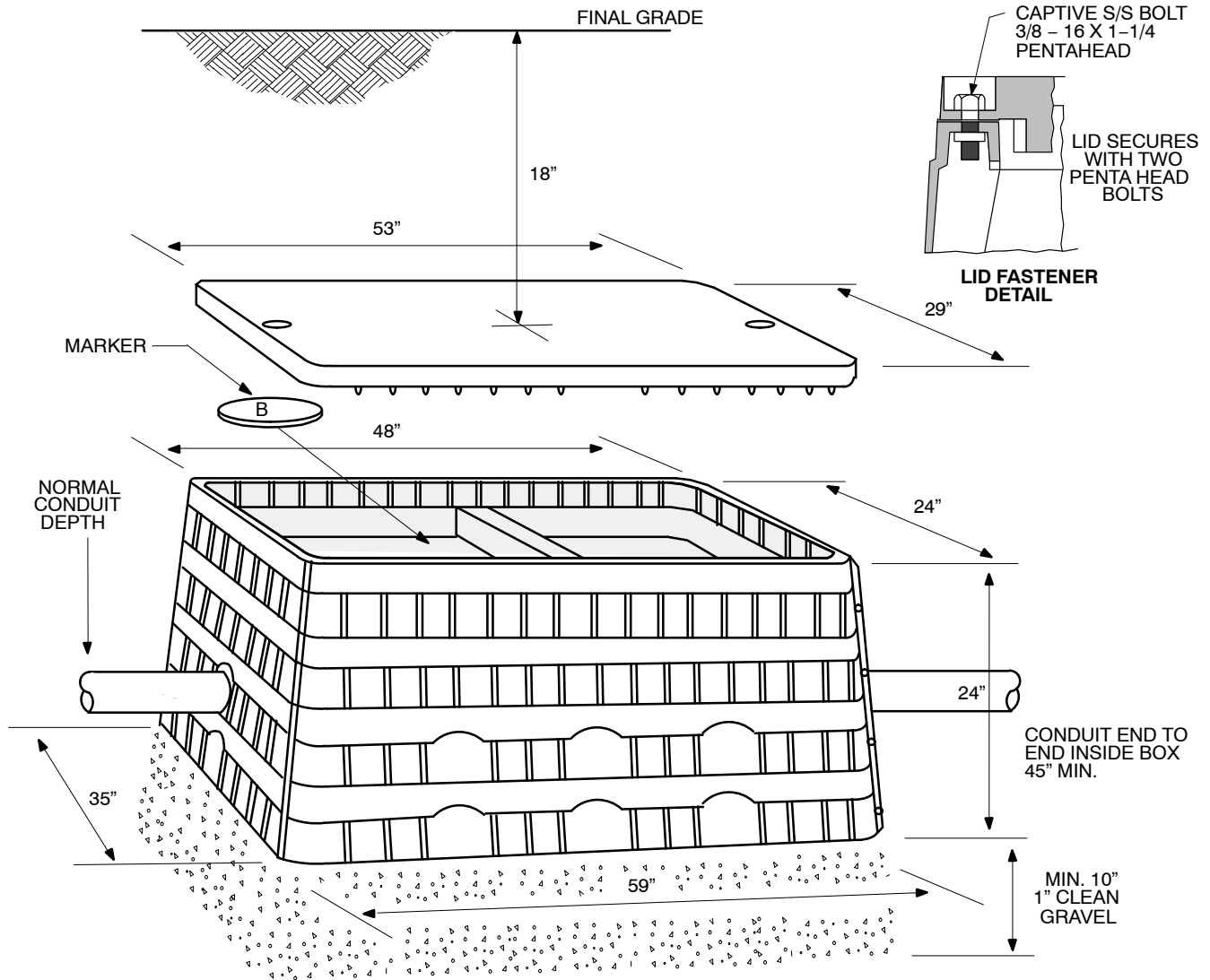
STRUCTURES

Splice – Box

2' X 4' X 2' Deep

31 21 02 01

Sheet 1 of 1



BOX – SPLICE
24" X 24" X 48"
FOR USE IN NON-TRAFFIC AREAS

INSTRUCTIONS :

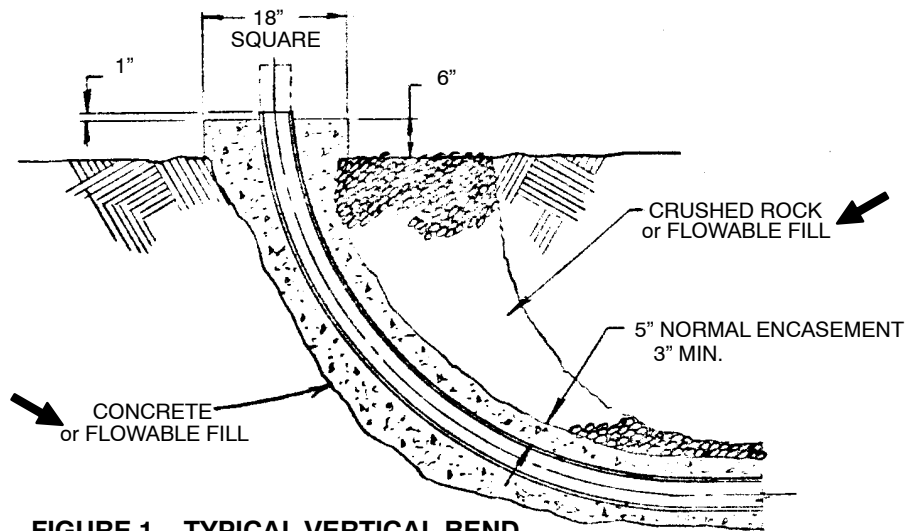
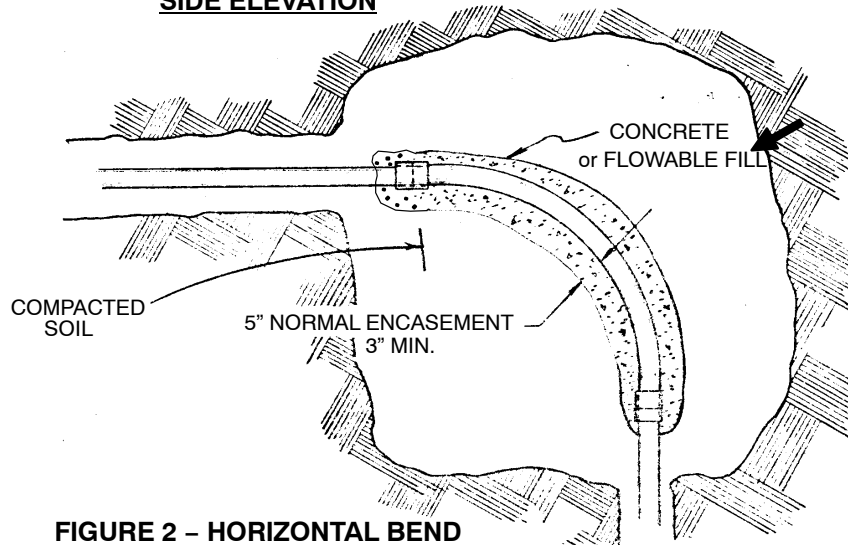
1. Excavate and install box at standard conduit depths on 10 inch base of 1 inch gravel. Box lid located approx. 18" below grade
2. Install conduits thru knockouts, or bore holes in the box. Seal conduits at box interface.
3. After installing cable, place lid on box, partially backfill and tamp soil.
4. Place electronic marker at the center inside of the box and complete backfill. **IMPORTANT:** Marker must be laid flat.
5. In Missouri residential developments, the contractor will install the splice box and conduit.

	Std. / Stk. No.	Description	31 21 02	01
	12 06 105	Box, Cable, 2' x 4' x 2' Deep		1
	49 05 519	Marker, Electronic		1
@	98 00 014	Rock Crushed		As Req'd
@	701	Drill Hole In Box		@

DISTRIBUTION
CONSTRUCTION STANDARDS



ENG:EJB
REV. NO: 8
REV. DATE: 06/06/08

RESTRAINT-SWITCHGEAR & TERMINAL POLE BEND**FIGURE 1 – TYPICAL VERTICAL BEND
SIDE ELEVATION****FIGURE 2 – HORIZONTAL BEND
PLAN VIEW**

	Std. / Stk. No.	31 47 01 **	Horizontal				Vertical			
			01	02	03	04	05	06	07	08
	12 51 180	Bend 2" x 36" Rad.	1				1			
	12 51 173	Bend 3" x 36" Rad.		1				1		
	12 51 176	Bend 4" x 36" Rad.			1				1	
	12 51 206	Bend 5" x 36" Rad.				1				1
	11 04 105	Concrete or Flowable Fill- Cu. Ft.	4	5	6	7	6	7	8	9
	98 00 014	Crushed Rock Cu. Yd.					1/2	1/2	1/2	1/2
	BTRN	Backhoe trn 36" x Ft.	4	4	4	4	4	4	4	4

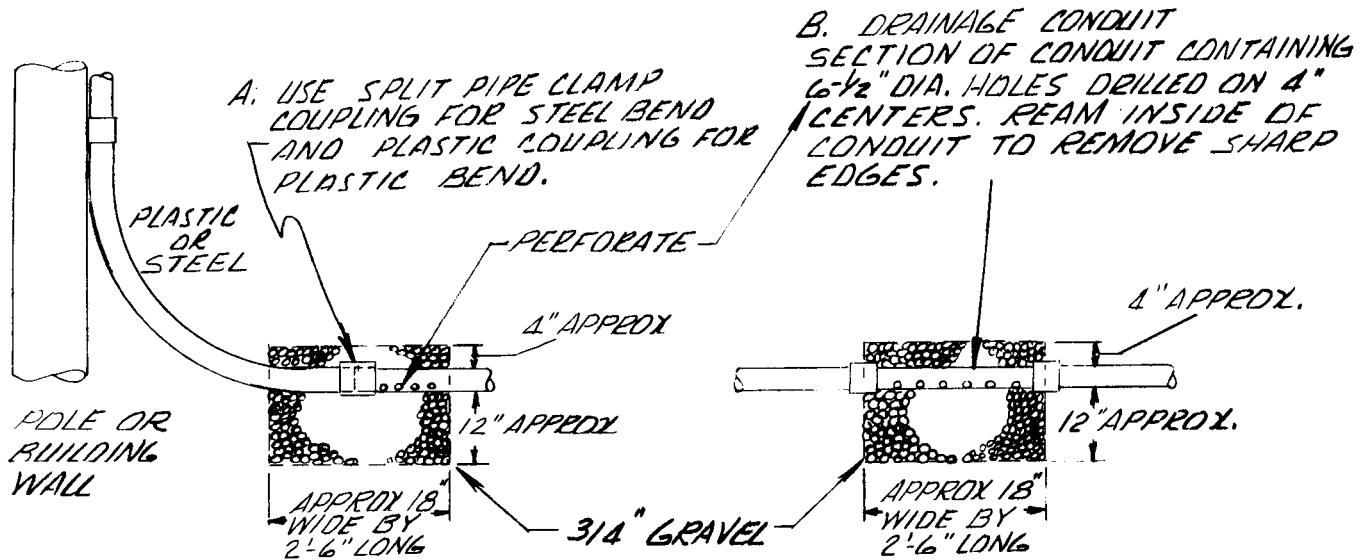


FIG. 1

FOR BURIED ELECTRICAL STEEL
OR PLASTIC CONDUIT

FIG. 2

FOR BURIED NON-METALLIC
CONDUIT

BUILDING PAPER ABOVE CONDUIT
TO PREVENT UPPER CONCRETE
SHEATHING FROM FILLING
CONDUIT HOLES & GRAVEL

DRAINAGE CONDUIT
SECTION OF CONDUIT CONTAINING
6-1/2" DIA HOLES DRILLED ON 4"
CENTERS. REAM INSIDE OF CONDUIT
TO REMOVE SHARP EDGES.

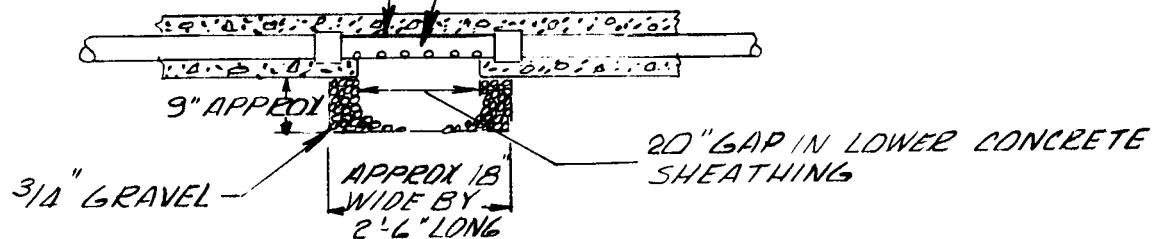


FIG. 3

FOR CONCRETE ENCASED
NON-METALLIC CONDUIT

	Std. / Stk. No.	Description	31 47 02 **	2"	3"	4"	5"
				01	02	03	04
@	by shop	Conduit Perforated 30" long		1 Ea	1 Ea	1 Ea	1 Ea
@	BTRN	Backhoe 42" in ft.		3'	3'	3'	3'
→ @	98 00 014	Rock Crushed		As Req'd	As Req'd	As Req'd	As Req'd

6'-0" x 17'-6" x 7'-0" ←

Sheet 1 of 2



NECK STYLE

36" Round – 32 21 01 01

36" Round x 5' Deep – 32 21 01 02

NOTE

1. 5.32 Cubic yards of dirt removed per foot of excavation.
2. Add the required number of 6" concrete (Stk. # 12 06 063) and 3" concrete (Stk. # 12 06 062) necks so that the frame and cover are at final grade.
3. Manholes are equipped with the cable mounting racks. Add the required number of cable mounting arms to suspend the installed cables.
4. Set the manhole at the "Preferred Depth" or contact company rep. if not achievable.

		Stock. No.	Description	01	02
	A	12 06 235	Manhole – Top, Precast Conc.	1	1
		12 06 236	Manhole – Bottom, Precast Conc.	1	1
	B	98 00 006	Concrete – 2 Sack (c.y.)	8	8
	C	33 12 01 01	Neck & Frame – 36" Rd.	1	
		33 12 01 02	Neck & Frame – 3' x 5' Deep		1
	D	19 04 327	Grate – 14"	1	1
		MEXC	Excavation (Mach.) (c.y.)	52	70
		MBF	Backfilling (Mach.) (c.y.)	12	31
		ATMP	Tamping (s.f.)	130	130
			Surface Removal (s.f.)	130	130
			Surface Replacement (s.f.)	130	130
	E	33 11 ** **	Wingwall Bays	A/R	A/R
		819	Loading Out (c.y.)	A/R	A/R
	F	98 00 014	Crushed Rock (c.y.)	1.33	1.33
	G	12 53 017	Shield – Duct, 3" thru 6"	12	12
3	H	12 56 113	Arm–Cable Mounting 14"	A/R	A/R
3	I	12 56 112	Arm–Cable Mounting 18"	A/R	A/R
3	J	12 56 114	Arm–Cable Mounting, 7 1/2"	A/R	A/R

A/R = As Required

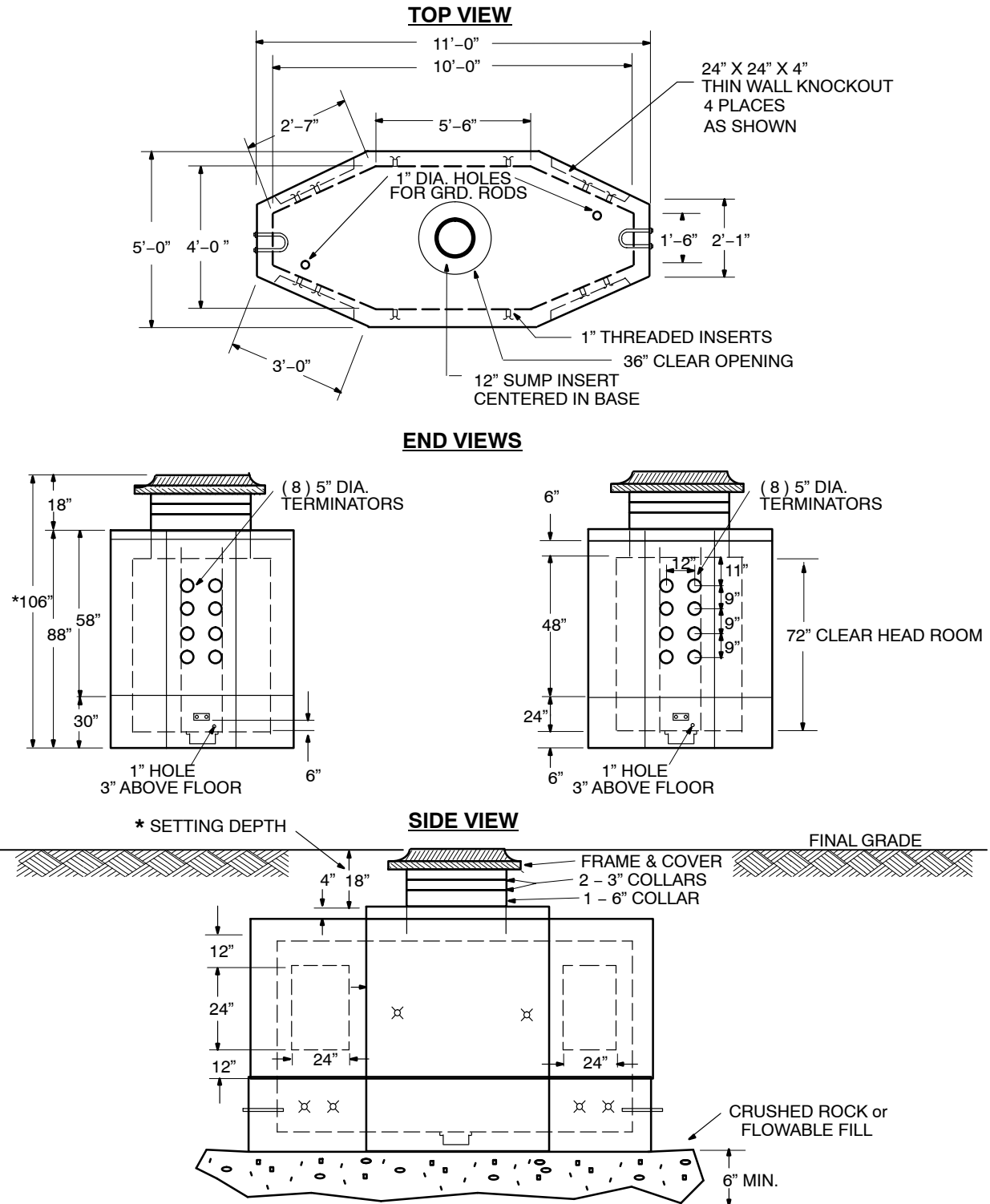
STRUCTURES – MANHOLES

Straight – Precast

4'-0" x 10'-0" x 6'-0"

32 21 02 **

Sheet 1 of 2



COLLAR CONFIGURATION

PREFERRED – 1-6" & 2-3"
3" NECKS ARE REQUIRED ON ALL MANHOLES
AND SHALL BE TOP COLLARS

* SETTING DEPTHS

COORDINATE W/AMEREN REP.
PREFERRED – 18" (AS SHOWN)
MINIMUM – 12" TO FINAL GRADE
MAXIMUM – 60" TO FINAL GRADE

WEIGHTS

TOP SECTION	13,200 lbs.
BASE SECTION	7,350 lbs.
TOTAL	20,550 lbs.

TRAFFIC RATED DESIGN

DISTRIBUTION
CONSTRUCTION STANDARDS



ENG:DDG
REV. NO: 7
REV. DATE: 12/12/12

NECK STYLE

36" Round – 32 21 02 01

36" Round x 5' Deep – 32 21 02 02

NOTE

1. 2.45 Cubic yards of dirt removed per foot of excavation.
2. Add the required number of 6" concrete (Stk. # 12 06 063) and 3" concrete (Stk. # 12 06 062) necks so that the frame and cover are at final grade.
3. Manholes are equipped with the cable mounting racks. Add the required number of cable mounting arms to suspend the installed cables.
4. Set the manhole at the "Preferred Depth" or contact company rep. if not achievable.

		Std. / Stk. No.	Description	32 21 02 **	01	02
@ @ @ @	A	12 06 231	Manhole – Top, Precast Conc.		1	1
		12 06 232	Manhole – Bottom, Precast Conc.		1	1
	B	98 00 006	Concrete – 2 Sack (c.y.)		4	4
	C	33 12 01 01	Neck & Frame – 36" Rd.		1	
		33 12 01 02	Neck & Frame – 3'x5' Deep			1
	D	19 04 327	Grate – 14"		1	1
		MEXC	Excavation (Mach.) (c.y.)		18	27
		MBF	Backfilling (Mach.) (c.y.)		4	11
		ATMP	Tamping (s.f.)		70	70
			Surface Removal (s.f.)		70	70
			Surface Replacement (s.f.)		70	70
	E	33 11 ** **	Wingwall Bays		A/R	A/R
		819	Loading Out (c.y.)		A/R	A/R
	F	98 00 014\	Crushed Rock (c.y.)		2/3	2/3
	G	12 53 017	Shield – Duct, 3" thru 6"		4	4
	H	12 56 113	Arm – Cable Mounting, 14"		A/R	A/R
	I	12 56 112	Arm – Cable Mounting, 18"		A/R	A/R
	J	12 56 114	Arm–Cable Mounting, 7 1/2"		A/R	A/R

A/R=As Required

NECK STYLE

36" Round – 32 21 03 01

36" Round x 5' Deep – 32 21 03 02

NOTE

1. 3.536 Cubic yards of dirt removed per foot of excavation.
2. Add the required number of 6" concrete (Stk. # 12 06 063) and 3" concrete (Stk. # 12 06 062) necks so that the frame and cover are at final grade.
3. Manholes are equipped with the cable mounting racks. Add the required number of cable mounting arms to suspend the installed cables.
4. Set the manhole at the "Preferred Depth" or contact company rep. if not achievable.

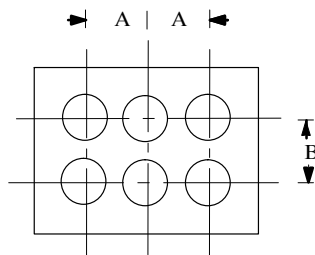
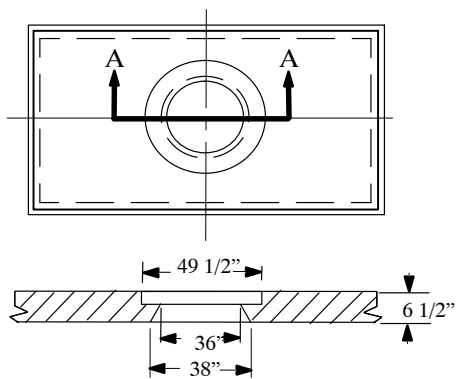
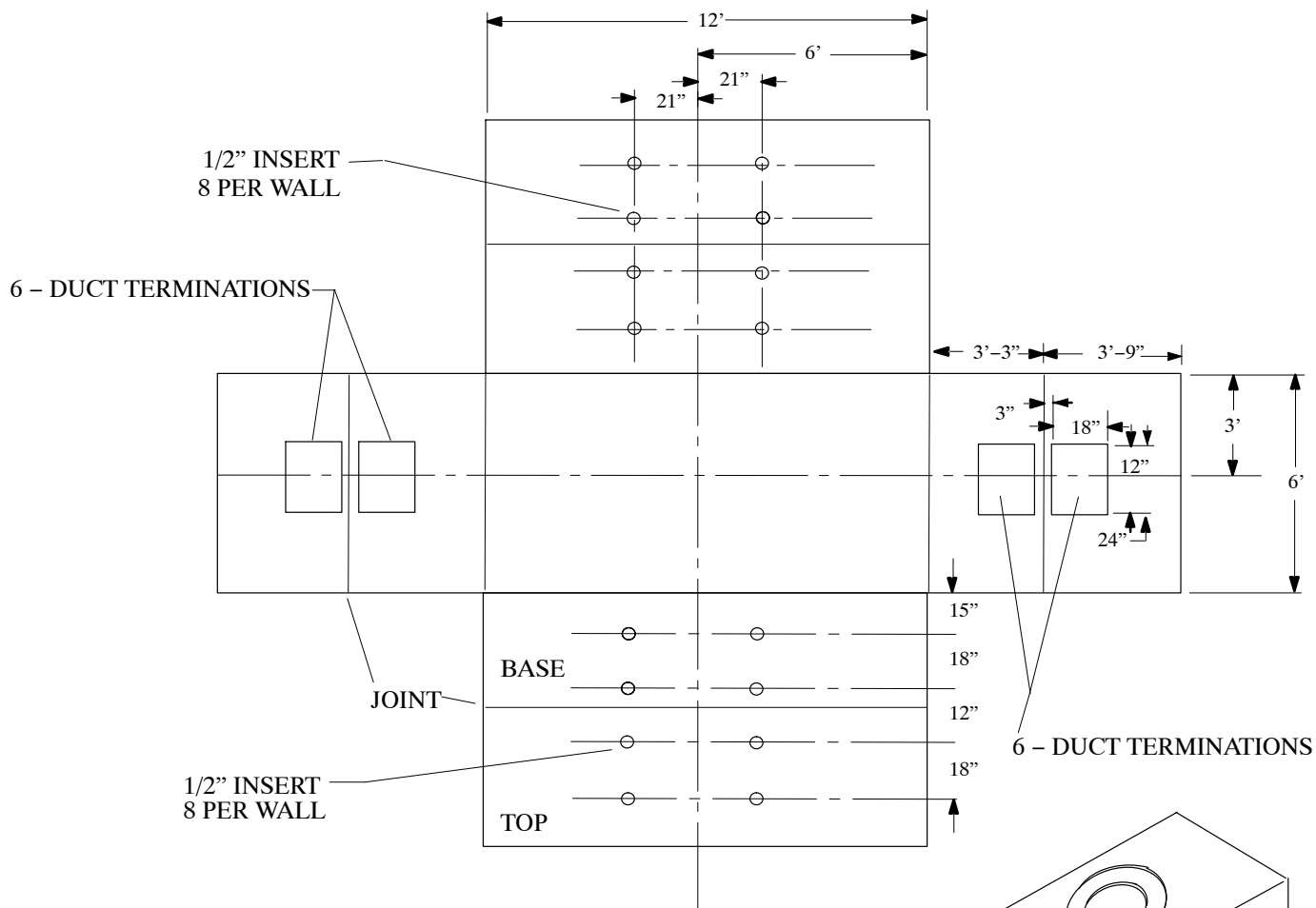
		Std. / Stk. No.	Description	32 21 03 **	01	02
@ @ @ @ 3 3 3	A	12 06 233	Manhole – Top, Precast Conc.		1	1
		12 06 234	Manhole – Bottom, Precast Conc.		1	1
	B	98 00 006	Concrete – 2 Sac (c.y.)		8	8
	C	33 12 01 01	Neck & Frame – 36" Rd.		1	
		33 12 01 02	Neck & Frame – 3'x5' Deep			1
	D	19 04 327	Grate – 14"		1	1
		MEXC	Excavation (Mach.) (c.y.)		40	53
		MBF	Backfilling (Mach.) (c.y.)		9	24
		ATMP	Tamping (s.f.)		99	99
			Surface Removal (s.f.)		99	99
			Surface Replacement (s.f.)		99	99
	E	33 11 ** **	Wingwall Bays		A/R	A/R
		819	Loading Out (c.y.)		A/R	A/R
	F	98 00 014*	Crushed Rock (c.y.)		1.0	1.0
	G	12 53 017	Shield – Duct, 3" thru 6"		12	12

A/R = As Required

STRUCTURES-MANHOLES
 Straight-Precast
 6'-0" x 12'-0" (Type 38Y-A) (ILLINOIS)

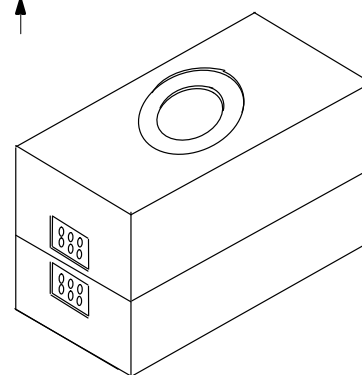
32 21 04 **

Sheet 1 of 2



DIM	MAX	MIN
A	7 5/8"	6 5/8"
B	7 5/8"	6 5/8"

DUCT TERMINATORS
 (5" TYPE EB PVC CONDUIT)



DESCRIPTION

	LENGTH	WIDTH	HEIGHT
INSIDE	12'	6'	7'
OUTSIDE	13'-1"	7'-1"	8'

WEIGHT
 14,000 Lb. MAX.
 EACH SECTION.
 TRAFFIC RATED DESIGN

STRUCTURES-MANHOLES
Straight-Precast
6'-0" x 12'-0" (Type 38Y-A) (ILLINOIS)

32 21 04 **

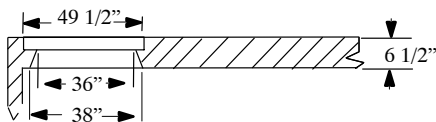
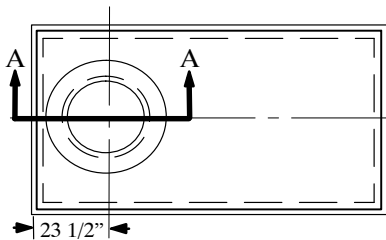
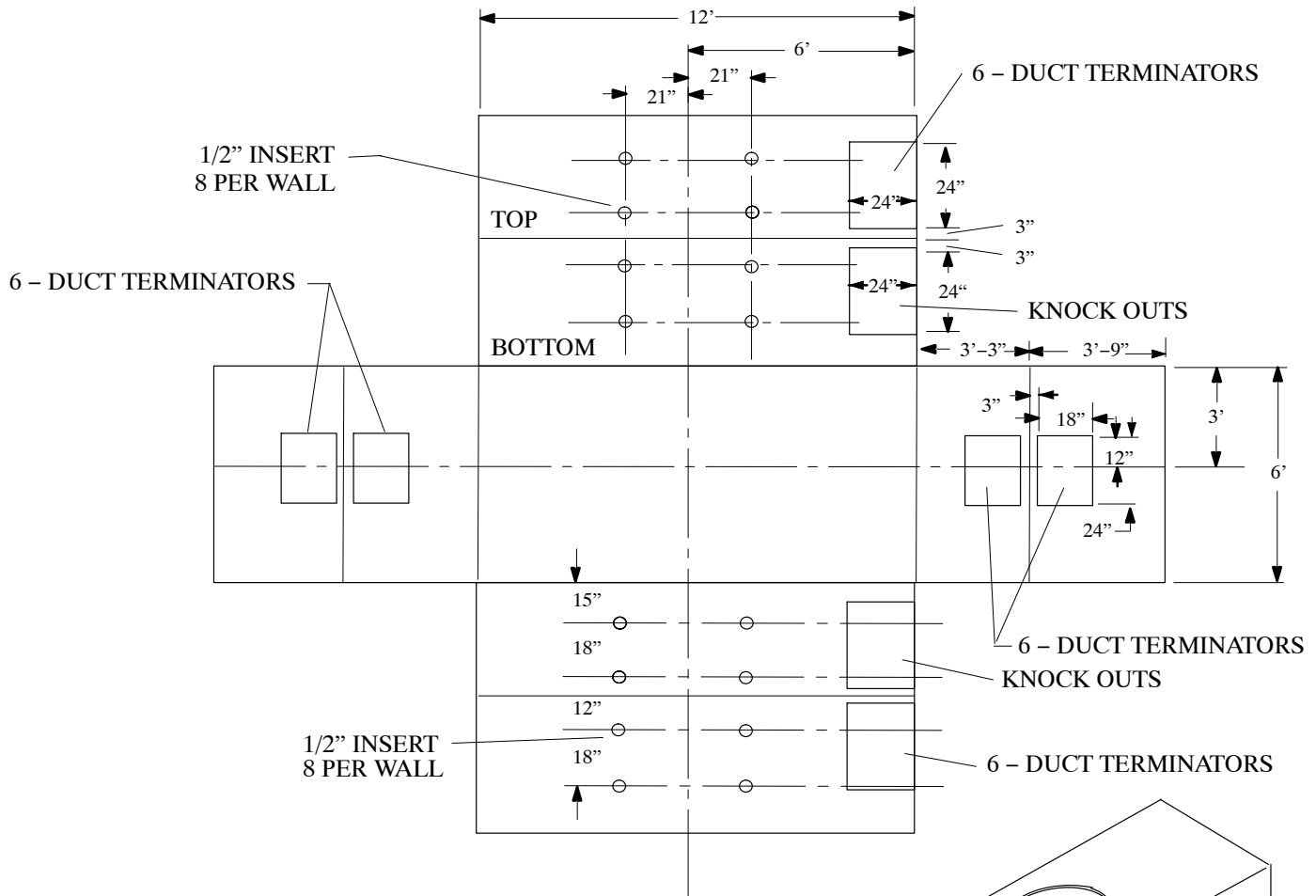
Sheet 2 of 2

NECK STYLE

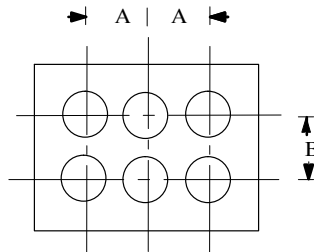
32" Round x 5-5/8" Deep 32 21 04 01

32" Round x 10" Deep 32 21 04 02

		Std. / Stk. No.	Description	01	02
	A	12 06 223	Manhole - Top, Precast Conc. (Type 38Y-A)	1	1
		12 06 224	Manhole - Bottom, Precast Conc. (Type 38Y-A)	1	1
	B	33 12 02 01	Manhole Frame and Cover - Shallow	1	
		33 12 02 02	Manhole Frame & Cover - Standard		1

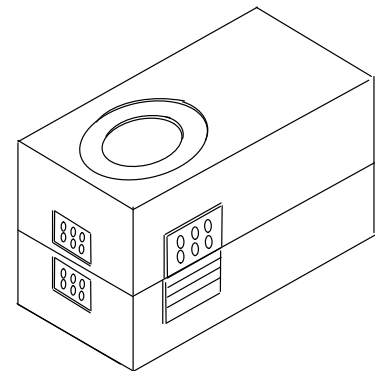


SECTION A-A



DIM	MAX	MIN
A	7 5/8"	6 5/8"
B	7 5/8"	6 5/8"

DUCT TERMINATORS
(5" TYPE EB PVC CONDUIT)



WEIGHT
14,800 Lb. MAX.
EACH SECTION.
TRAFFIC RATED DESIGN

STRUCTURES-MANHOLES
Straight-Precast
6'-0" x 12'-0" (Type 38Y-J4 Roof A) (ILLINOIS)

32 21 05 **

Sheet 2 of 2

NECK STYLE

32" Round x 5-5/8" Deep 32 21 05 01

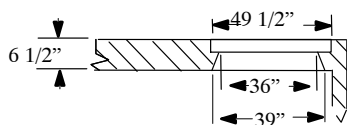
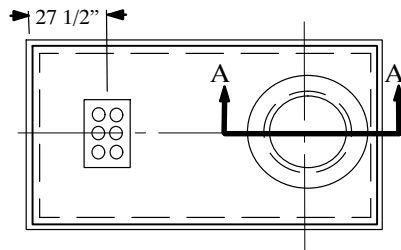
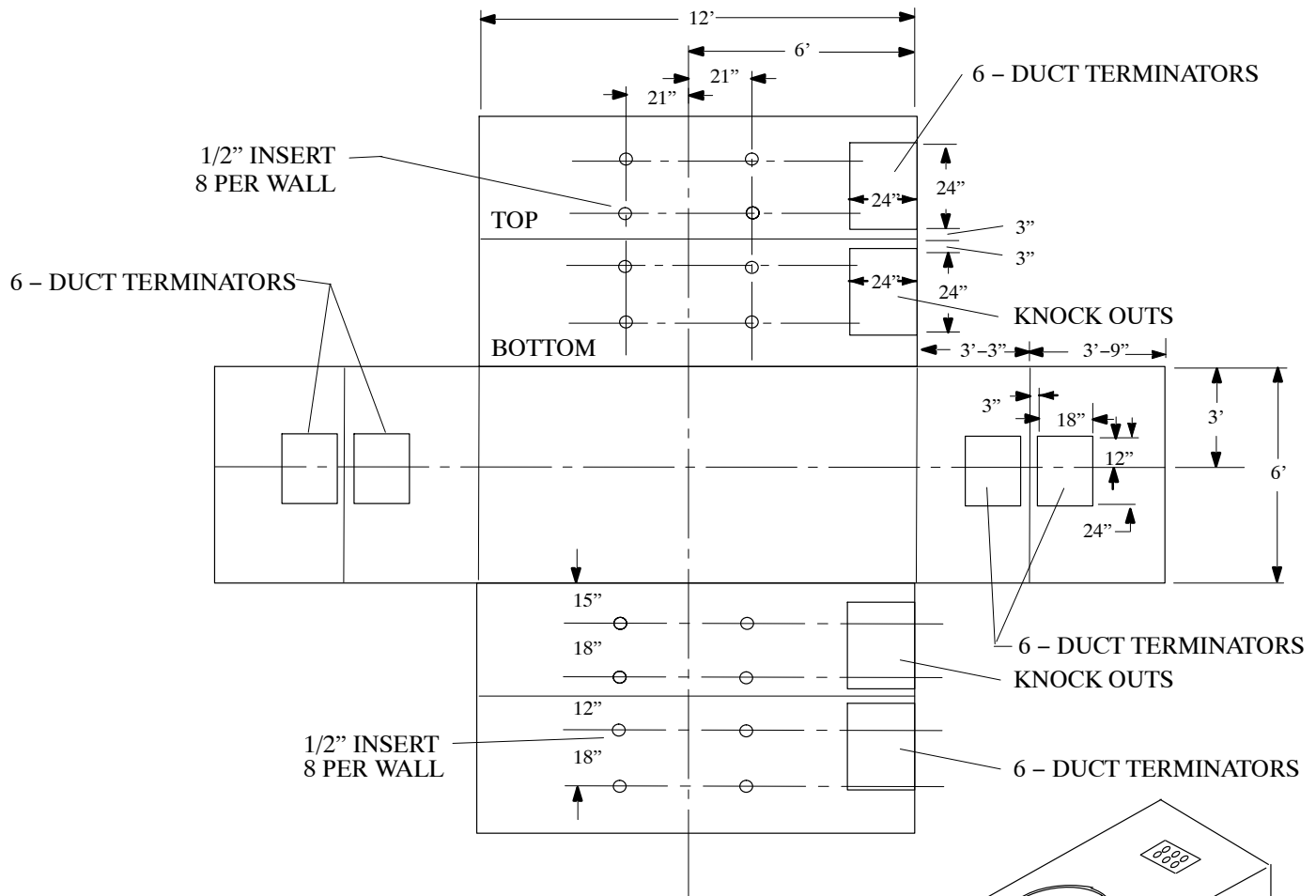
32" Round x 10" Deep 32 21 05 02

		Std. / Stk. No.	Description	01	02
	A	12 06 225	Manhole - Top, Precast Conc. (Type 38Y-J4 Roof A)	1	1
		12 06 226	Manhole - Bottom, Precast Conc. (Type 38Y-J4 Roof A)	1	1
	B	33 12 02 01	Manhole Frame and Cover - Shallow	1	
		33 12 02 02	Manhole Frame & Cover - Standard		1

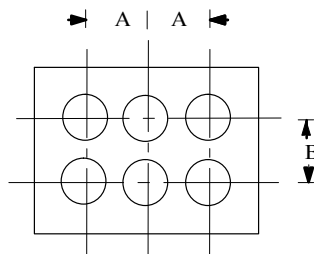
STRUCTURES-MANHOLES
 Straight-Precast
 6'-0" x 12'-0" (Type 38Y-J4 Roof D) (ILLINOIS)

32 21 06 **

Sheet 1 of 2

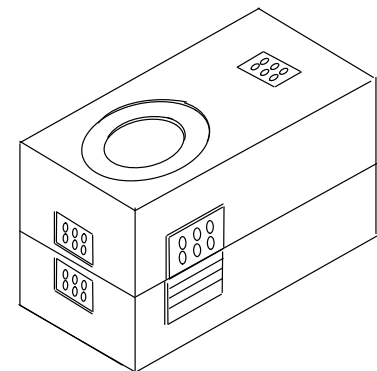


SECTION A-A



DIM	MAX	MIN
A	7 5/8"	6 5/8"
B	7 5/8"	6 5/8"

DUCT TERMINATORS
 (5" TYPE EB PVC CONDUIT)



WEIGHT
 14,800 Lb. MAX.
 EACH SECTION.
 TRAFFIC RATED DESIGN

STRUCTURES-MANHOLES
Straight-Precast
6'-0" x 12'-0" (Type 38Y-J4 Roof D) (ILLINOIS)

32 21 06 **

Sheet 2 of 2

NECK STYLE

32" Round x 5-5/8" Deep 32 21 06 01

32" Round x 10" Deep 32 21 06 02

		Std. / Stk. No.	Description	01	02
	A	12 06 227	Manhole - Top, Precast Conc. (Type 38Y - J4 Roof D)	1	1
		12 06 228	Manhole - Bottom, Precast Conc (Type 38Y-J4 Roof D)	1	1
	B	33 12 02 01	Manhole Frame and Cover - Shallow	1	
		33 12 02 02	Manhole Frame & Cover - Standard		1

STRUCTURES – MANHOLES

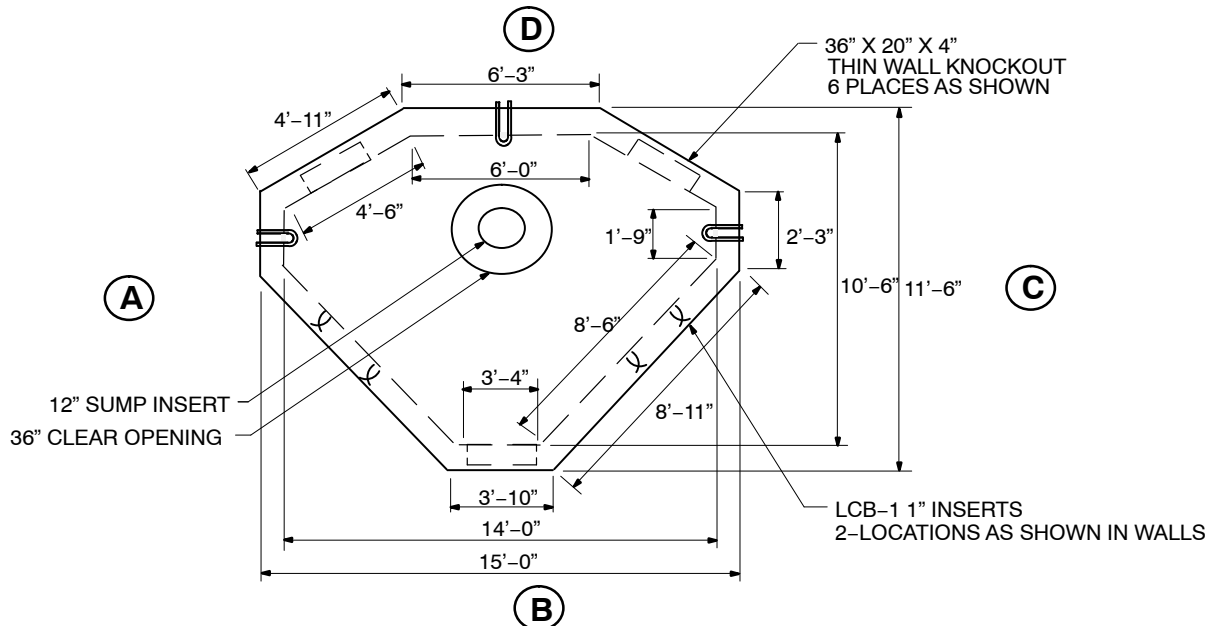
3 – Way – Precast

10'-6" x 14'-0" x 7'-0" ←

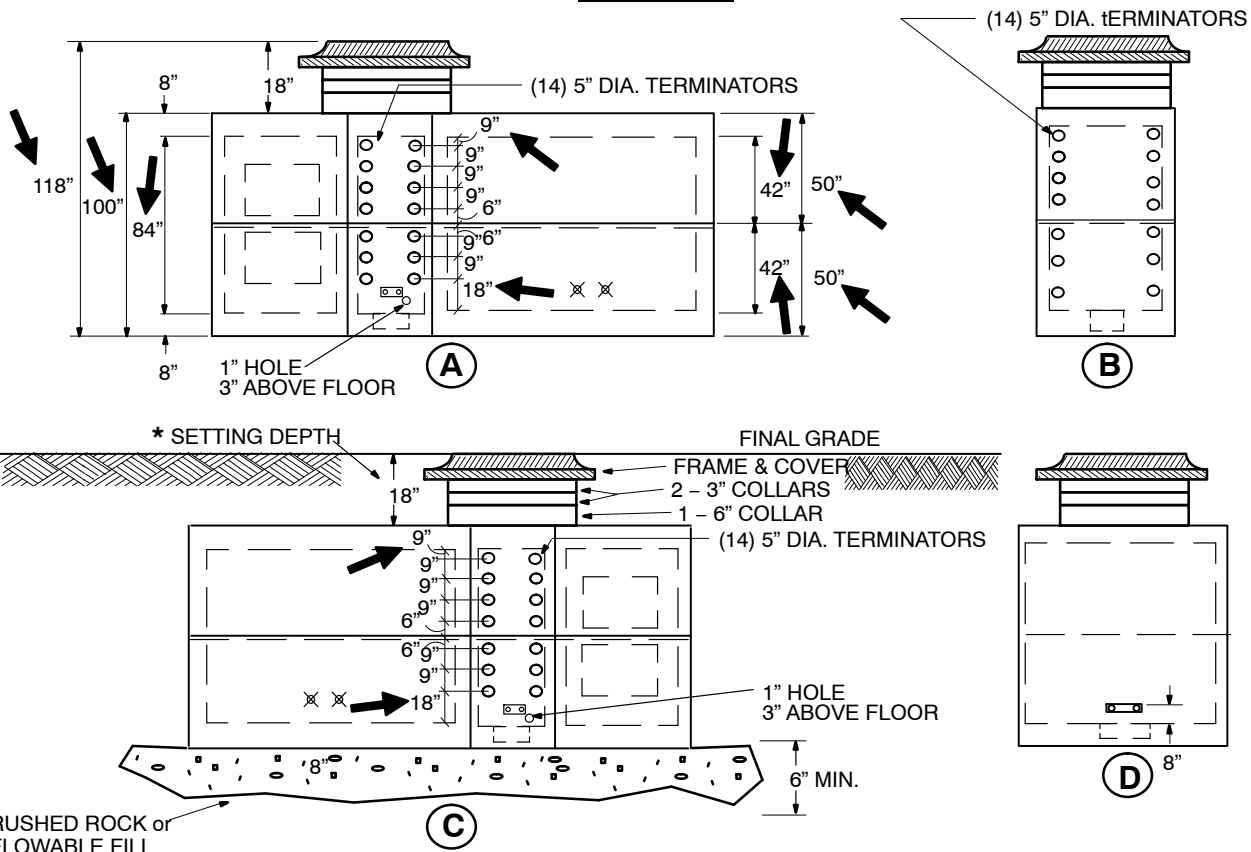
32 22 01 **

Sheet 1 of 2

TOP VIEW



SIDE VIEWS



COLLAR CONFIGURATION

PREFERRED – 1-6" & 2-3"
3" NECKS ARE REQUIRED ON ALL MANHOLES
AND SHALL BE TOP COLLARS

* SETTING DEPTHS

COORDINATE W/AMEREN REP.
PREFERRED – 18" (AS SHOWN)
MINIMUM – 12" TO FINAL GRADE
MAXIMUM – 60" TO FINAL GRADE

WEIGHTS

TOP SECTION 21,609 lbs.
BASE SECTION 22,305 lbs.
TOTAL 43,914 lbs.

TRAFFIC RATED DESIGN

DISTRIBUTION
CONSTRUCTION STANDARDS



ENG:EJB
REV. NO: 9
REV. DATE: 04/23/14

STRUCTURES – MANHOLES

3 – Way – Precast

10'-6" x 14'-0" x 7'-0" ←

32 22 01 **

Sheet 2 of 2

NECK STYLE

36" Round – 32 22 01 01

36" Round x 5' Deep – 32 22 01 02

NOTE

1. 4.586 Cubic yards of dirt removed per foot of excavation.
2. Add the required number of 6" concrete (Stk. # 12 06 063) and 3" concrete (Stk. # 12 06 062) necks so that the frame and cover are at final grade.
3. Manholes are equipped with the cable mounting racks. Add the required number of cable mounting arms to suspend the installed cables.
4. Set the manhole at the "Preferred Depth" or contact company rep. if not achievable.

		Std. / Stk. No.	Description	32 22 01 **	01	02
@	A	12 06 237	Manhole – Top, Precast Conc.		1	1
		12 06 238	Manhole – Bottom, Precast Conc.		1	1
	B	98 00 006	Concrete – 2 Sack (c.y.)		14	14
	C	12 51 156	Coupling – Conduit, 5” Plastic (avg.)		26	26
	D	19 04 327	Grate – 14”		1	1
	E	33 11 ** **	Wingwall Bays		1	1
	F	33 12 01 01	Neck & Frame – 36” Rd.		1	
		33 12 01 02	Neck & Frame – 3’ x 5’ Deep			1
@		MEXC	Excavation (Mach.) (c.y.)		46	65
		MBF	Backfilling (Mach.) (c.y.)		12	28
		ATMP	Tamping (s.f.)		124	124
			Surface Removal (s.f.)		124	124
			Surface Replacement (s.f.)		124	124
		819	Loading Out (c.y.)		A/R	A/R
3	G	98 00 014	Crushed Rock (c.y.)		2	2
	H	12 53 017	Shield – Duct, 3” thru 6”		26	26
	I	12 56 113	Arm–Cable Mounting 14”		A/R	A/R
	J	12 56 112	Arm–Cable Mounting 18”		A/R	A/R
	K	12 56 114	Arm–Cable Mounting 7 1/2”		A/R	A/R
	L	12 06 062	Neck – Manhole, 36” ID x 52” OD x 3” Thick		A/R	A/R
	M	12 06 063	Neck – Manhole, 36” ID x 52” OD x 6” Thick		A/R	A/R

A/R =As Required

UNDERGROUND STRUCTURES

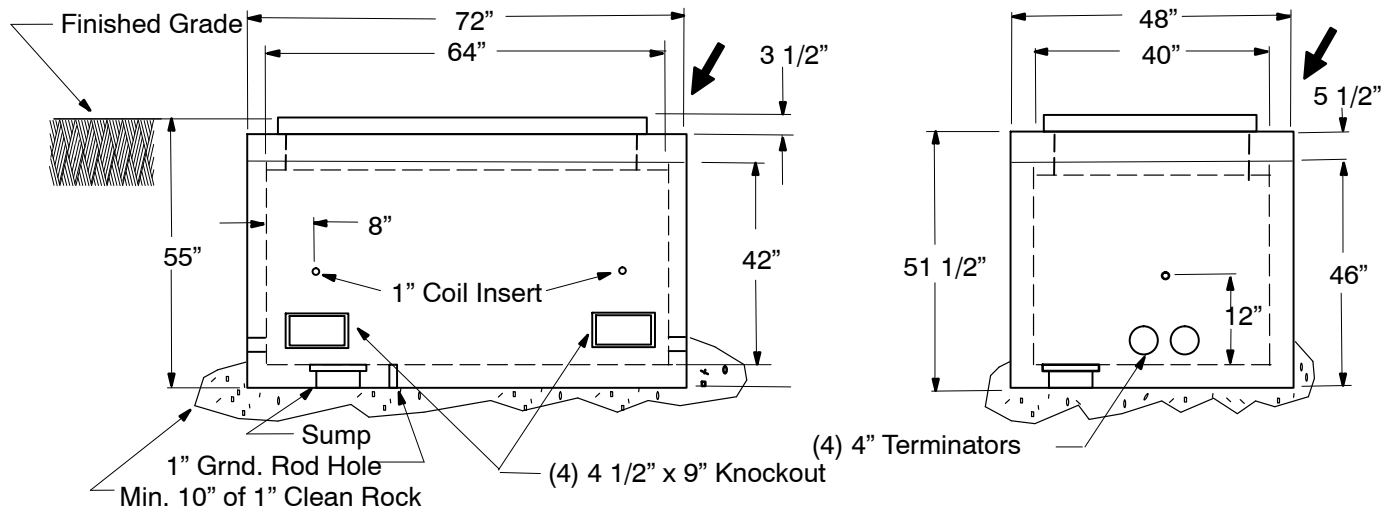
Vault – Precast 3' x 5' – 42" deep

For #2 & 4/0 Al, CNR, 15kV 2–4" PVC Couplings Each End

32 24 01 **

Sheet 1 of 1

****THIS VAULT DOES NOT HAVE A TRAFFIC RATING.****



Grade adjustments shall be made using the riser to meet the existing slope. The vault floor shall always be installed level.

1. Locate this vault out of the way of vehicular traffic.
2. Excavate a 5' x 7' pit to a depth necessary to obtain minimum cover for the conduits. Outside dimensions are L-72"; W-48"; H-55"; Riser 6" tall. NOTE: RISER MUST BE USED.
3. Fill with crushed rock leveling the rock and tamping to firm wherever the earth has been disturbed.
4. Use swivel plates mounted to the Richmond inserts with lag bolts that "Firmly" fasten the plate against the wall.
5. Place conduits into ducts or Knockouts as required. Grout or mortar around ducts entering thru Knockouts.
6. FILL & TAMP – Replace and stabilize the earth around the vault and riser tamping to compaction.
7. Brick and mortar between riser and keyway in manhole to accommodate the grade slope. Seal the cover frame to the riser with aquaseal. Install pulling eyes firmly into wall above conduits.
8. WEIGHTS: Vault = 4200 lbs, Riser = 665 lbs, Cover = 500 lbs.
9. Sod or resurface grade as necessary.
10. In Missouri residential developments, the contractor will install the vault and conduit. See Stds. 32 24 01 03 and 32 24 01 04.
11. Install 3" to 6" duct shields (12-53-017) as required.

	Std. / Stk. No.	Description	UNIT	LEVEL 01	SLOPED 02	LEVEL 03	SLOPED 04
	12 06 097	Vault – Precast 3' x 5'	Ea	1	1		
	12 02 100	Cover – Vault Galv. Stl. 42" x 66"	Ea	1	1		
	98 00 014	Rock – Crushed	Cy	1	1		
	23 59 076	Eye – Pulling	Ea	2	2	2	2
	MEXC	Mechanical Excavation	Cy	11	13		
	MBF	Mechanical Backfill	Cy	2	3		
	ATMP	Air Tamping	S.F.	32	40		
	25 54 053	Compound – Sealer Aqua	Rq'd	1	1		
	19 04 352	Grate – Sewer 10" Round		1	1	1	1
	2399	Install Conduit	MH/10	50	60		
@	701	Knockout – Conduit preparation	--	--	--		
@	849	Resurfacing	--	--	--		

**DISTRIBUTION
CONSTRUCTION STANDARDS**



ENG: EJB
REV. NO: 10
REV. DATE: 01/12/16

UNDERGROUND STRUCTURES

Vault – Precast 4' x 8' – 4 Ft. deep

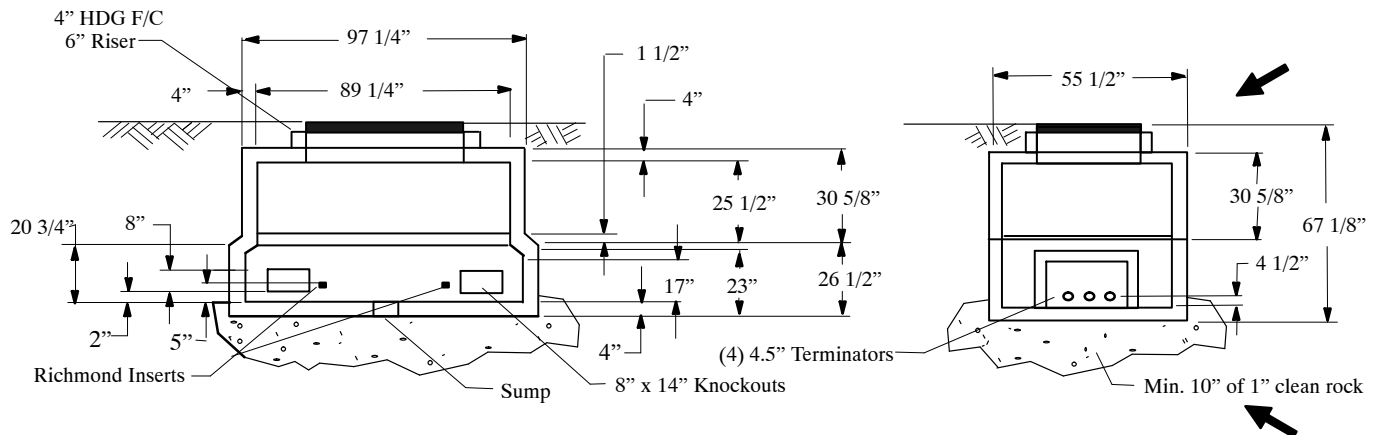
For 750 kcmil Al, Cu, 15kV 3–5" PVC Couplings Each End

32 24 02 **

Sheet 1 of 1

Grade adjustments shall be made using the riser to meet the existing slope. The vault floor shall always be installed level.

**** THIS VAULT DOES NOT HAVE A TRAFFIC RATING****



NOTES:

1. Locate this vault out of the way of vehicular traffic.
2. Excavate a 6' x 11' pit to a depth necessary to obtain minimum cover for the conduits. Outside vault dimensions: L-8'10"; W-5'6"; H-5'-10"; Riser 6" tall. NOTE: RISER MUST BE USED.
3. Fill any overdig with crushed rock leveling the rock and tamping to firm wherever the earth has been disturbed.
4. Use swivel plates mounted to the Richmond inserts with lag bolts that "Firmly" fasten the plate against the wall.
5. Place conduits into ducts or Knockouts as required. Grout or mortar around ducts entering thru Knockouts.
6. FILL & TAMP – Replace and stabilize the earth around the vault and riser tamping to compaction.
7. Brick and mortar between riser and keyway in manhole to accommodate the grade slope. Seal the cover frame to the riser with aquaseal. Install pulling eyes firmly into wall above conduits.
8. WEIGHTS: Bottom = 4560 lbs., Top = 4420 lbs., Riser = 365 lbs., Cover = 500 lbs.
9. Sod or resurface grade as necessary.
10. In Missouri residential developments, the contractor will install the vault and conduits. See Stds. 32 24 02 03 and 32 24 02 04.
11. install 3" to 6" duct shields (12-53-017) as required.

Std./Stk. No.	Description	UNIT	LEVEL 01	SLOPED 02	LEVEL 03	SLOPED 04
12 06 096	Vault – Precast 4' x 8'	Ea	1	1		
12 06 192	Riser – Neck 6" Extension	Ea	1	1		
12 02 100	Cover – Vault Galv. Stl. 42" x 66"	Ea	1	1		
98 00 014	Rock – Crushed	Cy	2	2		
23 59 076	Eye – Pulling	Ea	2	2	2	2
MEXC	Mechanical Excavation	Cy	20	23		
MBF	Mechanical Backfill	S.F.	4	6		
ATMP	Air Tamping	MH/10	50	60		
19 04 352	Grate – Cast iron 10" x 3/4	Ea	1	1	1	1
25 54 053	Comp'd – Sealer Aqua	Req'd.	1	1		
2399	Install Conduit	Ea	50	60		
@ 701	Knockout – Conduit preparation	--	--	--		
@ 849	Resurfacing	--	--	--		

**DISTRIBUTION
CONSTRUCTION STANDARDS**



ENG:DDG
REV. NO: 9
REV. DATE: 1/26/11

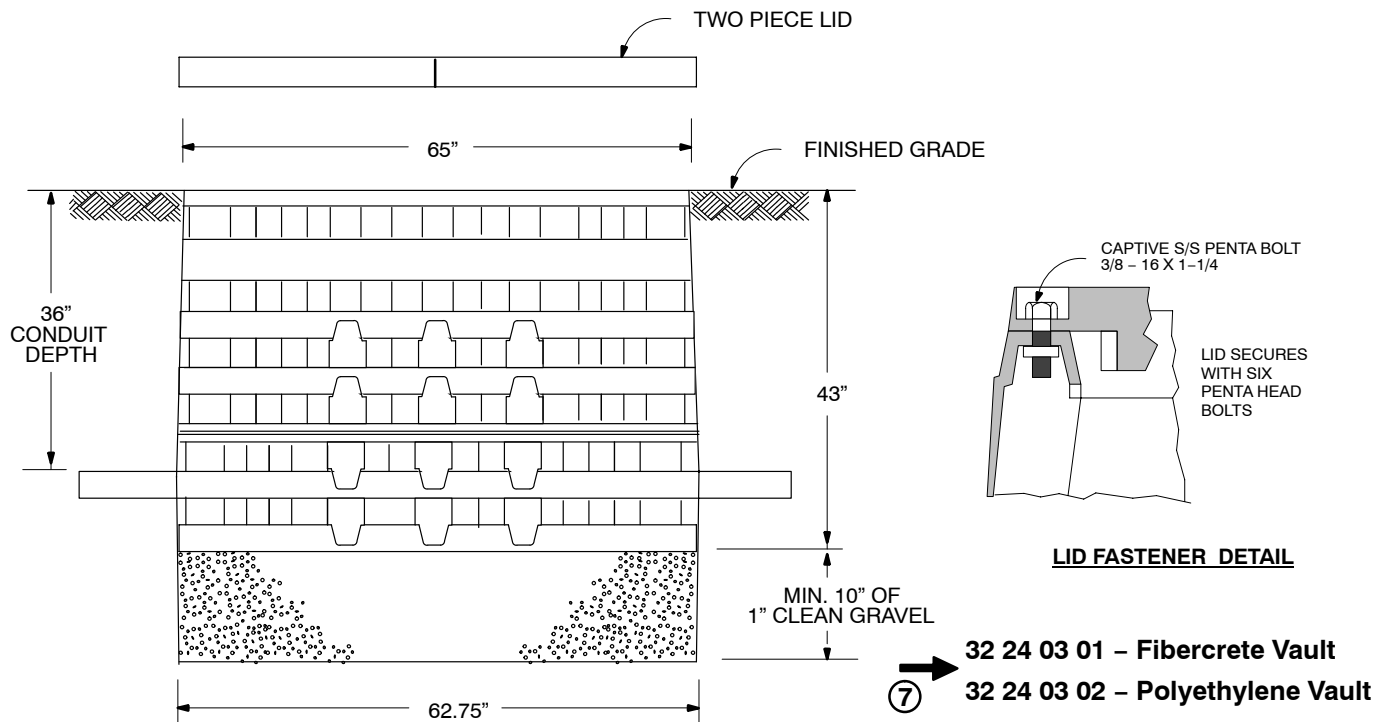
UNDERGROUND STRUCTURES

Vault – Polyethylene/Fibercrete 3' x 5' – 42"
For #2 & 4/0 Al, CNR, 15 kV 2 – 4" Couplings Each End

32 24 03 **

Sheet 1 of 1

**** THIS VAULT DOES NOT HAVE A TRAFFIC RATING ****



Instructions :

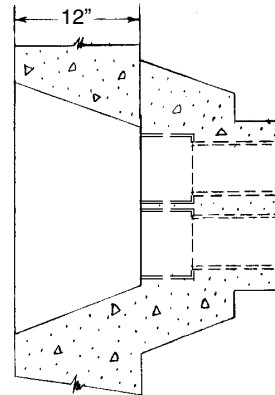
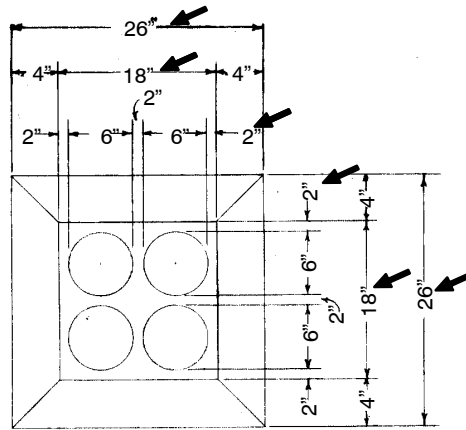
1. Locate this vault out of the way of vehicular traffic.
2. Excavate and install vault at standard conduit depths on 10" base of 1" gravel.
3. Fill any overdig with crushed rock levelling the rock and tamping firm.
4. Install conduits in couplings or drill holes in desired conduit locations.
5. FILL & TAMP – Replace and stabilize the earth around the vault tamping to compaction.
6. Sod or resurface grade as necessary.
7. Only use Polyethylene vault when Fibercrete vault is too heavy to transport – such as on private property.
8. Install 3" to 6" duct shields (12-53-017) as required.

Std. / Stk. No.	Description	32 24 03 **	Unit	01	02	Weight
12 06 122	Vault – 3' x 5' – Fibercrete		Ea.	1		1136 lbs.
12 06 259	Vault – 3' x 5' – Polyethylene		Ea.		1	420 lbs.
98 0014	Rock – Crushed		Cy	1	1	
MEXC	Mechanical Excavation		Cy	11	11	
MBF	Mechanical Backfill		Cy	2	2	
ATMP	Air Tamping		S.F.	32	32	
19 04 352	Grate – Sewer 10" Round		Ea.	1	1	
2399	Install Conduit		MH/10	50	50	
@ 701	Drill Hole in Vault		–	–	–	
@ 849	Resurfacing		–	–	–	

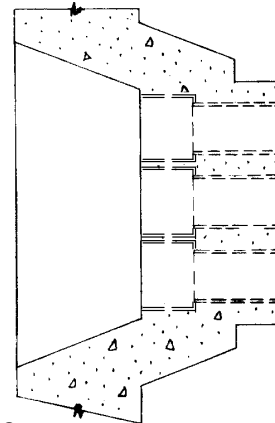
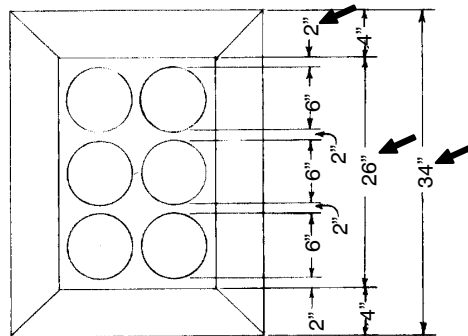
**DISTRIBUTION
CONSTRUCTION STANDARDS**



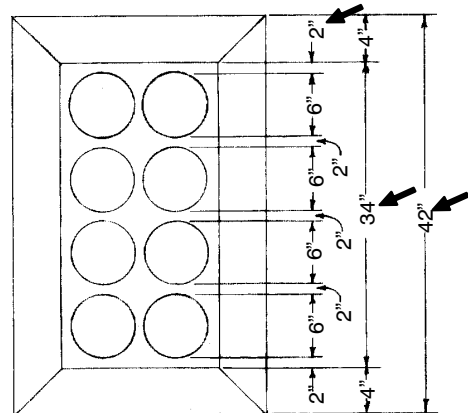
ENG:JMW
REV. NO: 4
REV. DATE: 06/26/2018



33 11 01 01
4 DUCT RECESS



33 11 01 02
6 DUCT RECESS



33 11 01 03
8 DUCT RECESS

Two or more ducts may be omitted if not required.

STRUCTURES – ACCESSORIES

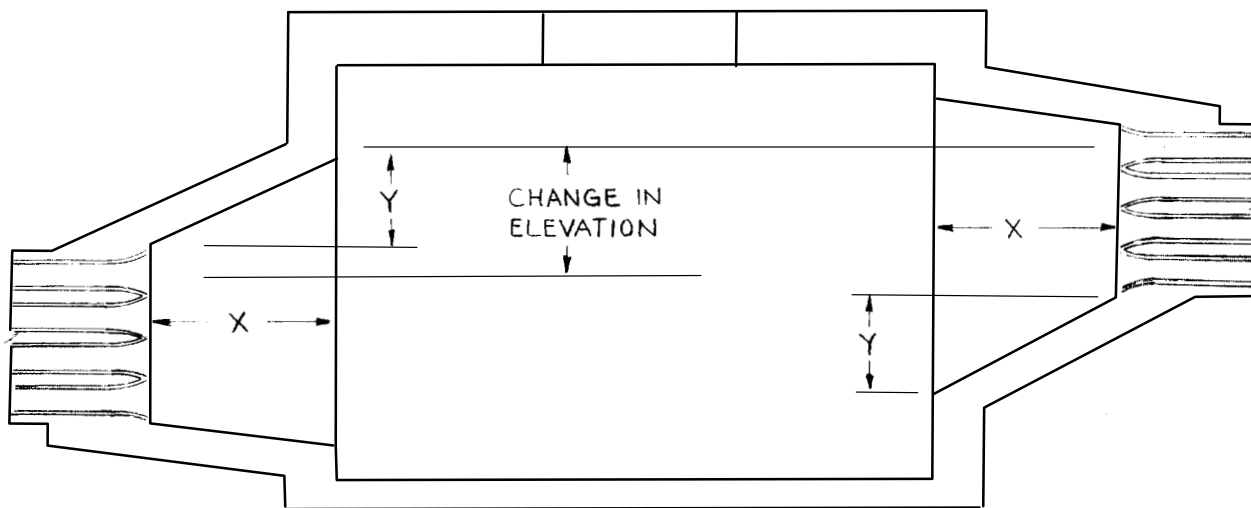
12" Recess Construction

33 11 01 **

Sheet 2 of 2

33 11 01 01 4 Duct Recess
 33 11 01 02 6 Duct Recess
 33 11 01 03 8 Duct Recess

		Std. / Stk. No.	Description	33 11 01 **	01	02	03
	A	98 00 005	Concrete – M.H. (c.y.)		1	1	1
	B	12 51 156	Coupling – 5", PVC		4	6	8
		MEXC	Excavation (Mach.) (c.y.)		3	3	3
		WFOR	Installing and Removing Forms (S.F.)		11	13	14
		MBF	Backfilling (Mach.) (c.y.)		1	1	1
		ATMP	Tamping (s.f.)		7	7	8
@			Surface Removal (s.f.)		7	7	8
@			Surface Replacement (s.f.)		7	7	8



Difference In Elevation (Ft.)	Dimension "X"	Dimension "Y"	Standard No.
3 to 4	24"	12"	33 11 02 01
4 to 5	30"	24"	33 11 02 02

NOTES:

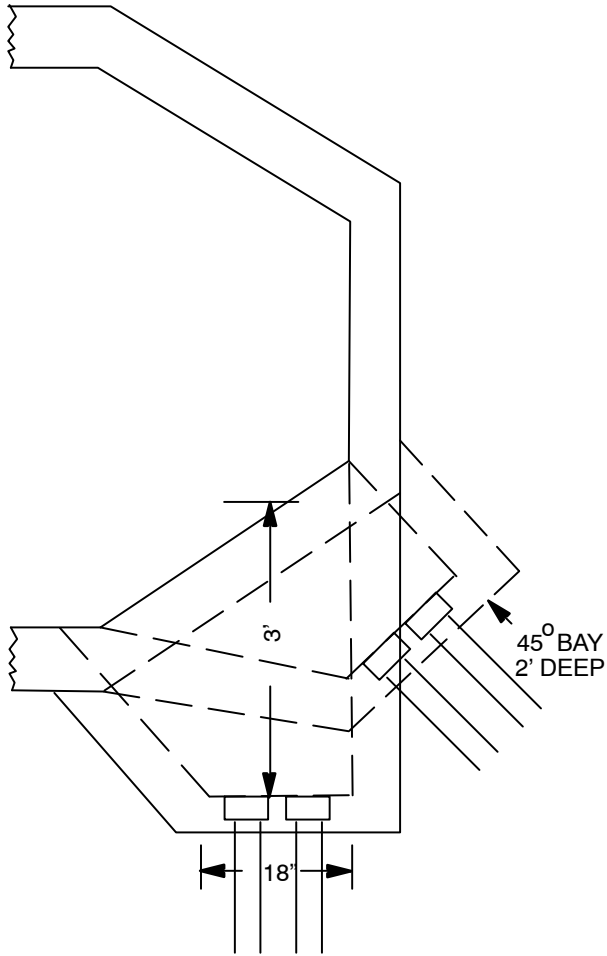
- 6'-0" x 17'-6" manholes do not require end-wall bays or recesses.
- 12" recesses are adequate for changes in duct elevation up to 3 ft.
- Bay mouth width shall be 30 inches.
- When horizontal angle of conduit entering end-wall bay exceeds 15° from long axis of manhole, build bay 30" deep regardless of change in elevation (except 6'-0" x 17'-6" manholes).

	Std. / Stk. No.	Description	33 11 02 **	01	02
→	A 98 00 005	Concrete – M.H. (c.y.)		1	1
→	MEXC	Excavation (Mach.) (c.y.)		4	5
→	WFOR	Installing and Removing Forms (S.F.)		20	25
→	MBF	Backfilling (Mach.) (c.y.)		1	1
@	ATMP	Air Tamping (s.f.)		12	14
@		Surface Removal (s.f.)		12	14
@		Surface Replacement (s.f.)		12	14

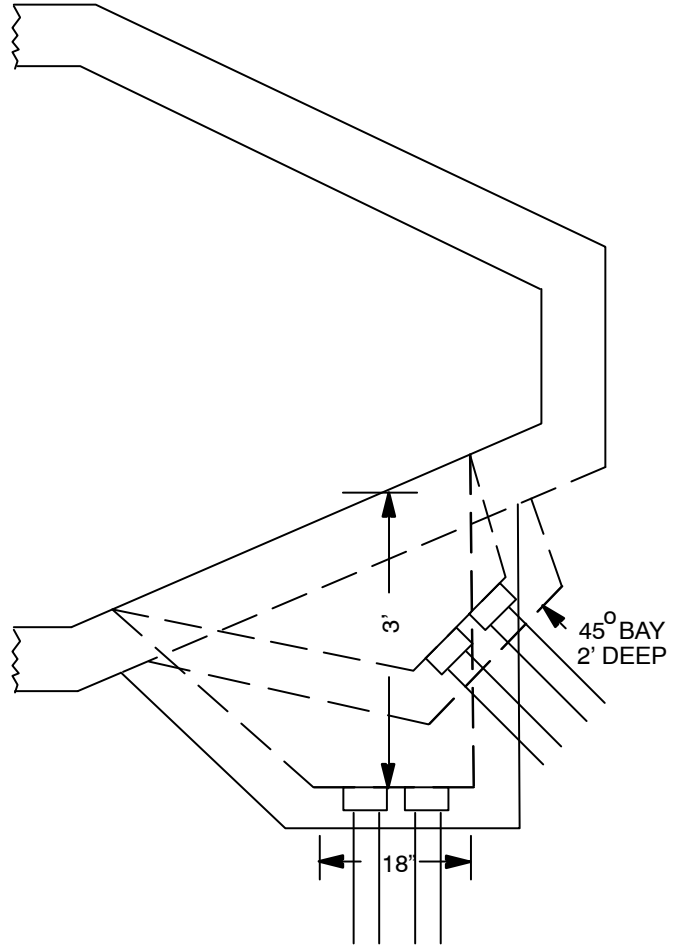
STRUCTURES – ACCESSORIES
Standard Bay Construction
Wing Wall

33 11 03 **

Sheet 1 of 1

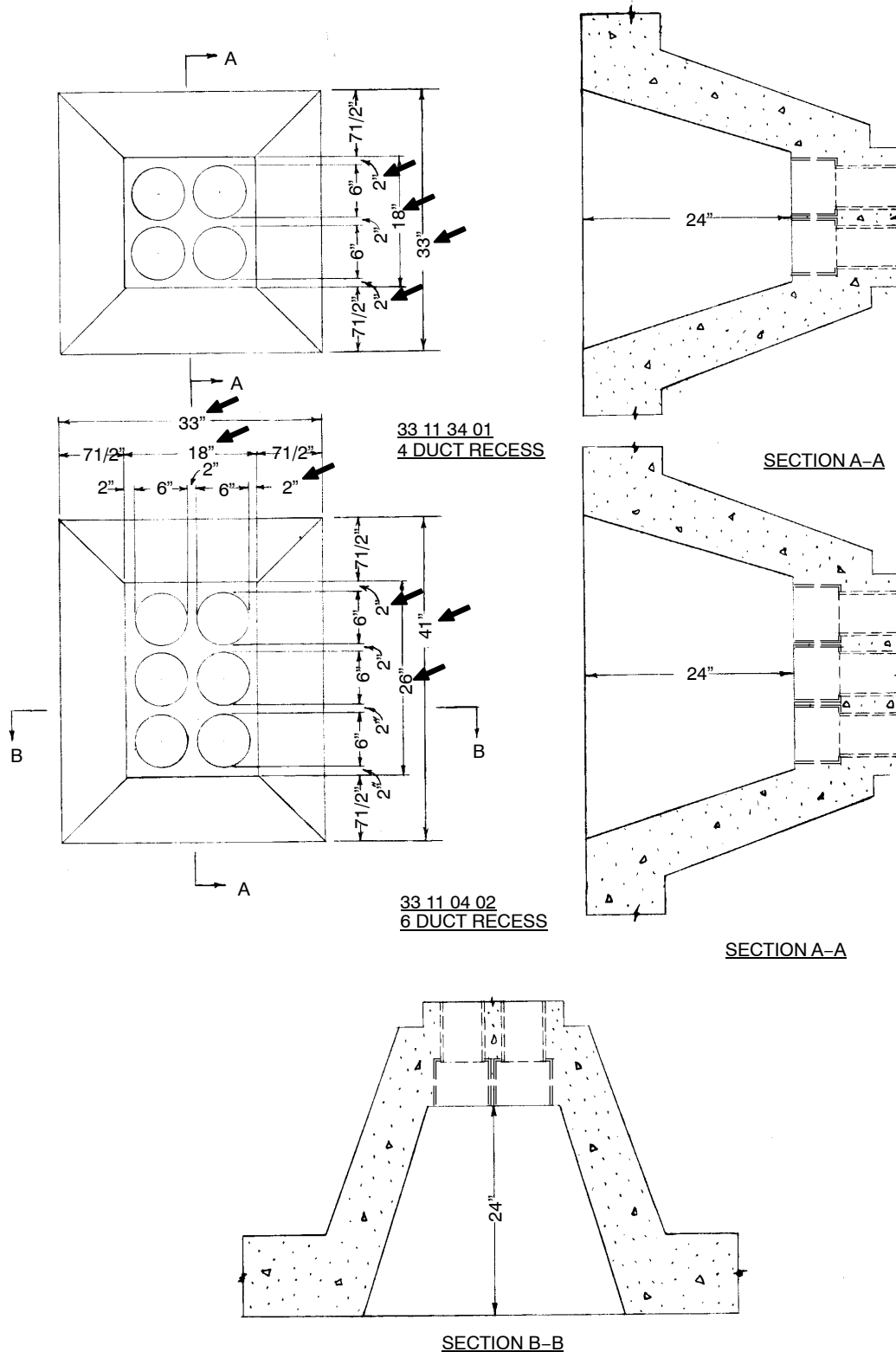


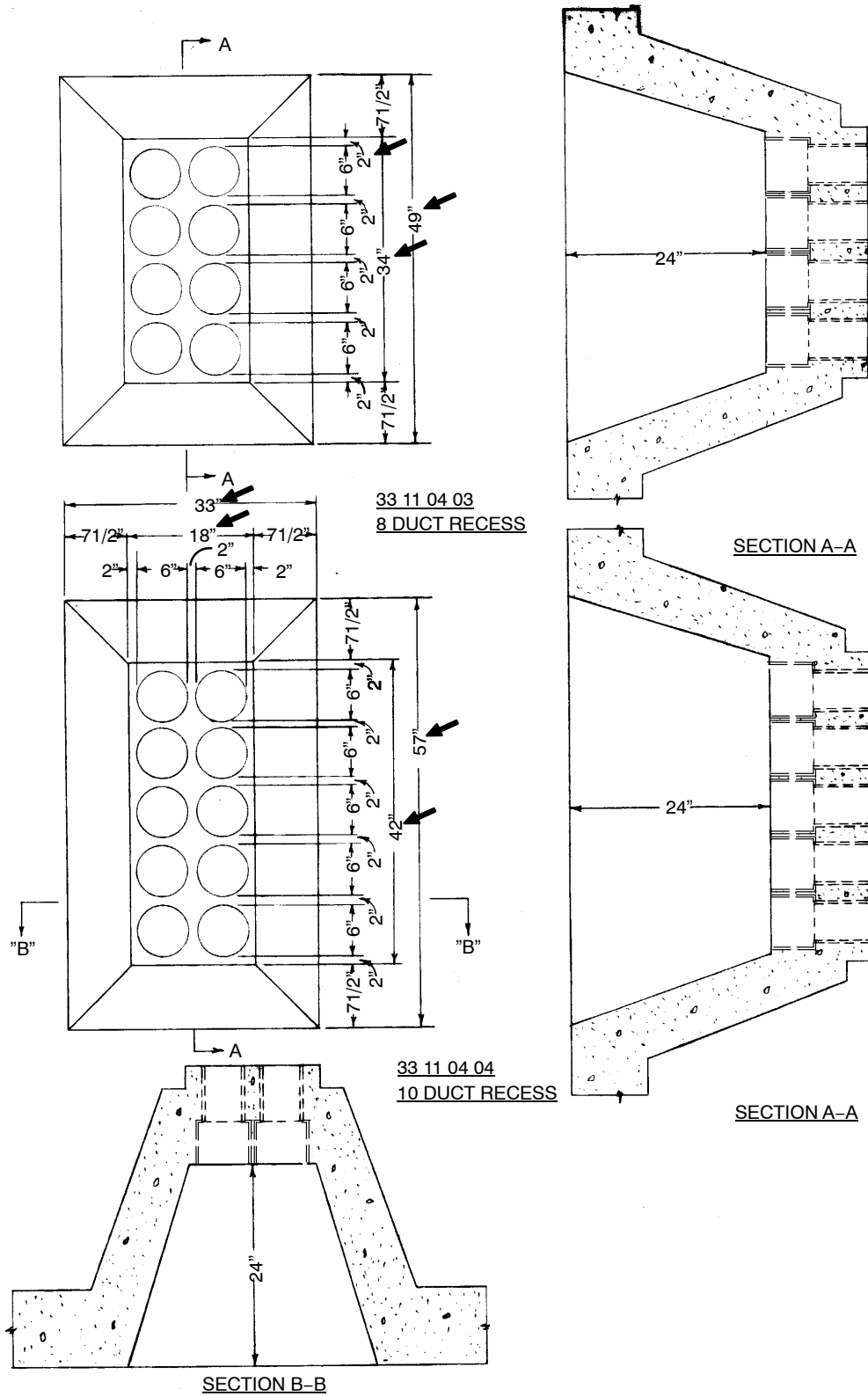
➔ 45° – 90° WINGWALL BAY FOR
10'–0" & 14'–0" LONG MANHOLES
33 11 03 01



45° – 90° WINGWALL BAY FOR
17'–6" LONG MANHOLES
33 11 03 02

		Std. / Stk. No.	Description	33 11 03 **	01	02
@ @	A	98 00 005	Concrete – M.H. (c.y.)		1	1
		MEXC	Excavation (Mach.) (c.y.)		8	8
		WFOR	Installing and Removing Forms (S.F.)		43	43
		MBF	Backfilling (Mach.) (c.y.)		1	1
		ATMP	Tamping (s.f.)		22	22
			Surface Removal (s.f.)		22	22
			Surface Replacement (s.f.)		22	22





STRUCTURES – ACCESSORIES

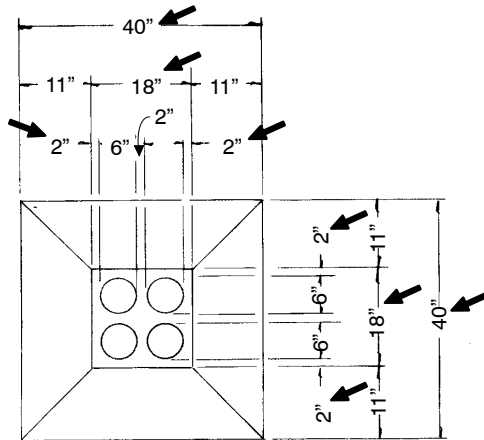
24" Recess Construction

33 11 04 **

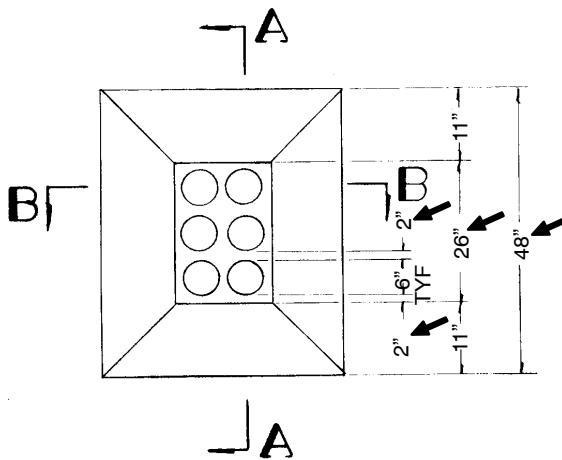
Sheet 3 of 3

33 11 04 01	4 Duct Recess
33 11 04 02	6 Duct Recess
33 11 04 03	8 Duct Recess
33 11 04 04	10 Duct Recess

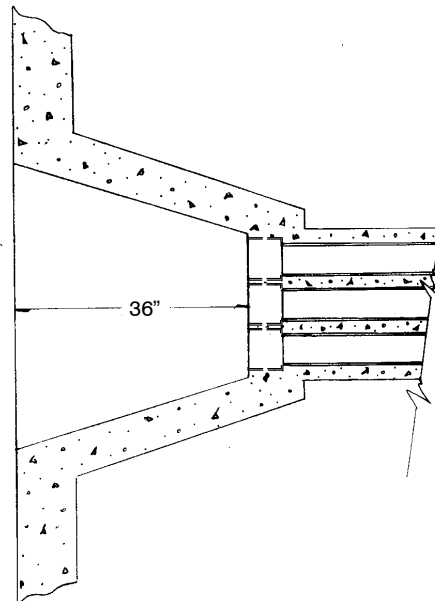
		Std. / Stk. No.	Description	33 11 04 **	01	02	03	04
	A	98 00 005	Concrete – M.H. (c.y.)		1	1	2	2
	B	12 51 156	Coupling – 5", PVC		4	6	8	10
		MEXC	Excavation (Mach.) (c.y.)		4	4	4	14
		WFOR	Installing and Removing Forms (S.F.)		20	23	26	29
		MBF	Backfilling (c.y.)		1	1	1	1
		ATMP	Tamping (s.f.)		12	12	12	12
@			Surface Removal (s.f.)		12	12	12	12
@			Surface Replacement (s.f.)		12	12	12	12
@			Demolition (s.f.)		7	8	10	11



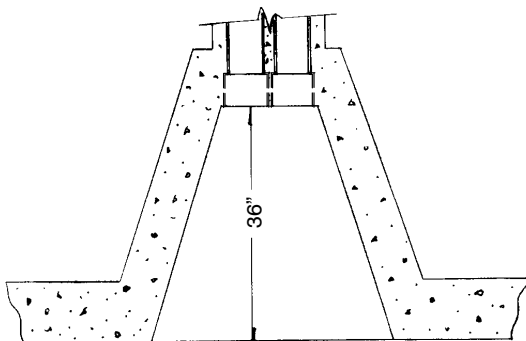
33 11 05 01
4 DUCT BAY



33 11 05 02
6 DUCT BAY



TYPICAL SECTION A-A
(3 DUCT HIGH SHOWN)

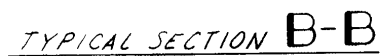


TYPICAL SECTION B-B

STRUCTURES – ACCESSORIES

33 11 05 **

Sheet 2 of 3



ENG: DDG
REV. NO: 3
REV. DATE: 1/16/03
REAFFIRMED DATE: 3/16/09

STRUCTURES – ACCESSORIES

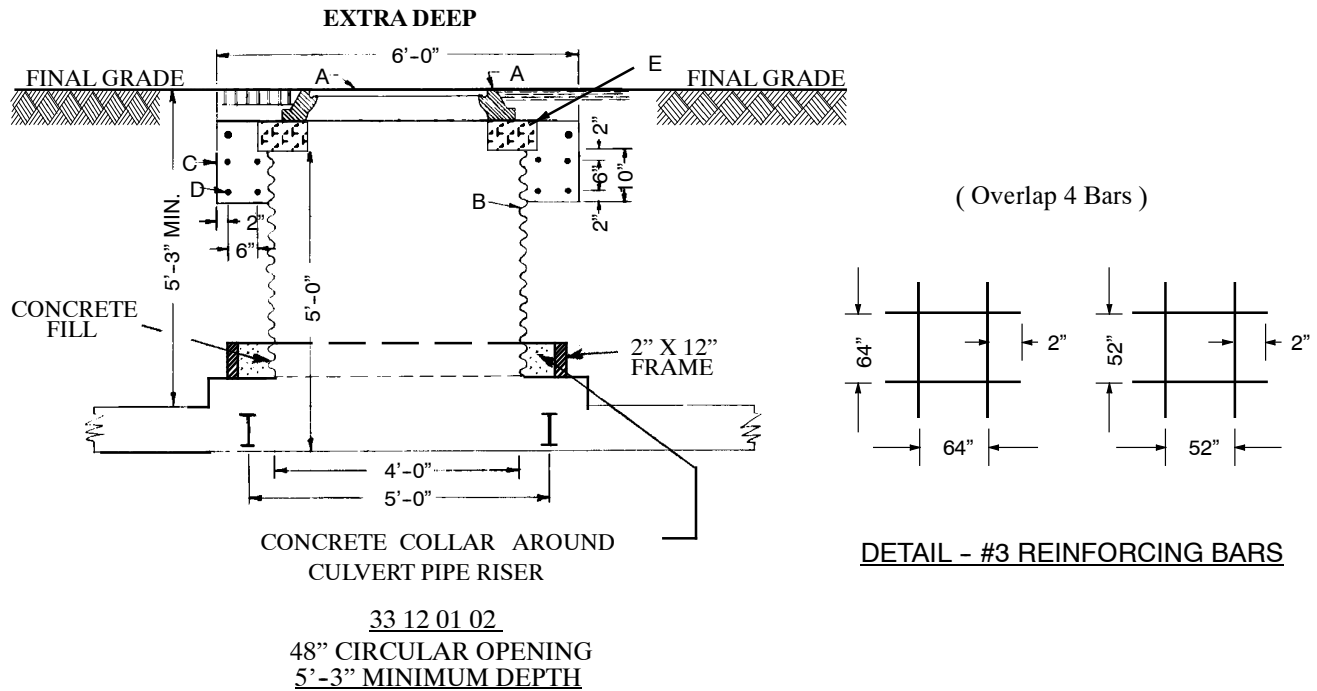
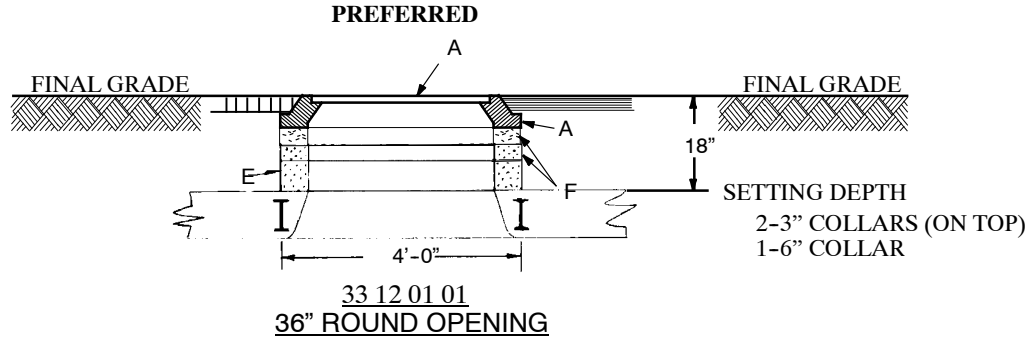
36" Bay Construction

33 11 05 **

Sheet 3 of 3

33 11 05 01	4 Duct Bay
33 11 05 02	6 Duct Bay
33 11 05 03	8 Duct Bay
33 11 05 04	10 Duct Bay

	Std. / Stk. No.	Description	33 11 05 **	01	02	03	04
	A	98 00 005	Concrete – M.H. (c.y.)	2	2	3	3
	B	12 51 156	Coupling – 5", PVC	4	6	8	10
		MEXC	Excavation (Mach.) (c.y.)	5	5	5	5
		WFOR	Installing and Removing Forms	36	39	42	45
		MBF	Backfilling (c.y.)	2	2	2	2
		ATMP	Tamping (s.f.)	18	18	18	18
@			Surface Removal (s.f.)	18	18	18	18
@			Surface Replacement (s.f.)	18	18	18	18
@			Demolition (s.f.)	8	10	11	12



		Std. / Stk. No.	Description	33 12 01 **	Req'd	
					01	02
	A	12 02 085	Frame and Cover		1	1
	B	12 02 076	Pipe, Culvert - 48" x 5'-0"			1
**@		12 02 077	Pipe, Culvert - 48" x 4'-0"			
	C	98 00 005	Concrete, 4000 PSI Cu Yrds			1
*	D	27 02 062	Bar, Reinforcing, #3 16 Ft.			6
	E	12 06 063	Neck - Section, 6" Thk. Conc		1	1
	F	12 06 062	Neck - Section, 3" Thk. Conc		2	

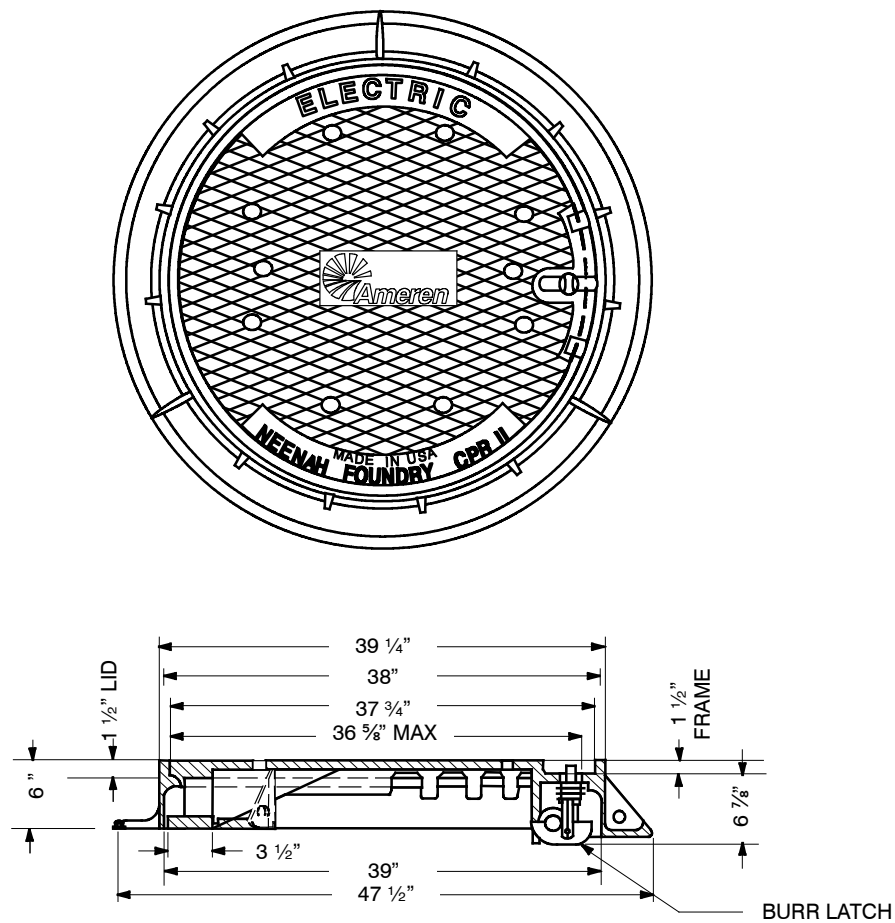
* See Detail

** 4' Length is available

NOTE: Manhole frame extension rings are used to raise the lid.

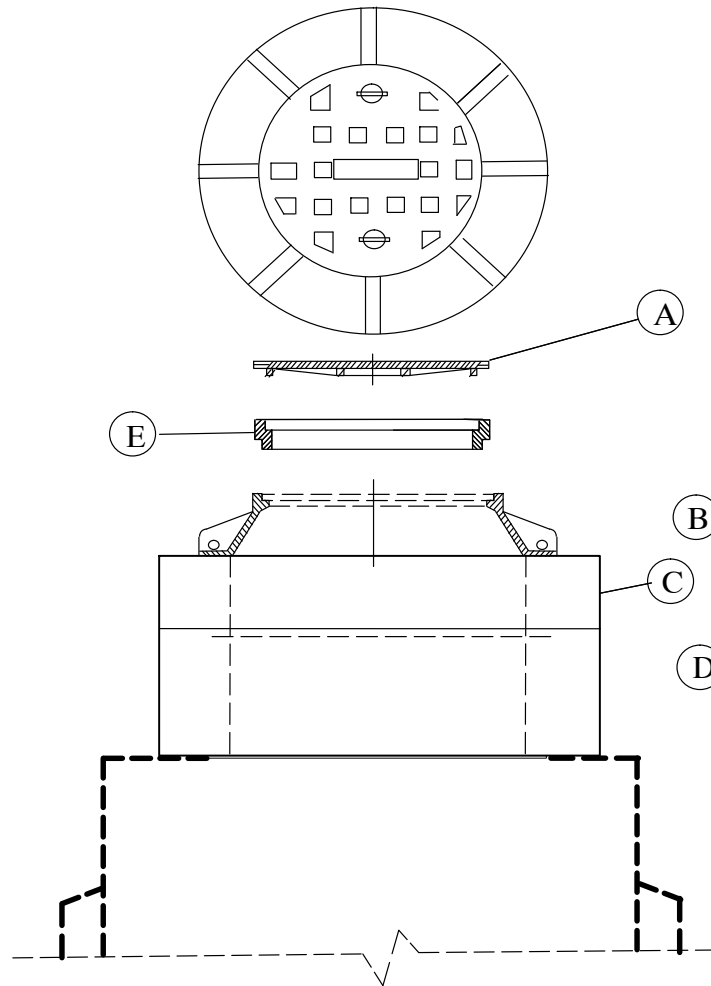
Stk.# 12 52 003 = 1.75" rise and Stk. # 12 52 004 = 2.25" rise.

SwiveLoc Type

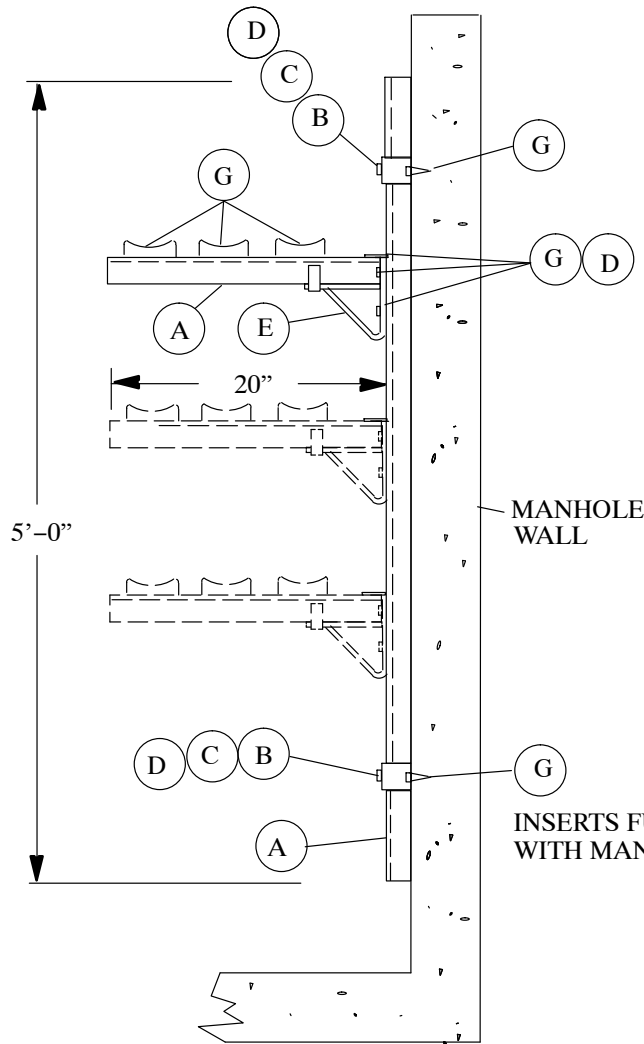


		Dist. Std./ Stk. No.	Description	33 12 01 **	03	04
	A	12 02 108	Frame and Cover - Explosion Mitigation Type		1	1
++@	B	12 02 076	Pipe, Culvert - 48" x 5' -0"			1
		12 02 077	Pipe, Culvert - 48" x 4' -0"			
	C	98 00 005	Concrete, 4000 PSI Cu Yards			1
*	D	27 02 062	Bar Reinforcing, #3 16 ft			6
	E	12 06 063	Neck - Section, 6" Thick Concrete		1	1
	F	12 06 062	Neck - Section, 3" Thick Concrete		2	
@	G	12 02 107	Cover Only - Explosion Mitigation Type		-	-

*See Detail (Sheet 1)

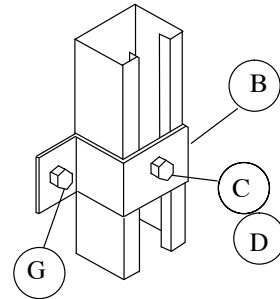


		Std. / Stk. No.	Description	01	02	03	04	05	06
	A	12 02 088	Cover – Manhole, Electric	1	1				
	B	12 06 143	Ring – Manhole, Shallow (H = 5-5/8")	1					
		12 06 144	Ring – Manhole, Standard (H = 10")		1				
	C	12 56 085	Collar – Precast Concrete, 6"			1			
	D	12 56 086	Collar – Precast Concrete, 12"				1		
	E	12 52 089	Ring – Manhole Adjusting, 2"					1	
		12 52 091	Ring – Manhole Adjusting, 3"						1



- 33 20 01 01 – Cable Rack – 1 Circuit
- 33 20 01 02 – Cable Rack – 2 Circuits
- 33 20 01 03 – Cable Rack – 3 Circuits
- 33 20 01 04 – Cable Rack – Add'l Circuit

INSERTS FURNISHED
WITH MANHOLE

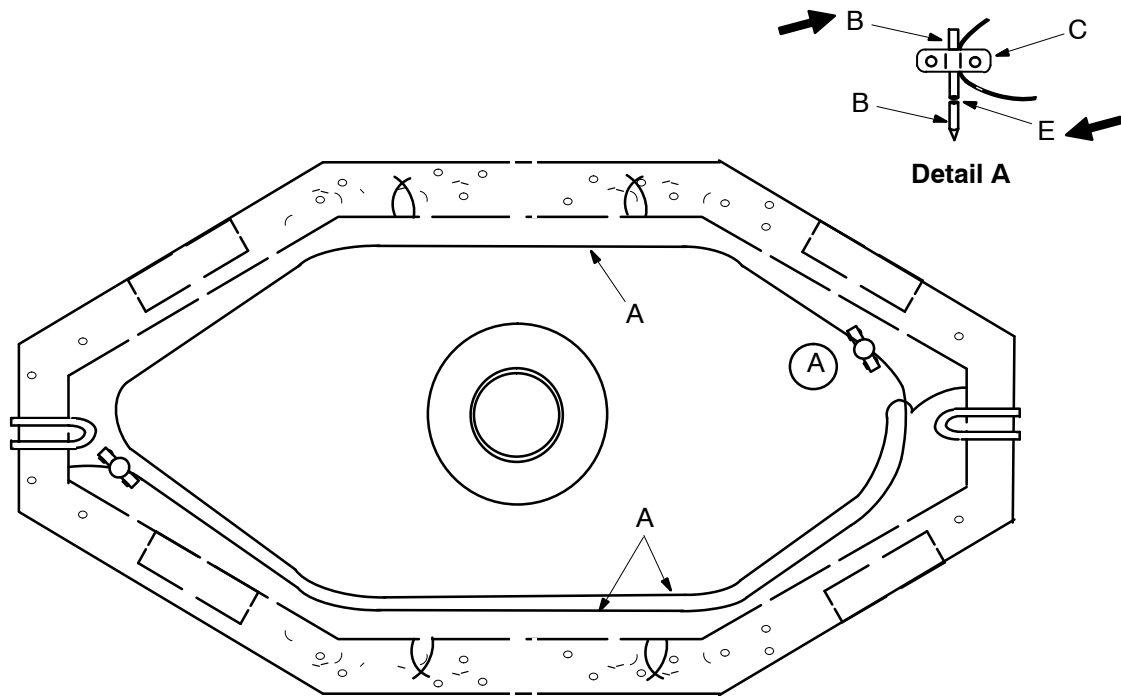


	Std. / Stk. No.	Description	01	02	03	04
A	40 79 781	Channel – Single, Galv, 1-5/8" x 1-5/8" x 10', (Ft.)	7	9	10	2
B	40 79 764	Support – Zee, Unistrut	2	2	2	
C	23 52 436	Screw – Cap, 1/2" x 1" Hex	2	2	2	
D	40 09 231	Nut – Channel, 1/2"	5	8	11	3
E	40 79 759	Brace – Bracket, Unistrut	1	2	3	1
F	40 79 761	Insulator – Cable Rack	3	6	9	3
G	40 79 763	Screw – Cap, 1/2" x 1-1/2" Hex	5	8	11	3

STRUCTURES-MANHOLES
STRAIGHT PRECAST
Grounding System

33 20 02 **

Sheet 1 of 1



		Std. / Stk. No.	Description	33 20 02 **	01	02	03
3	A	18 52 024	Wire-4/0 AWG, Copper, Bare, Soft Drawn		43	54	65
	B	23 63 143	Rod-Ground, 5/8" x 4'		4	4	4
	C	17 54 132	Connector-Wire, 8-350 kcmil, CU		2	2	2
2	D	12 56 123	Hook - Plastic, 2 1/2" Diameter, Bond Wire Support		10	10	10
5	E	23 13 070	Coupling-CU Alloy, 5/8", Threaded		2	2	2
			Operation Code 308		1	1	1

NOTES:

1. All splice ground and drain wires are connected to the grounding system using a two bolt connector.
2. The Bond Wire is to be fastened 6 inches above the manhole floor using plastic hooks (D) attached to the cable mounting brackets.
3. If the manhole is the first one in the substation do not drive the ground rods. Connect the end of the bond wire at two points to the substation ground grid.
4. When making grounding attachments to the bond wire, clean the bond wire at the attachment point.
5. Join two ground rods together with a coupling.

33 20 02 01

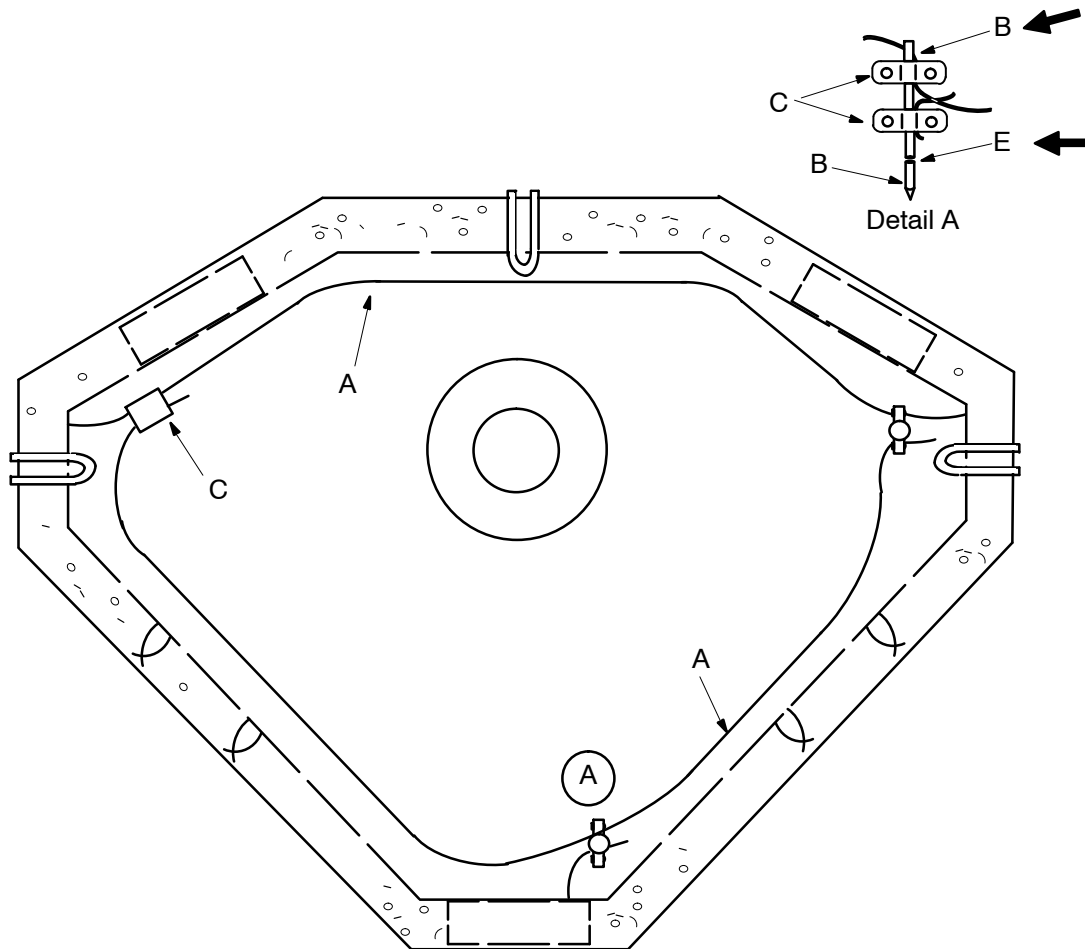
4' x10' Manhole

33 20 02 02

6' x 14' Manhole

33 20 02 03

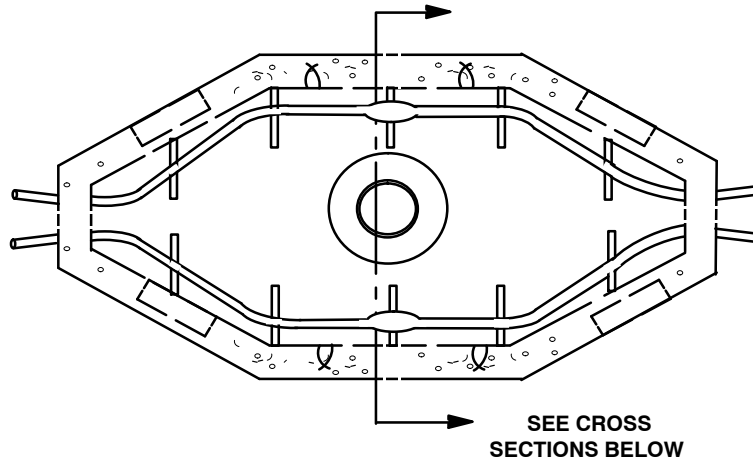
6' x 17" Manhole



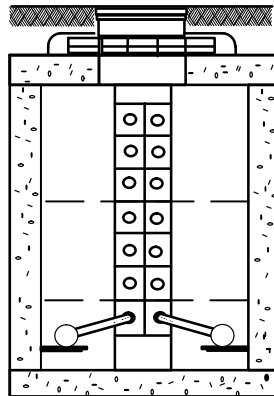
		Std. / Stk. No.	Description	33 20 03 01	
3	A	18 52 024	Wire-4/0 AWG, Copper, Bare, Soft Drawn		50
	B	23 63 143	Rod-Ground, 5/8" x 4'		4
	C	17 54 132	Connector-Wire, 8-350 kcmil, CU		5
2	D	12 56 123	Hook - Plastic, 2 1/2" Diameter, Bond Wire Support		8
5	E	23 13 070	Coupling - CU Alloy, 5/8", Threaded		2
			Operation Code 308		1

NOTES:

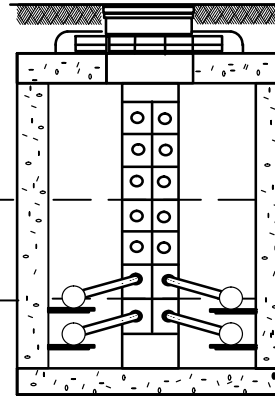
1. All splice ground and drain wires are connected to the grounding system using a two bolt connector.
2. The Bond Wire is to be fastened 6 inches above the manhole floor using plastic hooks (D) attached to the cable mounting brackets.
3. If the manhole is the first one in the substation do not drive the ground rods. Connect the end of the bond wire at two points to the substation ground grid.
4. When making grounding attachments to the bond wire, clean the bond wire at the attachment point.
5. Join two ground rods together with a coupling.



TWO DUCTS



FOUR DUCTS

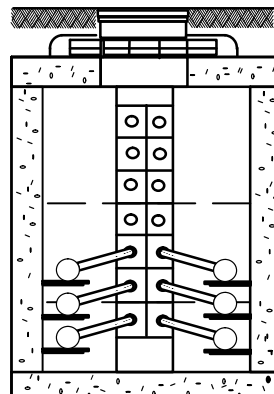


600 V Network Operating
Cable Zone
(If Necessary)

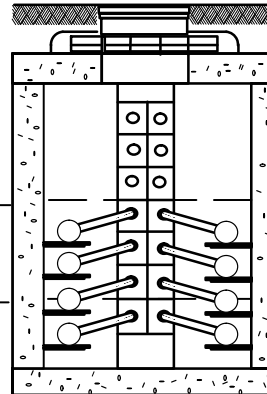
4-15 kV Operating
Cable Zone

34 kV Operating
Cable Zone
(If Necessary)

SIX DUCTS



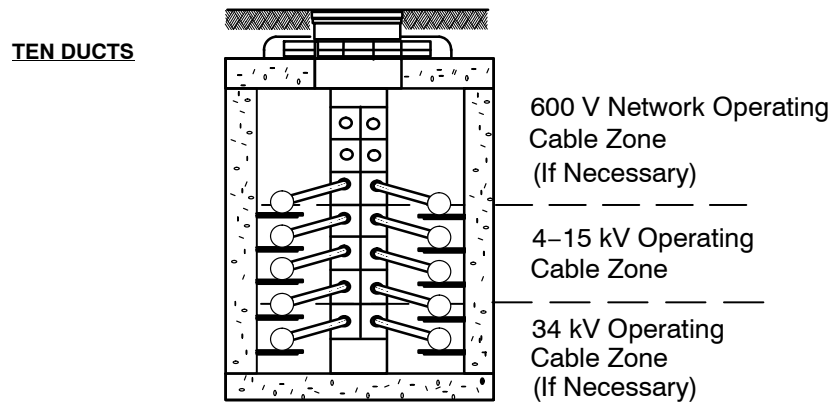
EIGHT DUCTS



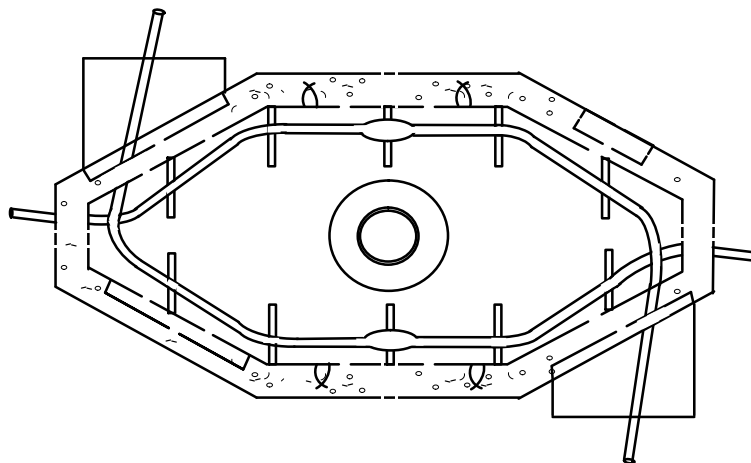
600 V Network Operating
Cable Zone
(If Necessary)

4-15 kV Operating
Cable Zone

34 kV Operating
Cable Zone
(If Necessary)

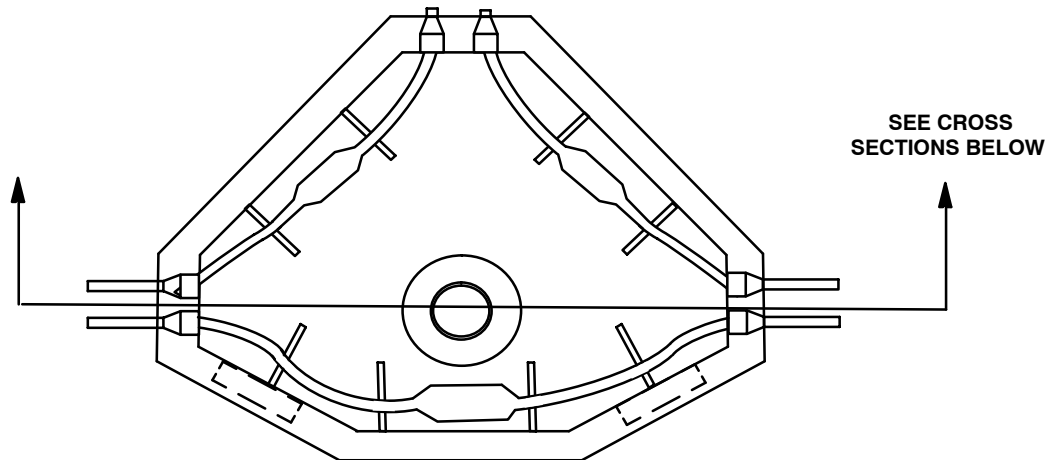


**CABLE TRAINING IN MANHOLE
WITH WINGWALL**

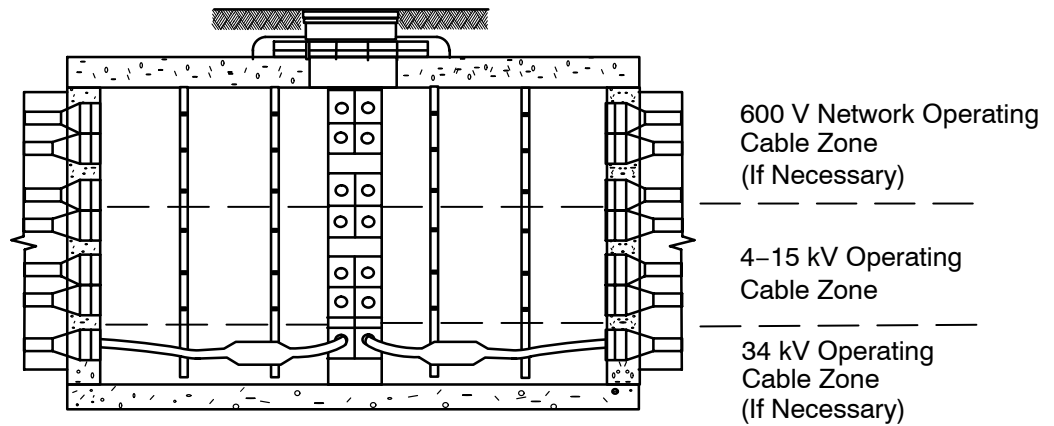


NOTES:

1. Cable and splice positions reflect either one conductor PILC cable and joint or three single conductor cables and three splices.
2. The maximum number of ducts occupied by energized power cables shall be ten.

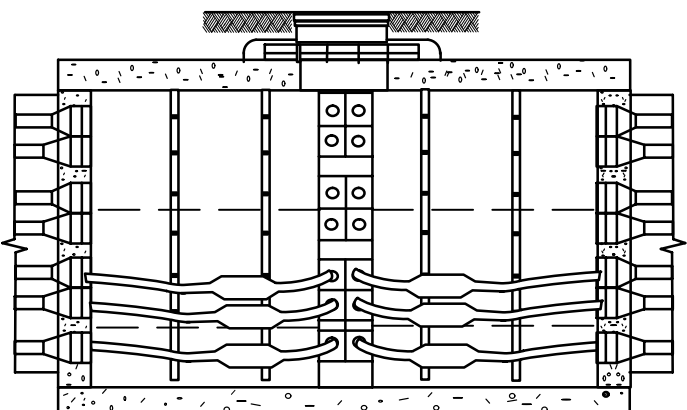
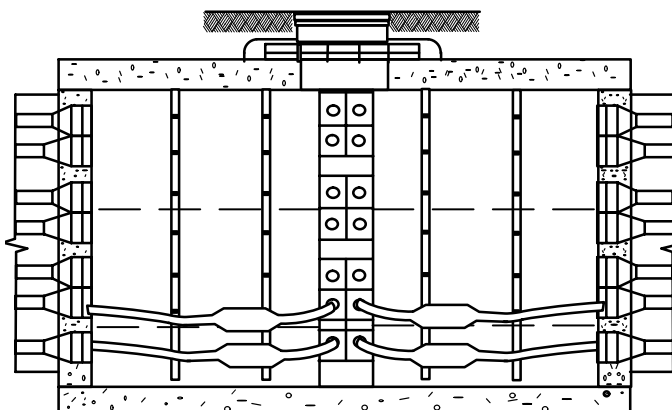


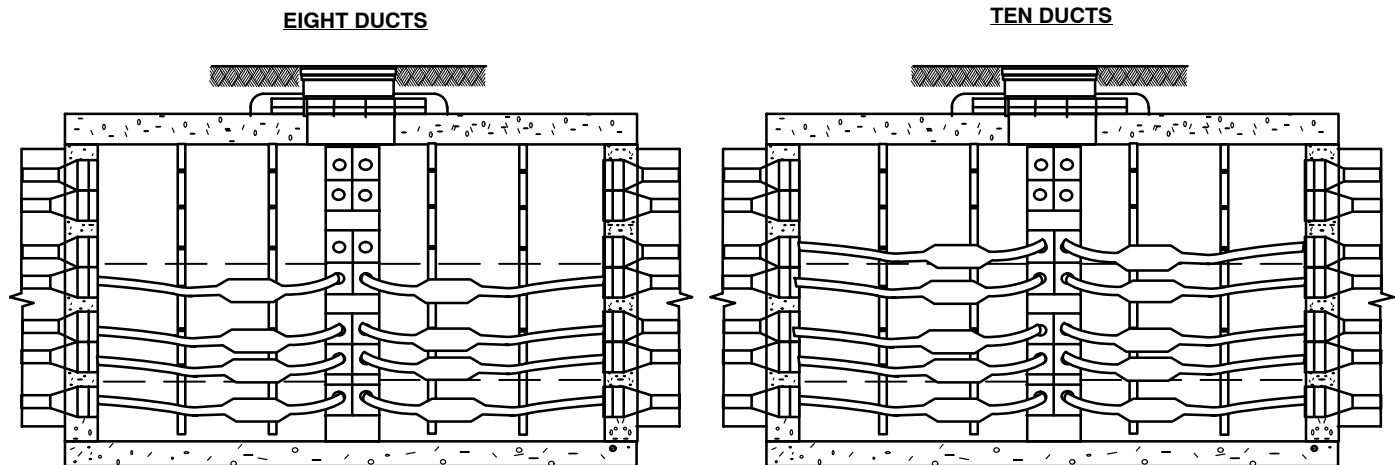
TWO DUCTS



FOUR DUCTS

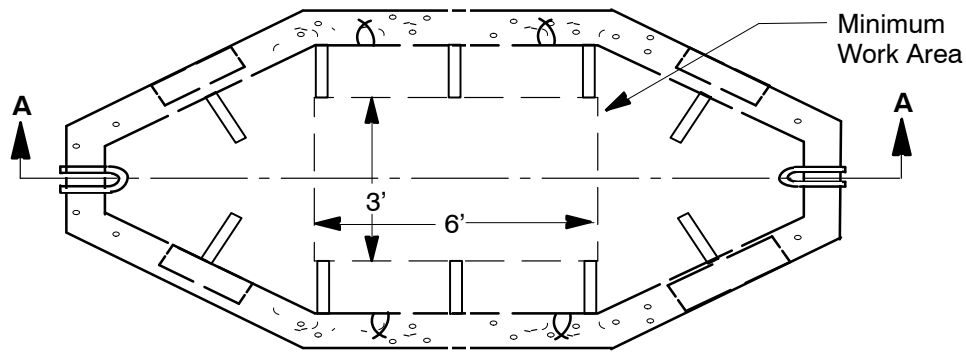
SIX DUCTS



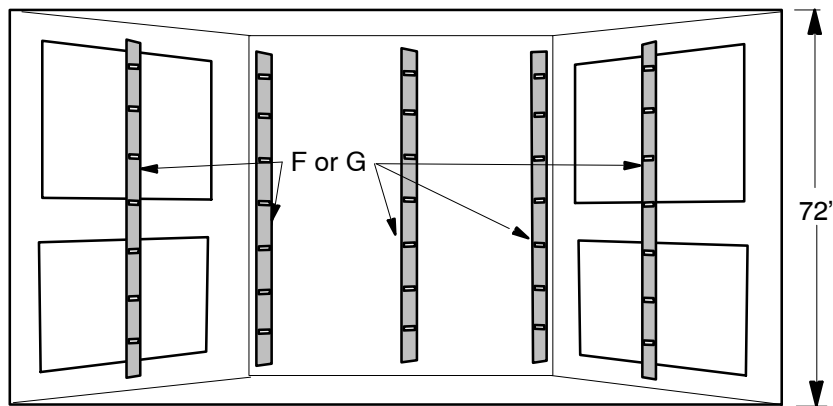


NOTES:

1. Cable and splice positions reflect either one 3 conductor PILC cable and joint or three single conductor cables and three splices.
2. The maximum number of ducts occupied by energized power cables shall be ten.



Cable Rack Spacing in Manhole



SECTION AA

Side View of Cable Racks in Manhole

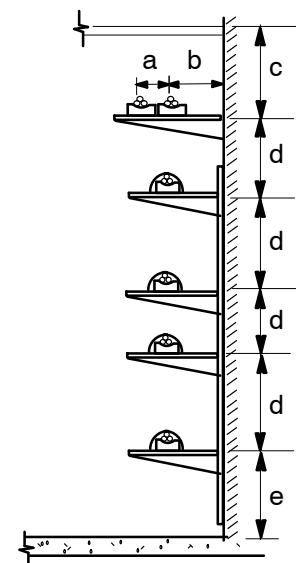
Standard Manhole (1 to 10 Ducts Used)

Maximum of 10 Network Cables on One Side

Maximum of 5 Primary Cables on Each Side

7 Brackets Maximum on Each Cable Rack

Cable Bracket Spacing



Dimension in Table

SPACING REQUIREMENTS FOR CABLE BRACKETS

Standard Precast Manhole

	a	b	c	d	e
Network & 600V	6"	6"	12"	12"	12"
5 & 15 kV		6"	12"	12"	12"
35 kV		6"	12"	12"	15"

STRUCTURES-MANHOLES
STRAIGHT PRECAST
Cable Racking

33 20 05 **

Sheet 2 of 3

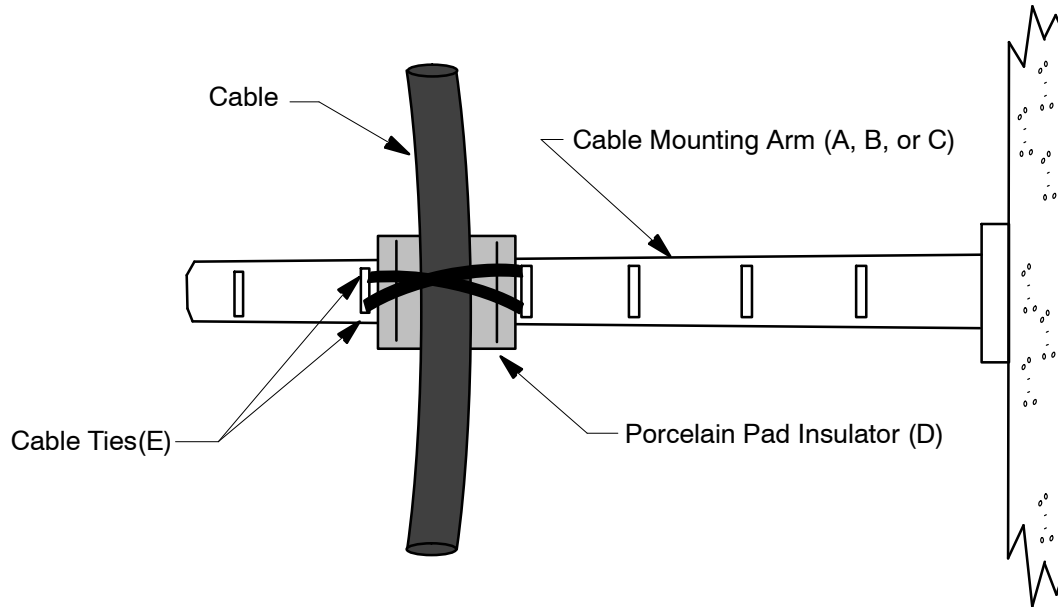
		Std. / Stk. No.	Description	33 20 05 **	01	02	03
	A	12 56 121	Arm – Cable Mounting 10"		5		
	B	12 56 113	Arm – Cable Mounting 14"			20	
	C	12 56 112	Arm – Cable Mounting 18"				20
	D	12 56 122	Insulator – Porcelain Pad		@	@	@
3	E	40 59 196	Tie – Cable, Black, 13 ½" Dia.		10	40	200
4	F	12 56 115	Rack – Cable, Galv. Steel, 30" Long, 18 Holes		@	@	@
4	G	12 56 116	Rack – Cable, Galv. Steel, 55" Long, 37 Holes		@	@	@

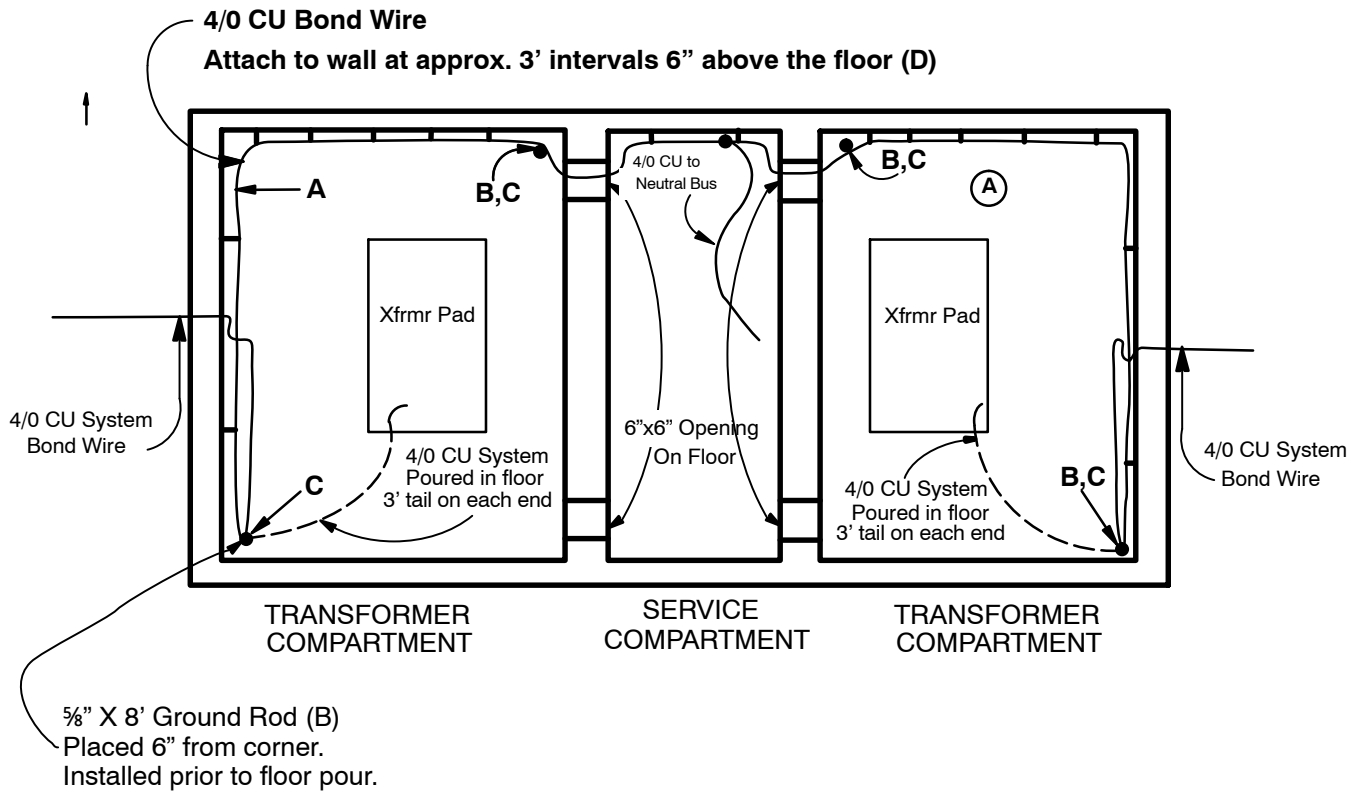
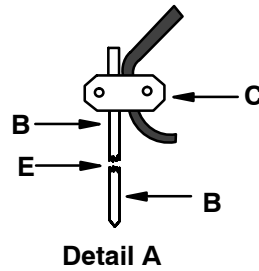
- 33 20 05 01 Single Installation of 5 kV or 15 kV Primary Cable and Splice or a 35 kV Sub-transmission Cable and a Splice
- 33 20 05 02 Installation of One or Two 600 V Network Cables and Straight Splices or 2–3 Network Cables and a 3–way Crab Connector
- 33 20 05 03 4–7 600 V Network Cables and Either a 5 or 7 way Crab Connector

NOTES:

1. In combined Network & Primary manholes the Network cables should be located on the top 1–4 brackets and the Primary cables should be located on the next 1–3 brackets below the Network cables. The Sub-transmission cables (if needed) should be located below the Primary cables on the bottom bracket(s).
2. Use the Cable Training Standard 33 20 04 01 to determine the duct position of new cable installations. When training and racking cables avoid situations whenever possible where cables will cross each other.
3. At each cable mounting arm, tie the cable/splice down to the porcelain insulator pad and mounting arm using two cable ties in a cross pattern (see Detail on Sheet 3).
4. New precast manholes will be supplied with the cable racks already installed in them.

Cable / Splice Cross Tie Down Detail





		Dist. Std. /Stk. No.	Description	33 20 06 01
1	A	18 52 024	Wire – 4/0 AWG, Copper, Bare, Soft Drawn	95
4	B	23 63 143	Rod – Ground, 5/8" x 4'	8
	C	17 54 132	Connector – Wire, 8–350 kcmil, CU	11
1	D	40 59 196	Tie – Cable, Black, 13 1/2" Dia.	20
6	E	23 13 070	Coupling – CU Alloy, 5/8", Threaded	4

NOTES:

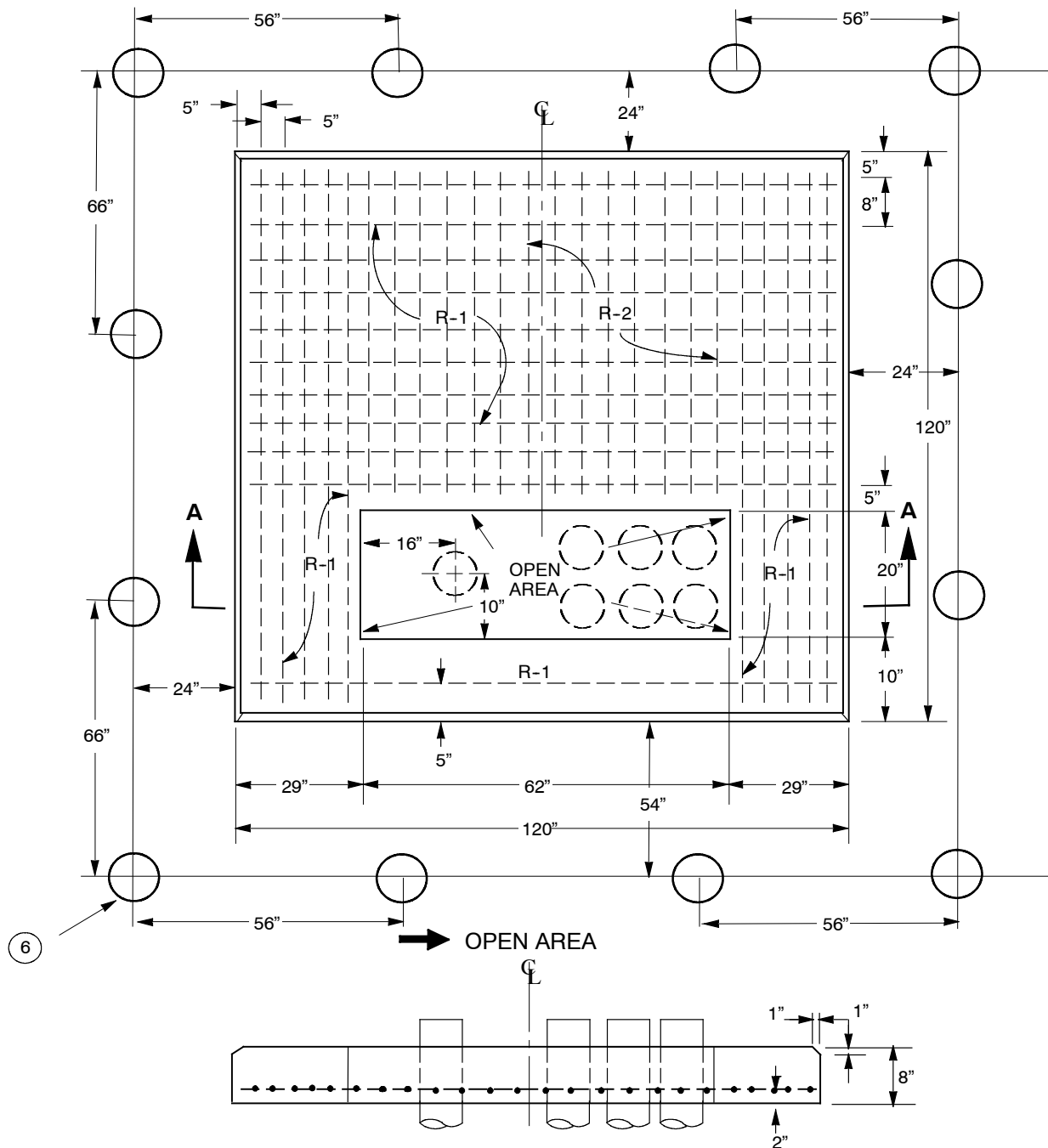
1. The Bond Wire (A) is to be fastened with cable ties (D) 6 inches above the manhole floor after the vault is poured. The Bond wire will be tied to 1/2" minimum diameter mounting eyes which are to be cast into the vault walls at intervals of 3 ft. maximum. The 4/0 AWG bond wire will run from the primary duct banks in to the vaults.
2. Each transformer compartment will have a 4/0 AWG copper bond wire extension from the wall to the transformer pad. The extension is to be poured into the vault floor and have two 3 foot tails exposed at each end. One end will connect to the bond wire system while the other end connects to the transformer ground. Connect the extension with two bolt connectors (C).
3. The service compartment will have a 4/0 AWG bond wire, clean the bond wire extension from the bond wire system to the neutral bus bar. Connect the extension with two bolt connectors (C).
4. Ground Rods (B) are to be driven in 6 feet prior to pouring the floor of the vault.
5. When making grounding attachments to the bond wire, clean the bond wire at the attachment point.
6. Join two ground rods together with a coupling.
7. All access ladders are to be individually connected to the grounding system.



STRUCTURES-PADS
Three Phase Padmount Transformers
34.5kV (Poured-In-Place)

34 11 00 00
Sheet 1 of 3

RADIAL-FEED ONLY
1500 kVA THRU 3000 kVA



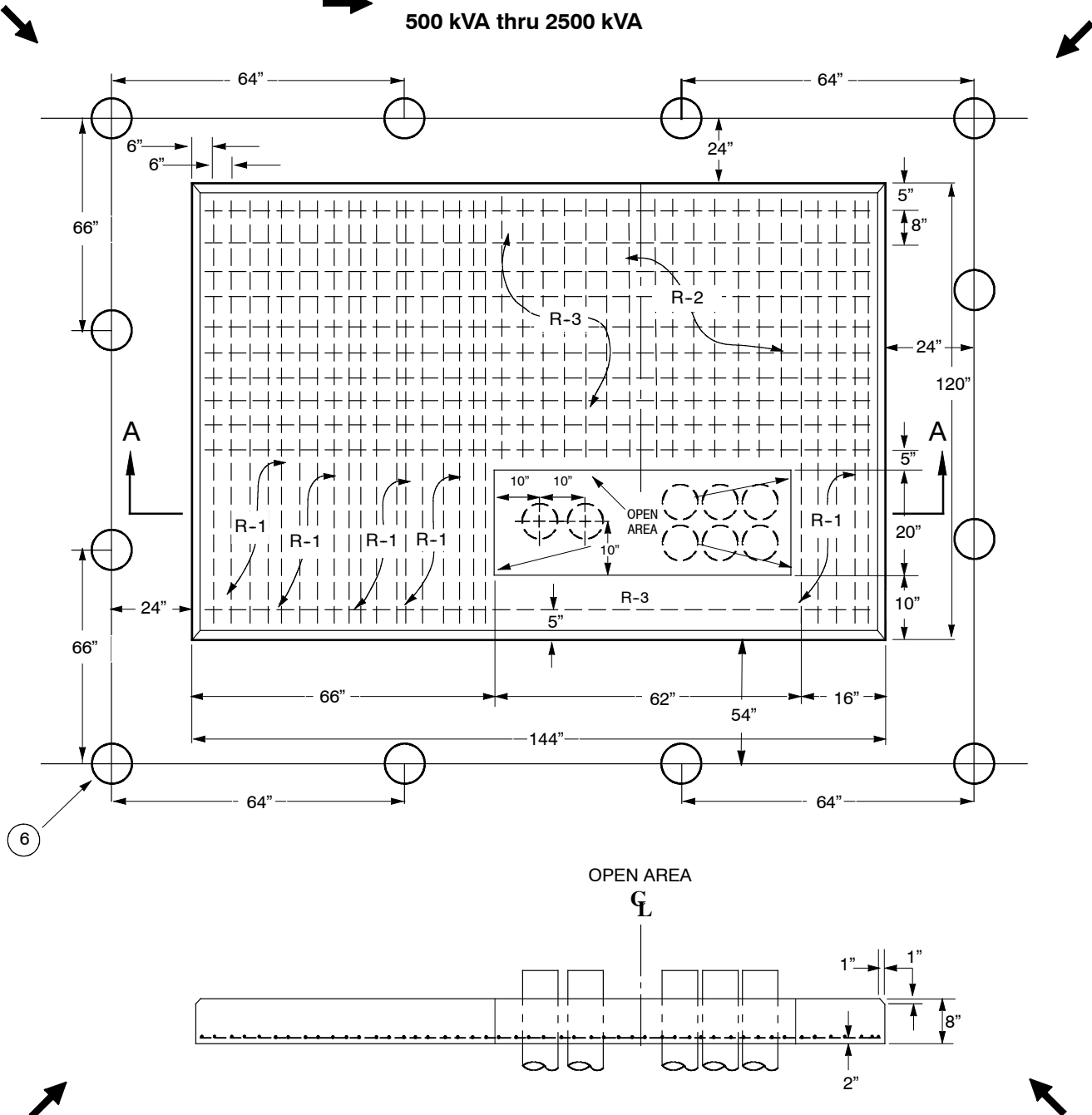
SECTION AA

REINFORCING SCHEDULE			
MARK	NO REQ'D	SIZE	LENGTH
R-1	22	#4	114"
R-2	13	#4	84"

STRUCTURES-PADS
Three Phase Padmount Transformers
34.5kV (Poured-In-Place)

34 11 00 00
Sheet 2 of 3

LOOP-FEED ONLY
500 kVA thru 2500 kVA



SECTION AA

REINFORCING SCHEDULE			
MARK	NO REQ'D	SIZE	LENGTH
R-1	12	#4	114"
R-2	11	#4	84"
R-3	12	#4	138"

1. CONCRETE MIX

Concrete mix shall be either Type I or Type III portland. Mix concrete in accordance with ASTM C94. Water shall be clear and drinkable. Ultimate strength at 28 days shall be 4,000 psi, 6 sacks minimum of cement per cubic yard. Maximum slump 4". Water to cement ratio shall not exceed 5.0 by weight, including free moisture on aggregate. Aggregate shall be white limestone rock, maximum size 3/4". Use air entraining admixture (3% to 6% air by volume.) **The use of calcium chloride is prohibited.**

2. PLACEMENT

All concrete shall be well vibrated, dense and smooth. No honeycombs, fins or cold joints shall be present. Placement and vibration of concrete shall not disturb the reinforcement.

3. REINFORCEMENT

Reinforcement shall consist of #4 reinforcing bars meeting the requirements of ASTM A615, minimum grade 40. All reinforcing bars shall be tied to prevent displacement during concrete placement.

4. DIMENSIONS

Dimensions shall be in accordance with the drawings shown in this standard. The top surface shall be true and free of mounds or depressions. A four foot level shall be placed at any location on the top surface and at no location may a #14 (American Wire Gauge) bare wire fit between the level and the surface. The finished pad shall be free of voids and crumbling edges. No protrusion or flashing shall exceed 1/4" in length from the finished surface. **Pads not conforming to any dimension or specification contained herein will not be accepted.**

5. CONDUITS

Secondary conduits shall be symmetrically located within a 20" x 24" area. Primary conduit shall be positioned as shown.

6. PROTECTIVE BARRIER RAILS

- Barrier iron to be railroad rails, 8'6" long, 50-100 lbs. per yard. An acceptable alternative is 4" iron pipe 8'6" long, concrete filled or see Dist. Std. 34 22 01 00 for power installed bumper posts.
- Barriers on sides not accessible to vehicles may be omitted.
- All Materials and labor for protective barrier rail installation shall be provided by the customer.
- Customer is encouraged to paint barrier rails with yellow street marking lacquer.

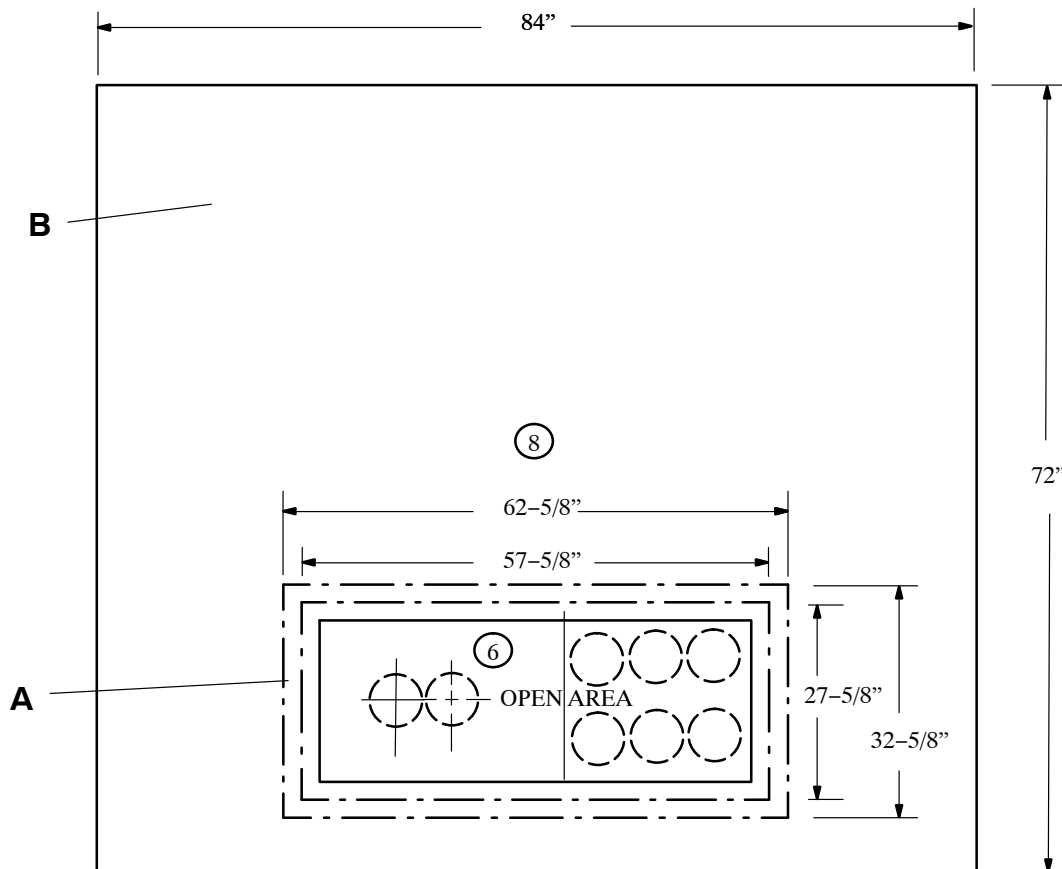
Caution: Installation of barrier rails must be coordinated with the conduit installation to avoid mutual interference.

Note: If circumstances are such that Ameren crews must install barriers the following materials may be used: Barrier Rail (Stk. # 68-05-024), Concrete (Stk. # 11-04-105), Yellow Lacquer (Stk. # 30-57-025).

APPLICATION

This transformer box vault (12 06 241) is for use with composite pad stock number 1206124 (or equivalent sized poured in place concrete pad) for the following applications:

- a) If primary cable is larger than 1/0,
- b) If secondary output requirement from the transformer is greater than 2000 Amps:
 - i. Loop-feed 750 kVA and larger transformer at 208Y/120 Volts
 - ii. Radial-feed 1500 kVA and larger transformer at 480Y/277 Volts



Top View

STRUCTURES – COMPOSITE BOX VAULT

Three Phase Padmounted Transformers

15kV & Below

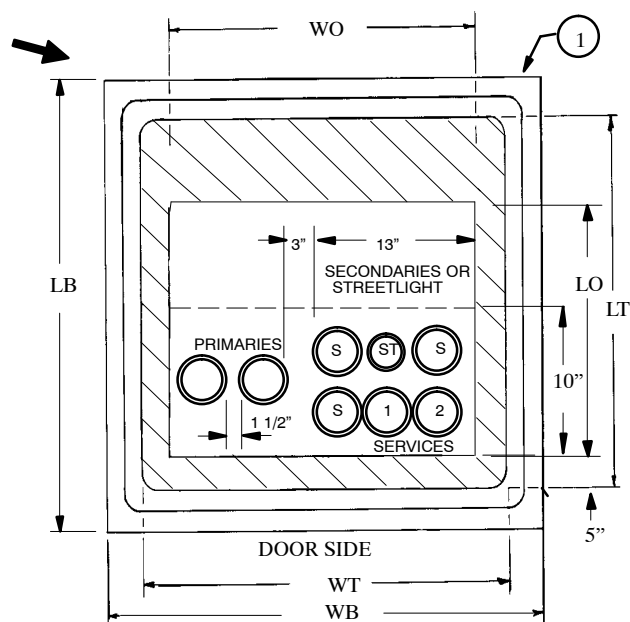
34 21 04 05

Sheet 3 of 3

1, 3, 7		Std./Stk. No.	Description	
	A	12 06 241	Box Vault, Composite, 60" x 30" x 24"	1
	B	12 06 124	Pad, Composite, 84" x 72"	1
			Pad, Poured-in-Place, 84" x 72"	
	C		Screenings, Crushed Stone	As Req'd.

NOTES:

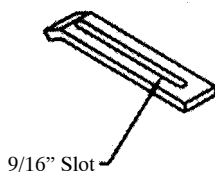
1. The areas of excavation that bear the box vault and the flat pad shall be tamped and leveled. Proper compaction prior to setting the box vault and the flat pad is important to prevent settling. Back filling with crushed stone screenings is recommended.
2. An initial depth of 27" shall be excavated for the box vault.
3. To install the 36" radius bends, an increase in the initial excavation depth will be required. After the bends have been installed, crushed stone screenings shall be placed and tamped to the level shown in the drawings.
4. The primary and secondary conduits may enter the box vault from the sides (as shown in drawings), from the front, or from the back.
5. All conduits shall be rigid PVC Schedule 40 or approved PVC flexible conduit. If bends are cut off, apply a bell end coupling over the end of each conduit.
6. See DCS 34 21 05 **, sheet 4 of 4, for conduit layout in the primary and secondary compartment areas of the pad vault.
7. Stabilize the box vault over the conduits before backfilling so that there will be no shifting. To further stabilize the conduit bends, place additional screenings inside the pad vault and hand tamp in place. Conduit openings should be 17" below the load bearing surface (top) of the box vault. See drawings.
8. The opening of the flat pad should be centered over the box vault. Note that the box vault opening is 57-5/8" x 27-5/8" and the flat pad opening is slightly smaller at 52" x 20".
9. If pulling tension through the conduit elbows will exceed 400 lbs., restrain the bends as per DCS 31 47 01 **.
10. Box vault cover stock #12 06 245 can be used on this vault box to temporarily cover the opening. Note however, this cover cannot be installed or removed with the flat pad in place over the box vault.



① BASE OF VAULT

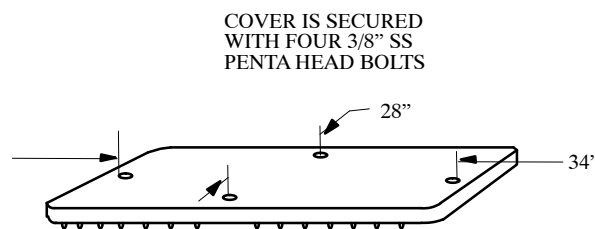
② LOAD BEARING SURFACE OF VAULT

TOP VIEW



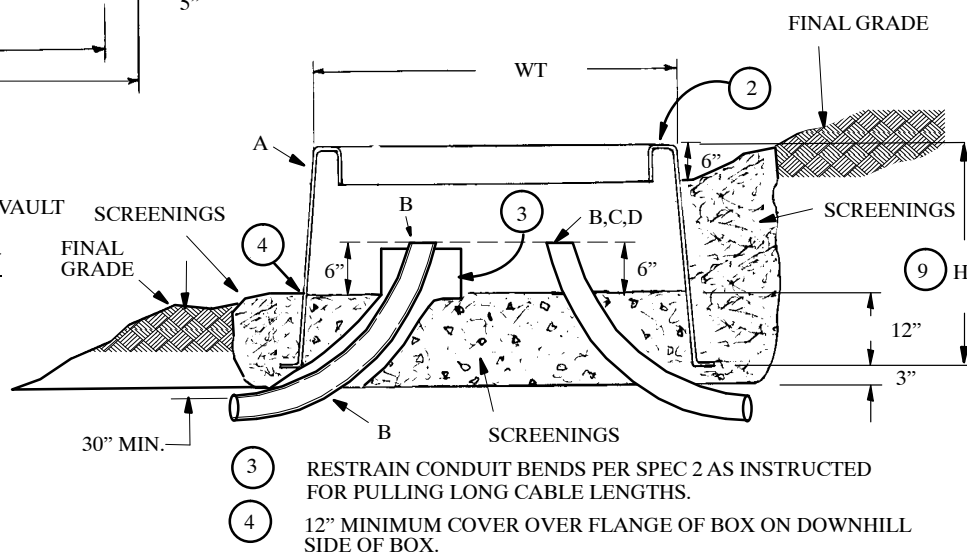
HOLD DOWN BRACKET DETAIL

2 Brackets Provided w/ Pad



OPTIONAL BOX VAULT COVER

STOCK # 12 06 085



③ RESTRAIN CONDUIT BENDS PER SPEC 2 AS INSTRUCTED FOR PULLING LONG CABLE LENGTHS.

④ 12" MINIMUM COVER OVER FLANGE OF BOX ON DOWNHILL SIDE OF BOX.

FRONT VIEW

5. In Missouri residential developments, the contractor will install the vault and bends.
6. Secondary conduit shall be symmetrically located within a 13" x 10" area as shown above.
7. For Missouri residential contractor jobs, 3" conduits shall be installed on the primary side. Otherwise 2" conduit may be installed on the primary side.
8. Conduit ends to be sealed with duct tape and the tape marked with permanent marker as follows: S=Secondary, ST=Streetlight, and service conduits marked with lot number.
9. The 32" tall box vault is for use on slopped grades.
10. The 18" tall box vault 1206218 is intended for use on flat grades for commercial applications with two or more runs of 750 kcmil secondary/service cables or where primary cable is larger than #2, and transformer is 100kVA or smaller.
11. The 18" tall box vault 1206163 is intended for use on flat grades for commercial applications with two or more runs of 750 kcmil secondary/service cables or where primary cable is larger than #2, and transformer is 167 or 250kVA. It is also used for 34.5kV Grdy/19.92kV single-phase padmount transformers.

STRUCTURES – FIBERGLASS BOX VAULT

Single Phase Padmounted Transformers

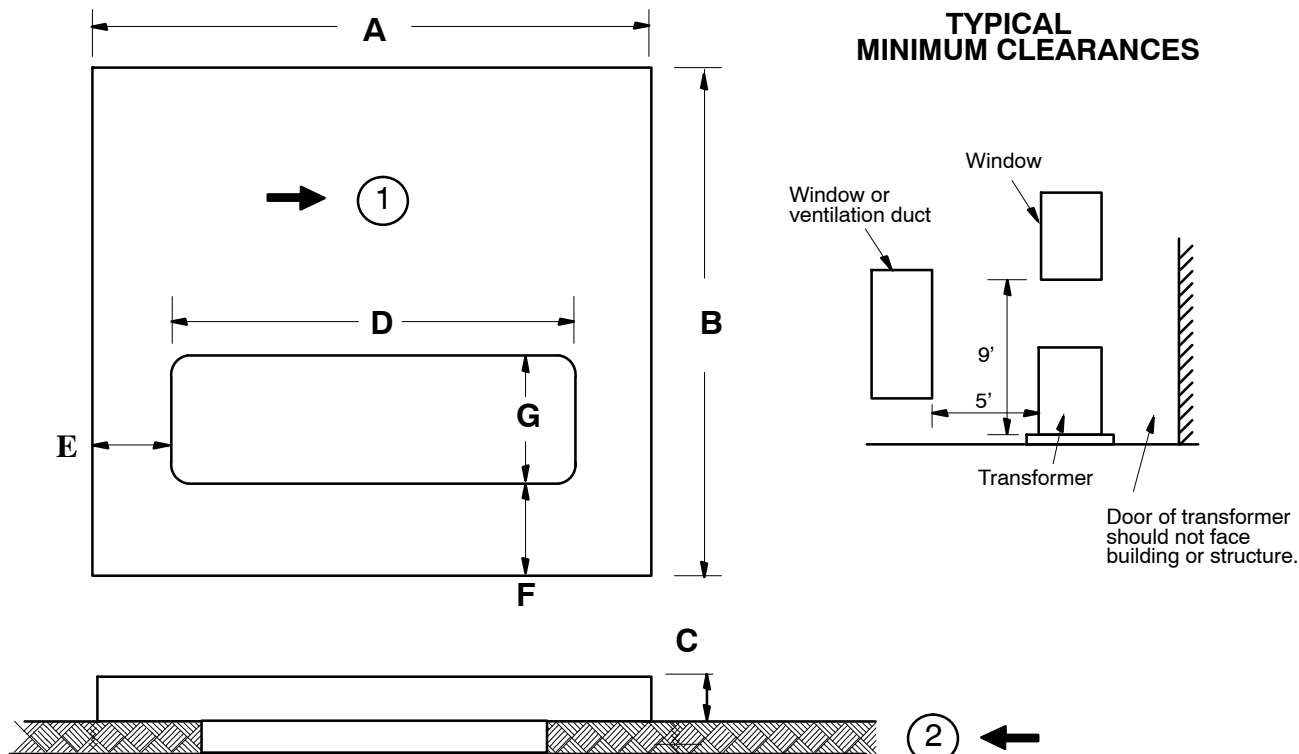
34 21 04 **

Sheet 2 of 2

Stock Number	Description	Dimensions (inches)							Approx. Weight
		Top		Height	Opening		Base		
		WT	LT	H	WO	LO	WB	LB	
12 06 215	42"Wx48"Lx32"H	42	48	32	25	24	54	60	144
12 06 163	42"Wx48"Lx18"H	42	48	18	25	24	50.5	56.5	90
12 06 218	37"Wx48"Lx18"H	37	43	18	22	23.5	47.5	54.5	80



		Std./Stk No.	Description	34 21 04 **	01	02	03
9,10,11	A	12 06 215	Vault – Transformer, Fiberglass, 42"x48"x32"		1	–	–
		12 06 163	Vault – Transformer, Fiberglass, 42"x48"x18"		–	1	–
		12 06 218	Vault – Transformer, Fiberglass, 37"x43"x18"		–	–	1
@	B	12 51 173	Bend – Plastic, 3", 36" Rad. (Secondary & 400 A Service)		As Req'd	As Req'd	As Req'd
@	C	12 51 331	Bend – Plastic, 1-1/2", 24" Rad. (Streetlight)		As Req'd	As Req'd	As Req'd
@	D	12 51 264	Bend – Plastic, 2-1/2", 24" Rad. (200 A Service)		As Req'd	As Req'd	As Req'd



	STOCK CODE	INTENDED USE	DIMENSIONS							APPROX. WEIGHTS
			A	B	C	D	E	F	G	
4	12 06 164	1 Phase, Lightweight	42	47	4	25	8.5	6	12	50lbs
4	12 06 198	1 Phase, Heavy	42	47	4	25	8.5	7	12	300lbs
3	12 06 123	3 Phase 750 kVA & under Radial Feed	72	65	4	48	12	6	15	600lbs
3	12 06 124	3 Phase over 750 kVA Radial Feed & all 3 Phase Loop Feed	84	72	5	52	16	10	20	800lbs

CONSTRUCTION NOTES:

- When possible, do not install cable under this portion of pad.
- Pad shall be installed on 4" of level, well compacted, 1" minus rock extending 12" outside the pad. Dirt under the rock must first be well compacted. Avoid filling pad opening before cable or conduit is installed. Refer to sheets 2 thru 5 for details.

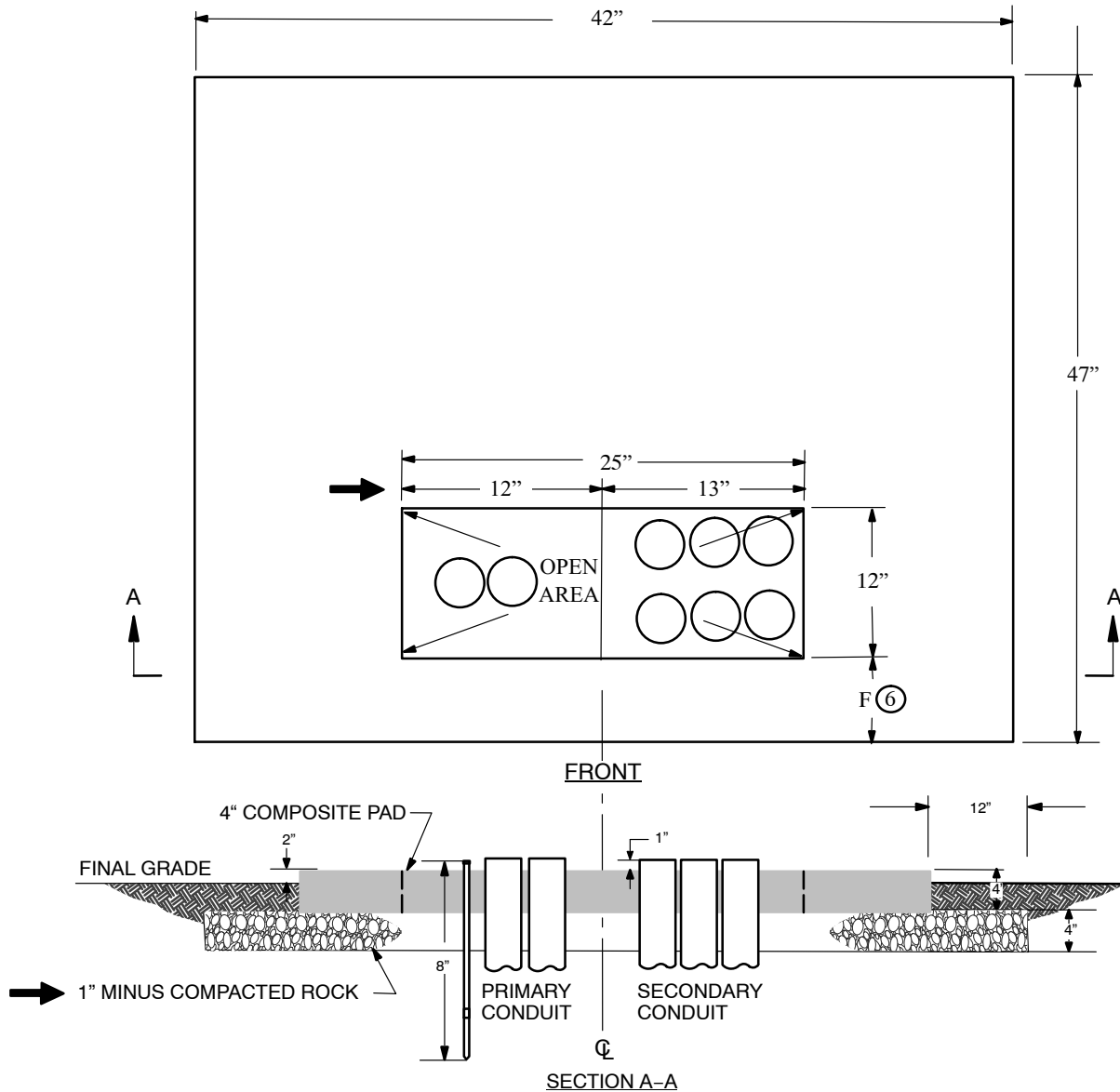
ENGINEERING NOTES:

- Ameren transformers 1999 or newer will fit on these pads. Transformer dimensions should be verified by construction personnel prior to using these pads with older transformers.
- Heavy pad for conduit systems where pad is installed by customer contractor and for "dummy" transformers. Lightweight pad is for installations where pad is installed by Ameren personnel.

Std./Stk.No.	Description	34 21 05 **	01	02	04	05
12 06 164	Pad – Xfrmr, Composite, 1 Phase, Lightweight	1				
12 06 198	Pad – Xfrmr, Composite, 1 Phase, Heavy		1			
12 06 123	Pad – Xfrmr, Composite, 3 Phase, 72" x 65"			1		
12 06 124	Pad – Xfrmr, Composite, 3 Phase, 84" x 72"				1	

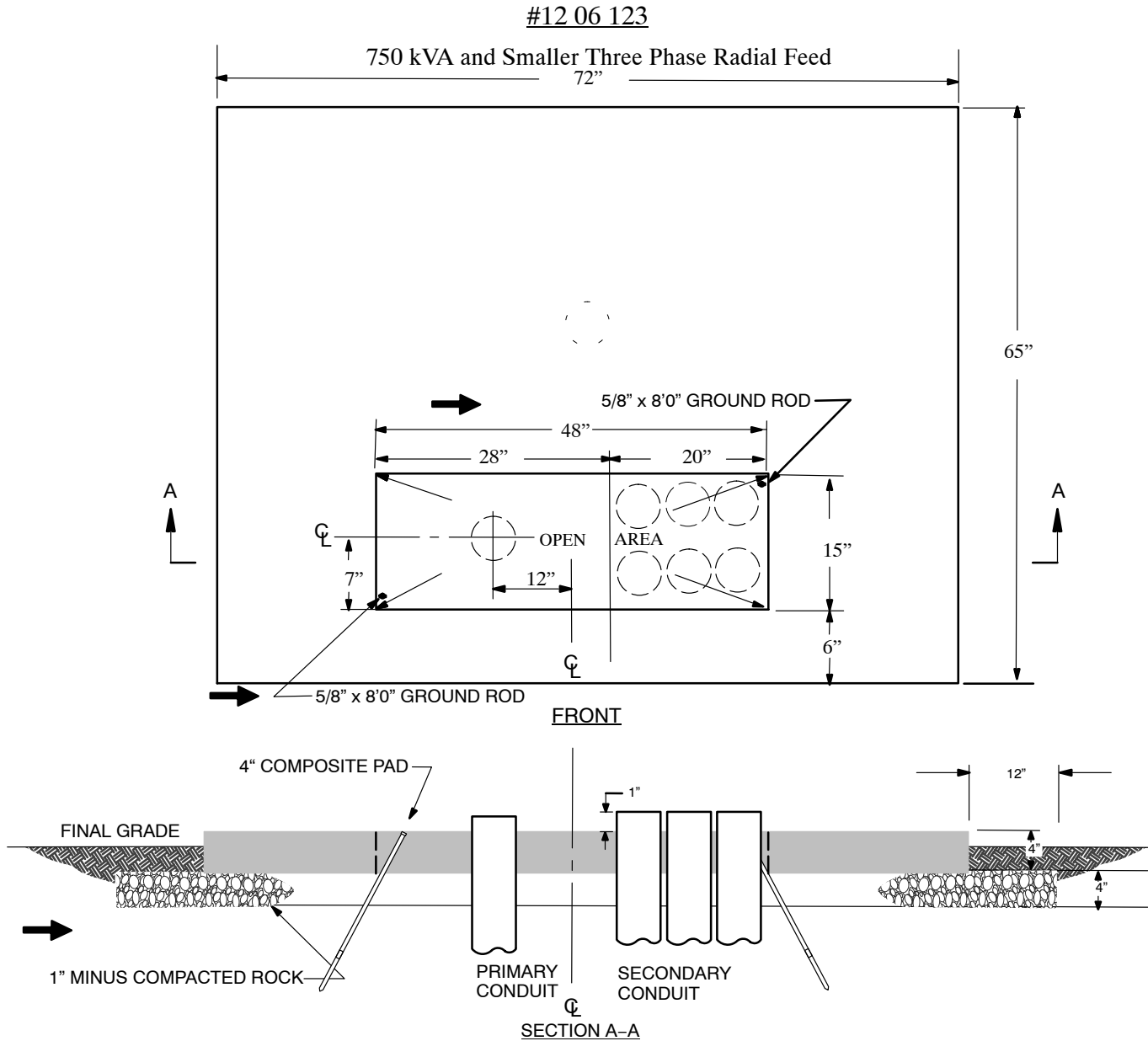
Stock # 12 06 198 or 12 06 164

➔ 25 kVA thru 250 kVA Single Phase Loop Feed



CONSTRUCTION NOTES:

1. The number of secondary cables shall not exceed 8 per phase.
2. Secondary conduit shall be symmetrically located within 12" x 13" area.
3. The maximum number of conduits is 6 – 3" for the secondary.
4. Two – 2" Conduits shall be installed on the primary side – minimum size 2".
5. In Missouri residential developments, the contractor will install the pad and conduits.
6. See sheet 1 for this dimension depending on pad stock number used.
7. Pad shall be installed on 4" of level, well compacted, 1" minus rock extending 12" outside the pad. Dirt under rock must first be well compacted. Avoid filling opening before cable or conduit is installed. Unless situated in a paved area, the rest of the exterior shall be backfilled with the excavated material and foot tamped.

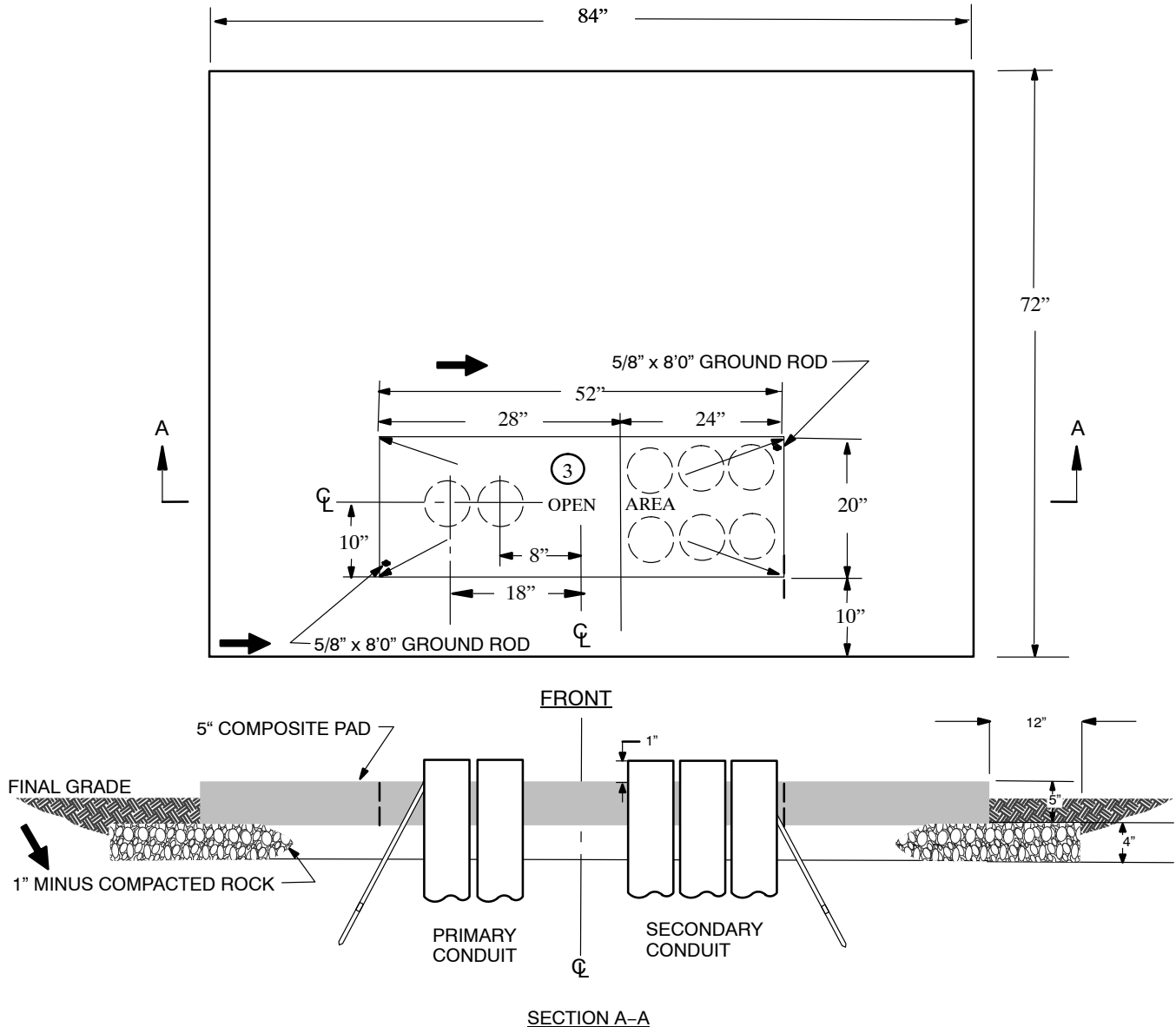


CONSTRUCTION NOTES

1. Ameren Engineering to determine final location and orientation of transformer pad.
2. All Conduit shall be rigid PVC Schedule 40 or approved PVC flexible conduit.
3. Secondary conduit shall be symmetrically located within a 15" x 20" area as shown above.
4. The number of primary and secondary conduits may vary. The number of secondary cables shall not exceed 12 per phase. Ameren Engineering will determine if the number of conduits is acceptable or if a vault will be required.
5. Two 5/8" x 8'0" ground rods shall be installed on opposite sides of the pad opening to provide maximum possible separation between rods. Ends of ground rods should be angled away from each other 45° +/- 15°.
6. Pad shall be installed on 4" of level, well compacted, 1" minus rock extending 12" outside the pad. Dirt under rock must first be well compacted. Avoid filling opening before cable or conduit is installed. Unless situated in a paved area, the rest of the exterior shall be backfilled with the excavated material and foot tamped.

Stock # 12 06 124

75 kVA thru 1000 kVA Three Phase Loop Feed
1000 kVA thru 2500 kVA Three Phase Radial Feed



CONSTRUCTION NOTES:

1. Ameren Engineering to determine final location and orientation of transformer pad.
2. All conduit shall be rigid PVC Schedule 40 or approved PVC flexible conduit.
3. Secondary conduits shall be symmetrically located within a 20" x 24" area as shown above.
4. The number of primary and secondary conduits may vary. The number of secondary cables shall not exceed 12 per phase. Ameren Engineering will determine if the number of conduits is acceptable or if a vault will be required.
5. Two 5/8" x 8'0" ground rods shall be installed on opposite sides of the pad opening to provide maximum possible separation between the rods. Ends of ground rods should be angled away from each other 45° +/- 15°.



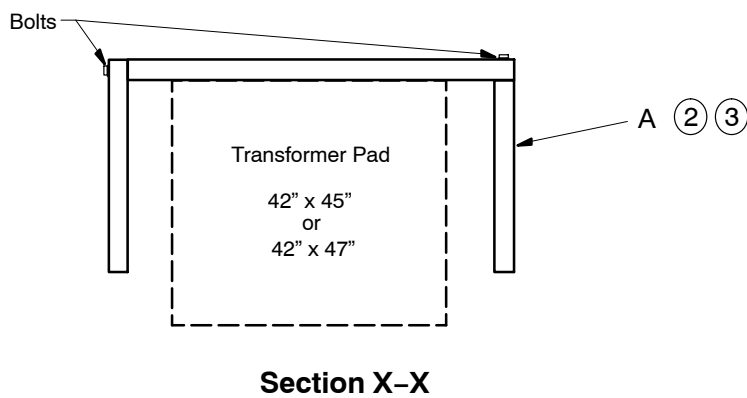
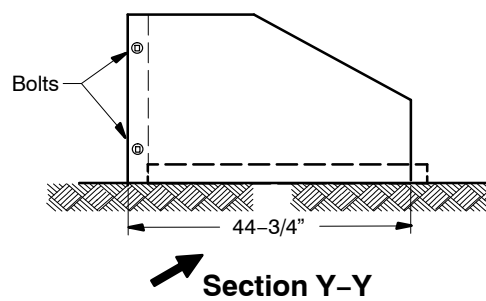
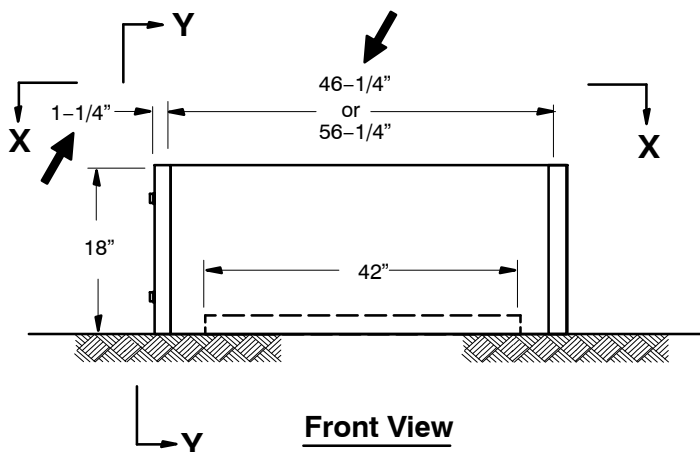
-
6. Pad shall be installed on 4" of level, well compacted, 1" minus rock extending 12" outside the pad. Dirt under rock must first be well compacted. Avoid filling opening before cable or conduit is installed. Unless situated in a paved area, the rest of the exterior shall be backfilled with the excavated material and foot tamped.

STRUCTURES – RETAINING WALL SET

For Single Phase Padmount Transformers
or Secondary Pedestals

34 21 06 **

Sheet 1 of 1



NOTES

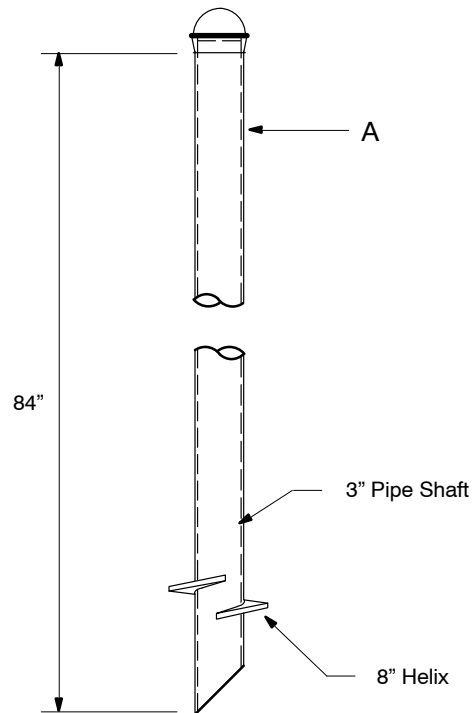
1. Use where grade has changed and transformer or pedestal has been partially buried. Can also be used in new installations where slight grade exists and erosion or landscaping is reasonably expected.
2. Retaining wall set includes 1– back wall, 1–right (short) wall, 1–left (long) wall, and 4–galvanized steel bolts with washers and nuts.
3. In some instances, only two of the three sides will be required. This will leave some wall set components “stranded” in stock. To make use of these stranded components, replacement components can be ordered as follows:
 Left (long) Wall – 12 06 210
 Right (short) Wall – 12 06 212
 46–1/4” Back Wall – 12 06 211
 56–1/4” Back Wall – 12 06 213

	Std./Stk.No.	Description	34 21 06 **	01	02
A	12 06 208	Wall, Retaining, 56–1/4” Wide		1	–
	12 06 209	Wall, Retaining, 46–1/4” Wide		–	1

STRUCTURES – BUMPER POST
Power Installed
To Protect Padmount Switchgear & Transformer

34 22 01 00

Sheet 1 of 1



NOTES

1. Cap should be driven on after bumper post is installed.
2. Install the base 4 feet into the ground in order to leave 3 feet projecting above ground line.
3. See Dist. Std. 59 81 51 10 for placement positions of bumper posts around padmounted transformers and switchgear.

	Std./Stk.No.	Description	34 22 01 00	
A	21 51 127	Bumper–Power Installed, Screw Type, Steel		1
		Operation Code 203		1

NOTES