



Precast Box Culvert & Crown-Span

Core Product Line

CORE PRODUCTS DIVISION



OVERVIEW

Precast Box Sections are recommended for installations where circular or elliptical concrete pipe cannot provide adequate flow capacity, and as a superior substitute for cast-in-place box culverts, long span metal arches, short bridges, and multi-barrel circular culverts or drains. Crown-Span 3-Sided bridge units are recommended for installations where precast box sections cannot carry the required flow capacity, uninterrupted opening spans are necessary, natural stream bottoms are desired and installation time is important.

SIZES

Precast box sections are normally available in spans of 4 feet through 12 feet, with a variety of rises. Crown-Span bridge units are normally available in spans of 10 feet through 28 feet, with rises up to 10 feet. Please contact our Sales / Engineering team for additional sizes and options.

APPLICATION

Precast box sections and Crown-Span bridge units can be used for the following:

- highway culverts
- railroad culverts
- highway bridges
- short span highway bridges
- storm drains
- livestock, pedestrian or golf cart undercrossings
- utility tunnels
- underground stormwater retention structures
- groundwater recharge systems
- to replace existing open channels or ditches, and enable land to be used productively
- jacked or tunneled installations.

JOINTS

Precast box sections are produced with tongue and groove joints and a glued on neoprene gasket. Joints may also be packed with mastic joint compound, preformed mastic or butyl gaskets, mortar, or other approved sealant. Crown-Span sections are butted together with a glued on neoprene gasket. They may also be sealed with a mastic compound or joint wrap.

LININGS / COATINGS

A variety of linings and coatings are available where project conditions dictate use.

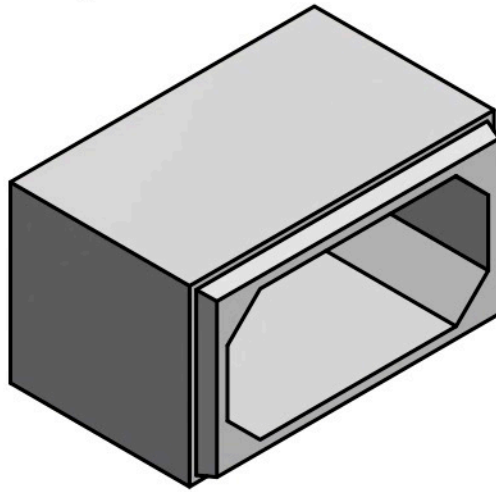
APPLICABLE SPECIFICATIONS

- **ASTM C1433** - Precast Reinforced Concrete Monolithic Box Sections for Culverts, Storm Drains, and Sewers
- **ASTM C1577** - Precast Reinforced Concrete Monolithic Box Sections for Culverts, Storm Drains, and Sewers according to AASHTO LRFO.
- **ASTM C1504** - Precast Reinforced Concrete Three-Sided Structures for Culverts and Storm Drains
- **AASHTO M259 & M273** - Precast Reinforced Concrete Box Sections for Culverts Storm Drains, and Sewers.

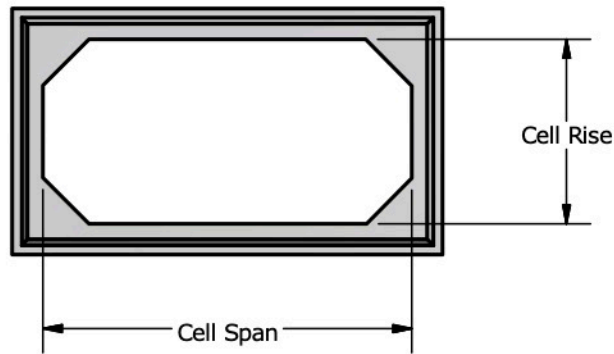
When specifying precast box sections, the following information is needed:

- Governing design specification (eg. ASTM, AASHTO, AREMA, etc.)
- Design live load (eg. AASHTO HS-20, AREA Cooper E80,
- Design fill range (eg. 0'-2', 2'-5', 5'-10', etc.).

STANDARD BOX CULVERT SIZES



Isometric View



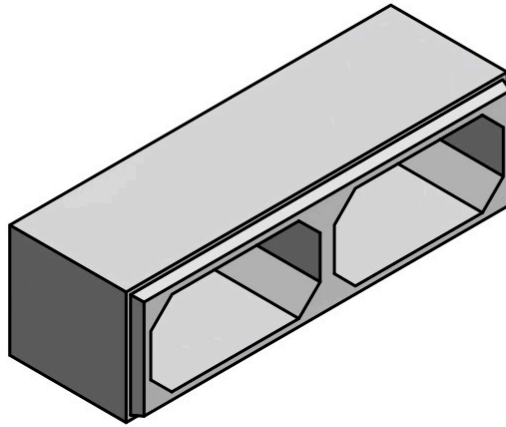
Elevation View

Product Dimensions										
Span (ft)	3	4	5	6	7	8	9	10	11	12
Wall Thickness (in)	4	5	6	7	8	8	9	10	11	12
Top Thickness (in)	7	7.5	8	8	8	8	9	10	11	12
Bottom Thickness (in)	6	6	7	7	8	8	9	10	11	12
Riser (ft)	Approximate Weight (Tons per Linear Foot)									
2	0.41	0.56								
3	0.46	0.62	0.82	0.99						
4		0.68	0.90	1.07	1.30	1.40			2.44	2.85
5			0.97	1.16	1.40	1.50	1.83	2.19		
6				1.25	1.50	1.60	1.94	2.31	2.72	3.15
7					1.60	1.70	2.05	2.44		
8						1.80	2.17	2.56	2.99	3.45
9							2.28	2.69		
10								2.81	3.27	3.75
11									3.4	
12										4.05

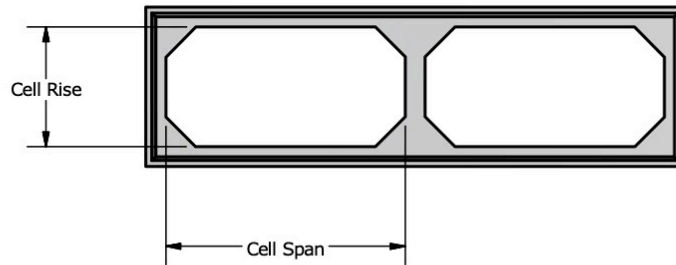
NOTES

- These Standard Sizes reflect ASTM C1577 for Precast Concrete Box Culverts.
- Additional sizes and configurations are available including: Intermediate Sizes, Over Sized Boxes, Bottomless (3-sided) Culverts, Multi-Cell Monolithic Units, Removable Top Sections
- Please contact CP&P for additional options and configurations. Pipe can be supplied with gaskets meeting the requirements of ASTM C443, C1619, C990 or ASTM C361 with approval.

DOUBLE CELL MONOLITHIC BOX CULVERT

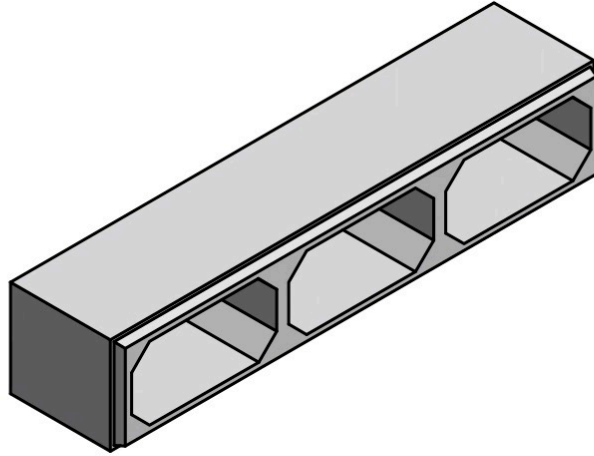


Isometric View

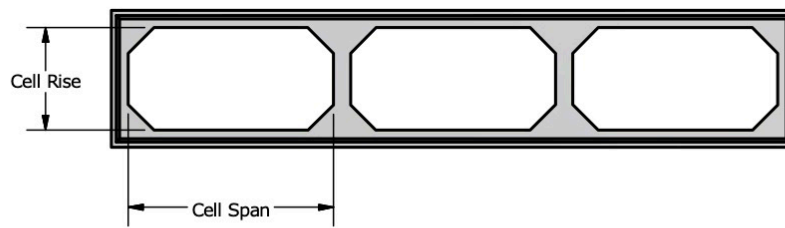


Elevation View

TRIPLE CELL MONOLITHIC BOX CULVERT

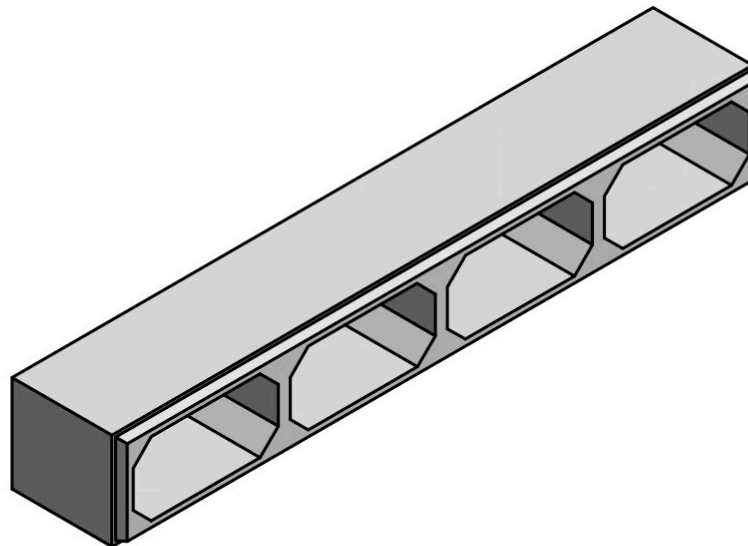


Isometric View

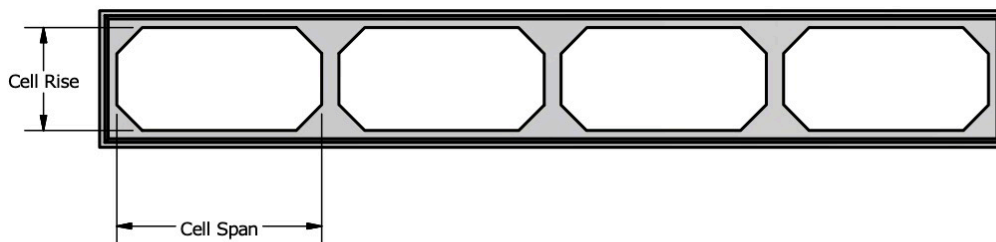


Elevation View

QUAD CELL MONOLITHIC BOX CULVERT

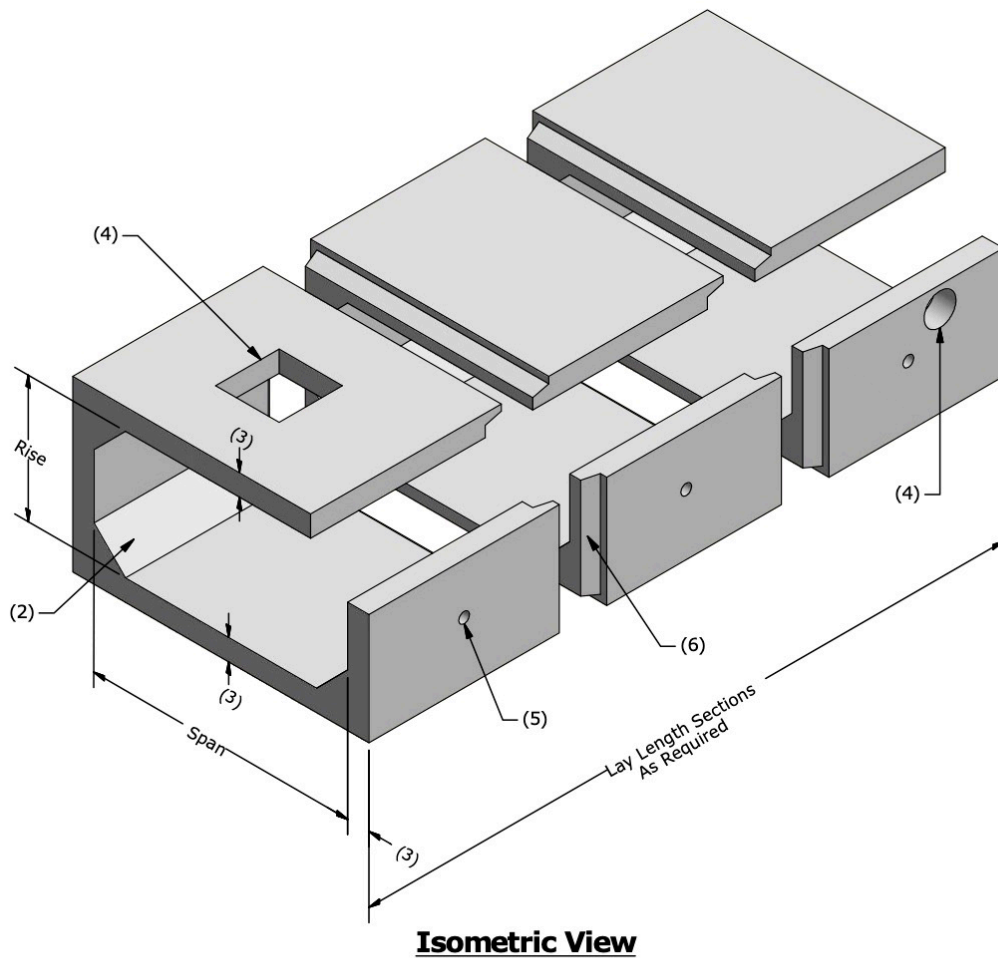


Isometric View



Elevation View

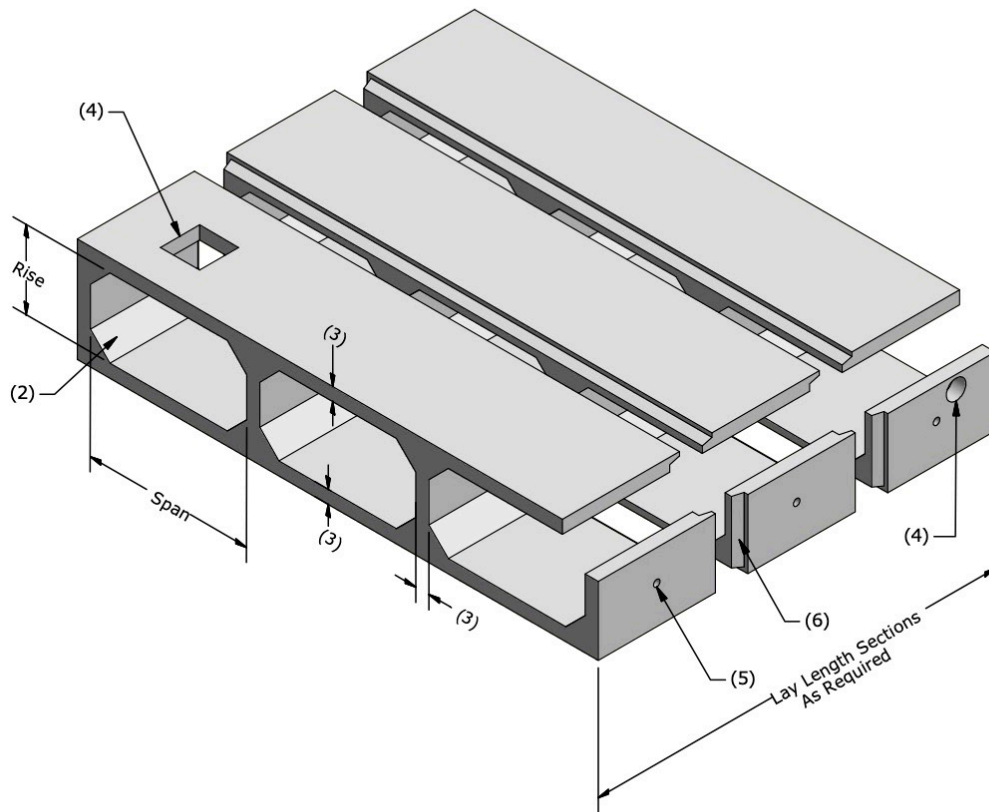
PRECAST BOX CULVERT SINGLE CELL



NOTES

1. Precast box culvert design conforms to ASTM C1433, ASTM C1577 and AASHTO for Highway Bridges.
2. Typical haunch.
3. Wall, roof and floor dimensions shall be determined by job conditions. Typical configurations as well as steel requirements are detailed in ASTM C1433 and ASTM C1577.
4. Penetrations in roof slab and walls can be provided per job requirements. Additional steel may be required at all penetrations.
5. Weep holes available per job requirements and are typically placed one per culvert section at each exterior wall.
6. Tongue and groove shall be sized in proportion to culvert cross section. Joints shall be sealed by 1" x 1" close cell neoprene sponge gasket material which is factory applied to Bell or Groove end of the culvert section.
7. See Special details for end treatments, curves, and additional options available.

PRECAST BOX CULVERT MULTIPLE CELL

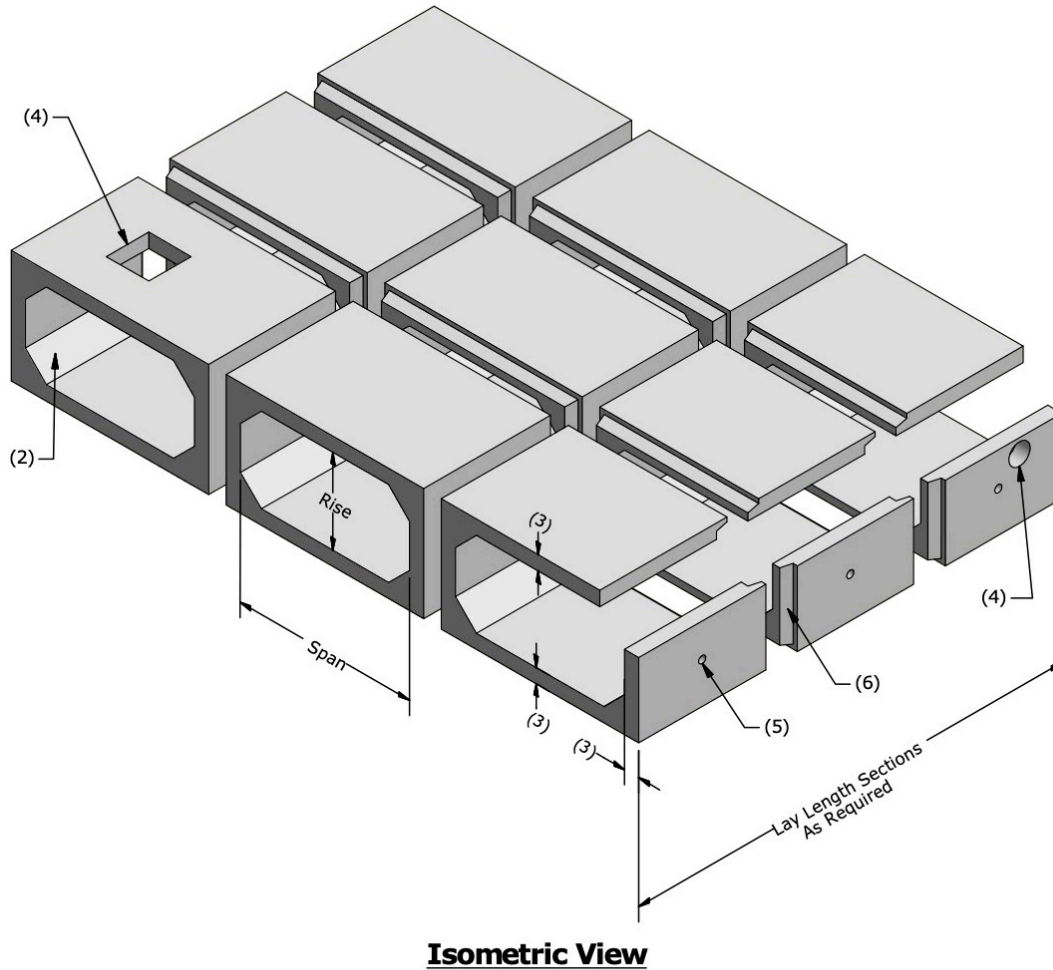


Isometric View

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7. See Special details for end treatments, curves, and additional options available.
8. Precast culvert section can be produced monolithically in multi-cell configurations.

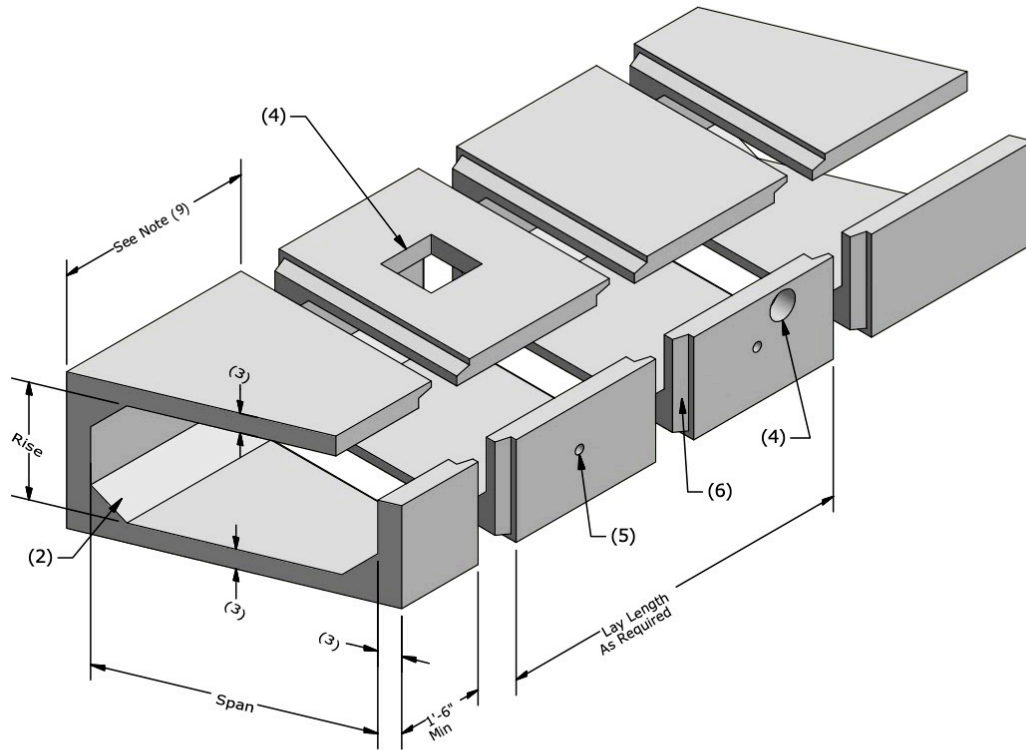
PRECAST BOX CULVERT MULTIPLE CELL-COMPOSITE



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5. Weep holes available per job requirements and are typically placed one per culvert section at each exterior wall.
6. Tongue and groove shall be sized in proportion to culvert cross section. Joints shall be sealed by 1" x 1" close cell neoprene sponge gasket material which is factory applied to Bell or Groove end of the culvert section.
7. See Special details for end treatments, curves, and additional options available.
8. Multi-cell configuration may be accomplished by repeated rows of single cell cross sections. This is primarily due to constraints on site due to weight handling limitations.
9. Spacing between rows are to be filled with granular material in order to assume load distribution in walls.

PRECAST BOX CULVERT SKEWED ENDS-SINGLE CELL

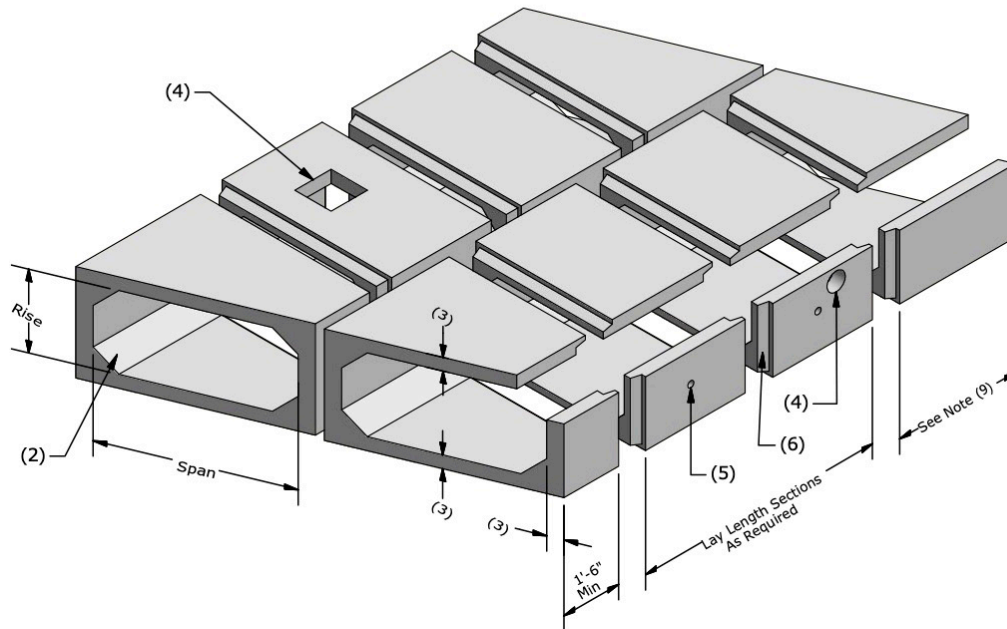


Isometric View

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4. Penetrations in roof slab and walls can be provided per job requirements. Additional steel may be required at all penetrations.
5. Weep holes available per job requirements and are typically placed one per culvert section at each exterior wall.
6. Tongue and groove shall be sized in proportion to culvert cross section. Joints shall be sealed by 1" x 1" close cell neoprene sponge gasket material which is factory applied to Bell or Groove end of the culvert section.
7. See Special details for end treatments, curves, and additional options available.
8. Standard skewed angle may be limited due to section length as related to span of culvert. Special length end section can be produced to increase skewed angle.
9. Special skew configuration can be achieved in single and multiple cell culverts by incorporating a precast headwall into the end design. Call our sales / Engineering Team for additional information.

PRECAST BOX CULVERT SKEWED ENDS-MULTIPLE CELL

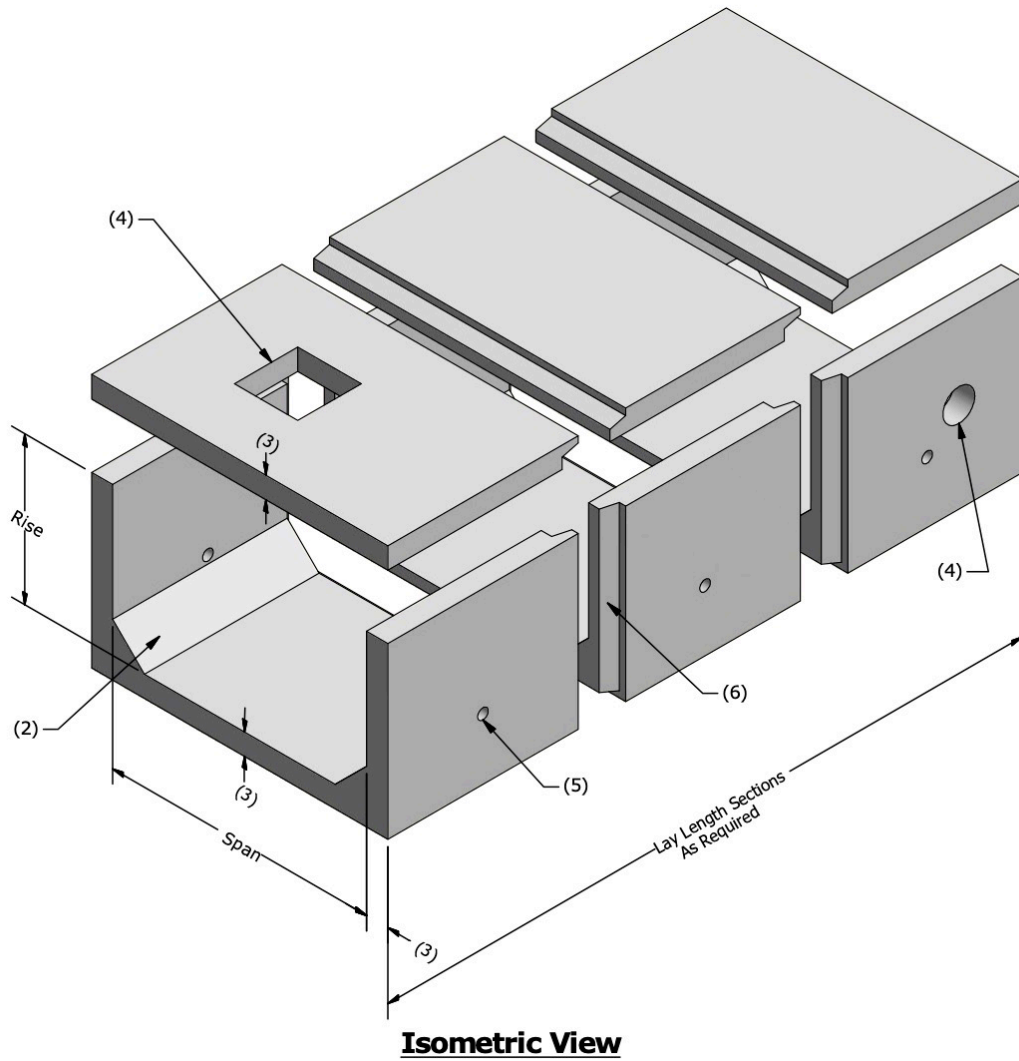


Isometric View

NOTES

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2. Typical haunch.
3. Wall, roof and floor dimensions shall be determined by job conditions. Typical configurations as well as steel requirements are detailed in ASTM C1433 and ASTM C1577.
4. Penetrations in roof slab and walls can be provided per job requirements. Additional steel may be required at all penetrations.
5. Weep holes available per job requirements and are typically placed one per culvert section at each exterior wall.
6. Tongue and groove shall be sized in proportion to culvert cross section. Joints shall be sealed by 1" x 1" close cell neoprene sponge gasket material which is factory applied to Bell or Groove end of the culvert section.
7. See Special details for end treatments, curves, and additional options available.
8. Standard skewed angle may be limited due to section length as related to span of culvert. Special length end section can be produced to increase skewed angle.
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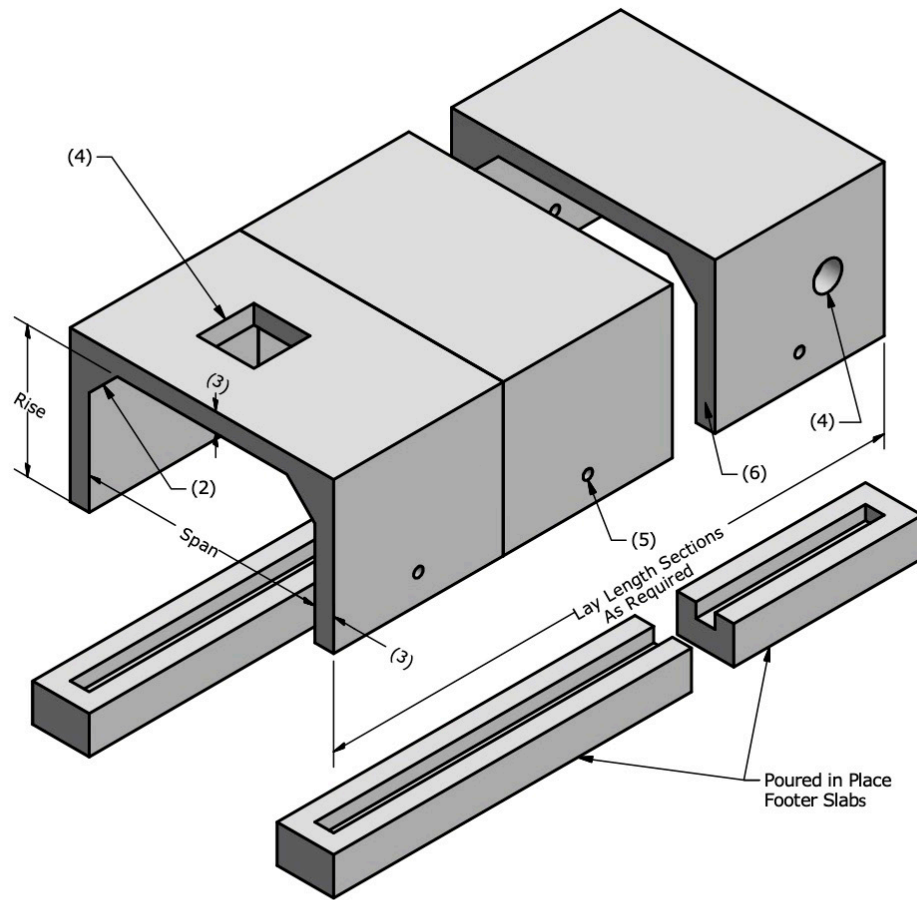
PRECAST BOX CULVERT 3 SIDED BOX WITH TOP SLAB



NOTES

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4. Penetrations in roof slab and walls can be provided per job requirements. Additional steel may be required at all penetrations.
5. Weep holes available per job requirements and are typically placed one per culvert section at each exterior wall.
6. Tongue and groove shall be sized in proportion to culvert cross section. Joints shall be sealed by 1" x 1" close cell neoprene sponge gasket material which is factory applied to Bell or Groove end of the culvert section.
7. See Special details for end treatments, curves, and additional options available.
8. This section may be used for various applications where it is desirable to gain access to a trench or install piping or utilities before closing top sections.

PRECAST BOX CROWN-SPAN 3 SIDED BOX WITH FOOTER SLABS

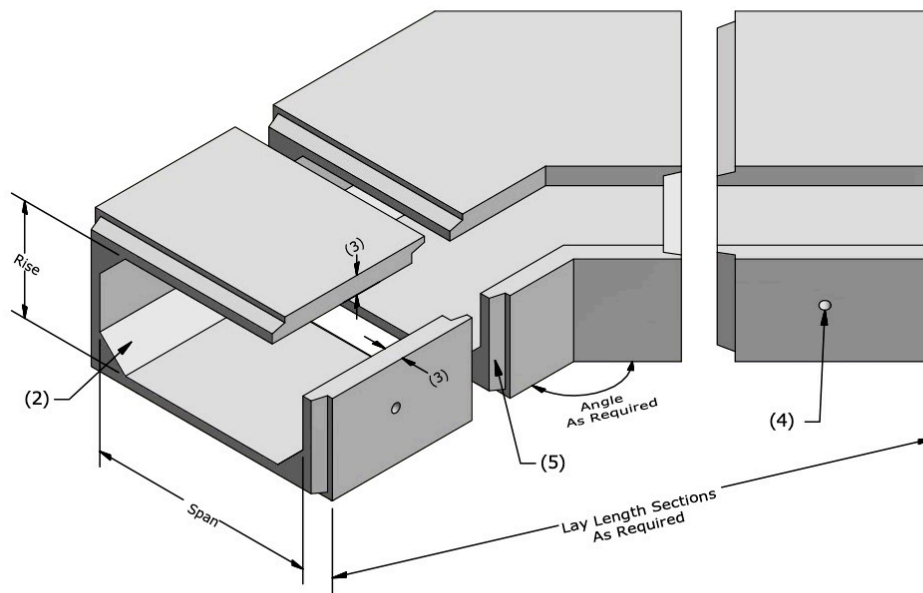


Isometric View

NOTES

1. Precast culvert design conforms to ASTM C1504 and AASHTO for Precast Reinforced Concrete Three-Sided Structures.
2. Typical haunch.
3. Wall and roof dimensions shall be determined by job conditions. Typical configurations as well as steel requirements are detailed in ASTM C1504.
4. Penetrations in roof slab and walls can be provided per job requirements. Additional steel may be required at all penetrations.
5. Weep holes available per job requirements and are typically placed one per culvert section at each exterior wall.
6. Joints shall be sealed by 1" x 1" close cell neoprene sponge gasket material which is factory applied to the Butt end of the culvert section.
7. See Special details for end treatments, curves, and additional options available.

PRECAST BOX CULVERT TIGHT BEND-SPECIAL SECTION

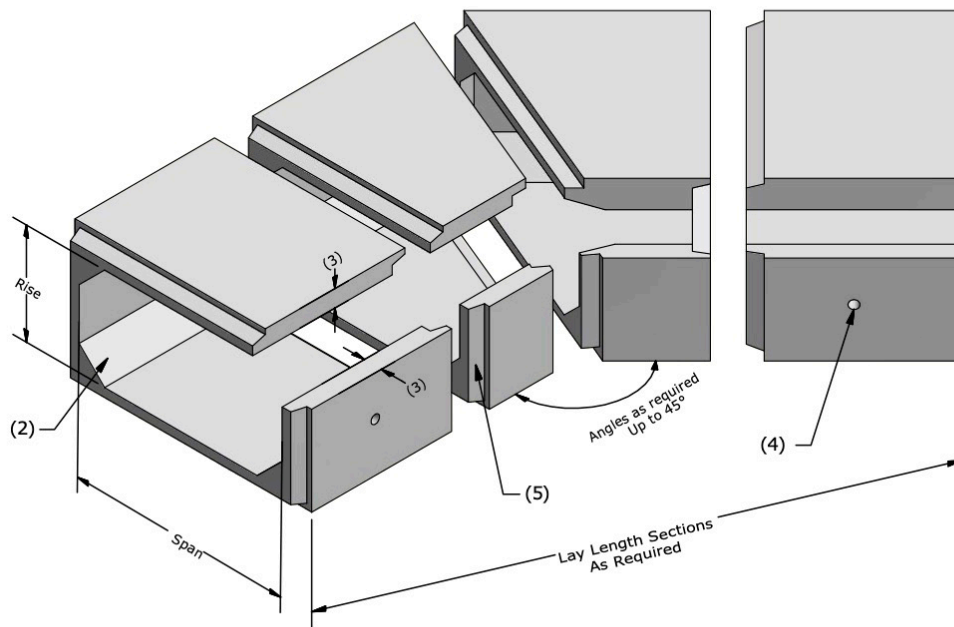


Isometric View

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4. Weep holes available per job requirements and are typically placed one per culvert section at each exterior wall.
5. Tongue and groove shall be sized in proportion to culvert cross section. Joints shall be sealed by 1" x 1" close cell neoprene sponge gasket material which is factory applied to Bell or Groove end of the culvert section.
6. Special joint section required. Limited by cross section configurations.

PRECAST BOX CULVERT TIGHT BEND-MITER JOINT

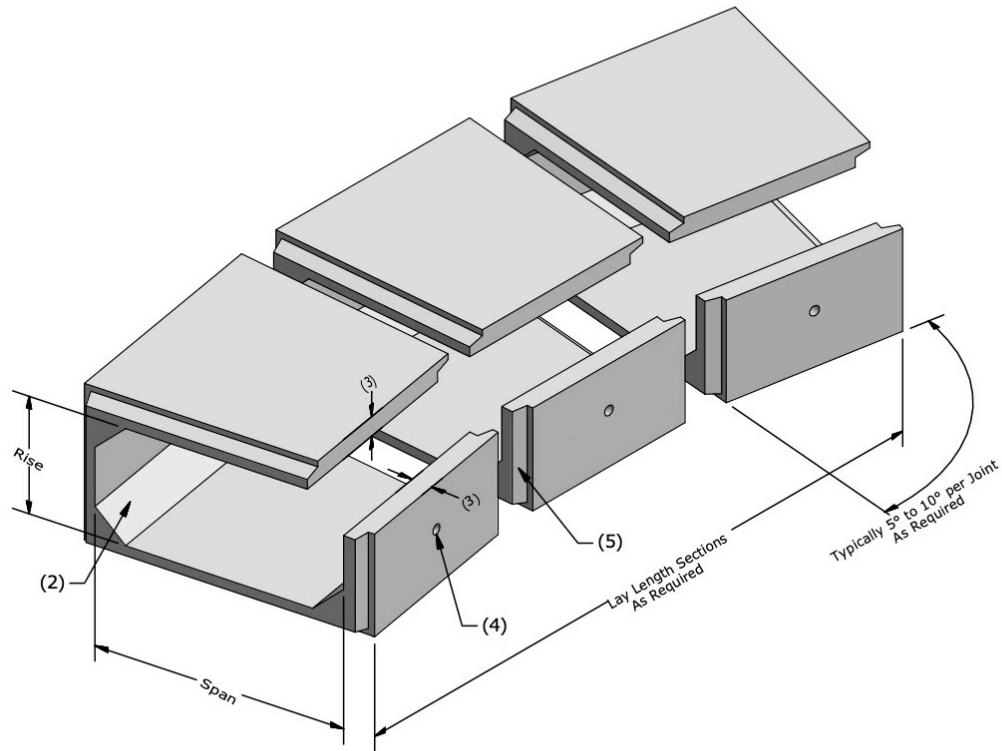


Isometric View

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6. Special joint section required. Limited by cross section configurations.

PRECAST BOX CULVERT SWEEP BEND-TAPERED JOINT

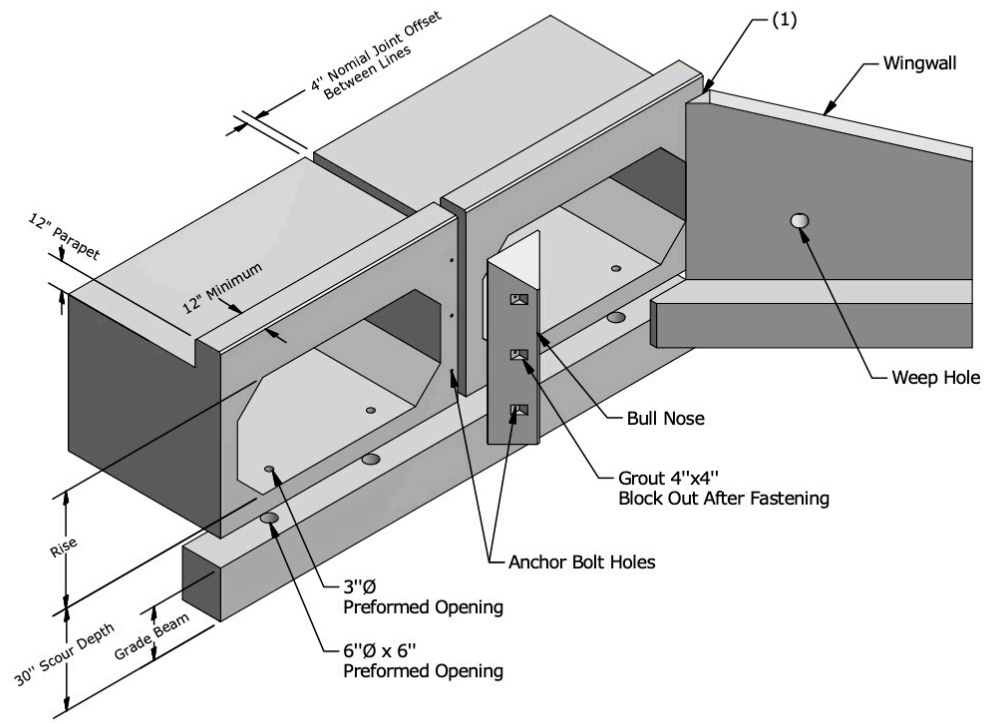


Isometric View

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PRECAST BOX ENDWALL (ES) AND WINGWALL (BWW) CONNECTION DETAILS

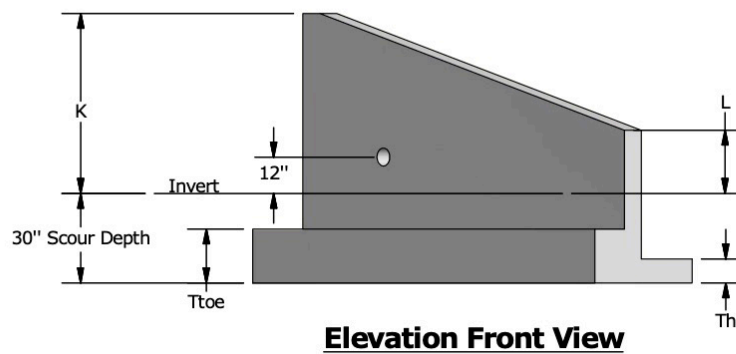
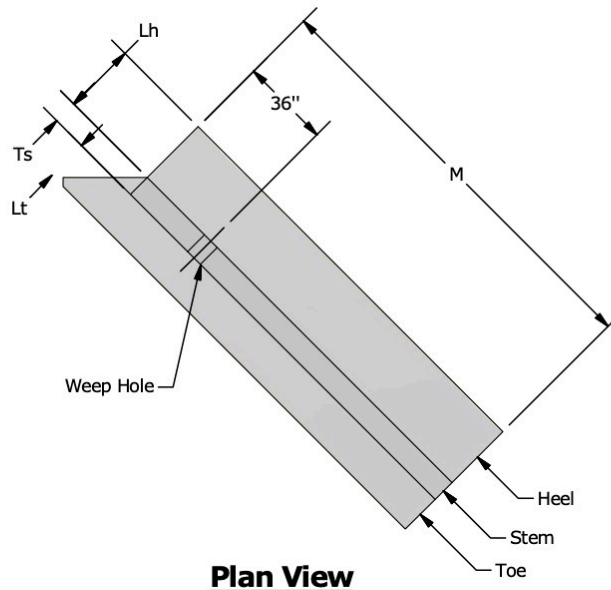


Isometric View

NOTES

1. All joining surfaces to be neatly sealed with state approved sealant.
2. All components designed to be independently stable in overturning, sliding and bearing. Components should not be externally restrained by mechanical connectors. Such connection could lead to stress concentrations from minor settlement or thermal expansion.
3. Wingwalls may be produced in 8' minimum sections as shipping limitations dictate. Weep holes to be adjusted to provide 1' clearance to section joints, if needed.
4. Chamfer $\frac{3}{4}$ " on all exposed 90 corners.
5. Grade Beam must be installed before box end sections and are required by design to retain fill and pressure below box sections. Minimum grade beam length to be equal to the overall width of finished end sections. Contractor to provide and place #6 bars in preformed openings and grout in the field.

PRECAST BOX AND CROWN-SPAN WINGWALL (BWW)



Stem Length	
M Up To	No. Weep Holes
12'	1
18'	2
24'	3
30'	4
36'	5

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3. Wingwalls may be produced in 8' minimum sections as shipping limitations dictate. Weep holes to be adjusted to provide 1' clearance to section joints, if needed.
4. Chamfer $\frac{3}{4}$ " on all exposed 90° corners.
5. K: Upper stem height, 12" increments (Typ), L: lower stem height, M: Stem length, 12" increments (Typ), Ts: Stem thickness, 8" (Typ), Th: Heel thickness, 8" (Typ), Ttoe: Toe thickness, 18" (Typ), Ln: Heel length, 6" increments (Typ), 12" minimum, Lt: Toe length, 14" for K less than 10 feet, 28" for K of 10 feet or more.

PRECAST BOX CULVERTS & CROWN-SPAN

Feet Span x Rise	Sq. Ft. Area	Inches Equiv Round Dia	Inches Equiv Dble Dia
3x3	8.9	36	28
4x3	11.7	45	35
4x4	15.7	53	41
4x5	19.7	59	45
4x6	23.7	64	50
4x7	27.7	69	53
4x8	31.7	73	57
4x9	35.7	78	60
4x10	39.7	81	63
4x11	43.7	85	65
4x12	47.7	88	68
5x2	9.5	40	31
5x3	14.5	50	39
5x4	19.5	59	45
5x5	24.5	66	51
5x6	29.5	72	56
5x7	34.5	78	60
5x8	39.5	83	64
5x9	44.5	88	67
5x10	49.5	92	71
5x11	54.5	96	74
5x12	59.5	100	77
6x3	17.3	55	42
6x4	23.3	64	49
6x5	29.3	72	56
6x6	35.3	79	61
6x7	41.3	85	66
6x8	47.3	91	70
6x9	53.3	96	74
6x10	59.3	101	78
6x11	65.3	106	82
6x12	71.3	110	85

Feet Span x Rise	Sq. Ft. Area	Inches Equiv Round Dia	Inches Equiv Dble Dia
7x3	20.1	59	45
7x4	27.1	69	53
7x5	34.1	78	60
7x6	41.1	85	66
7x7	48.1	92	71
7x8	55.1	99	76
7x9	62.7	104	81
7x10	69.1	110	85
7x11	76.1	115	89
7x12	83.1	120	92
8x3	23.1	62	48
8x4	31.1	73	56
8x5	39.1	83	64
8x6	47.1	91	70
8x7	55.1	99	76
8x8	63.1	105	81
8x9	71.1	112	86
8x10	79.1	118	91
8x11	87.1	123	95
8x12	95.1	129	99
9x4	34.9	77	59
9x5	43.9	87	67
9x6	52.9	96	74
9x7	61.9	104	80
9x8	70.9	112	85
9x9	79.9	119	92
9x10	88.9	125	96
9x11	97.9	131	101
9x12	106.9	137	105

Feet Span x Rise	Sq. Ft. Area	Inches Equiv Round Dia	Inches Equiv Dble Dia
10x4	38.6	81	62
10x5	48.6	91	71
10x6	58.6	101	78
10x7	68.6	110	85
10x8	78.6	118	91
10x9	88.6	125	96
10x10	98.6	132	102
10x11	108.6	138	107
10x12	118.6	144	111
11x4	42.3	84	65
11x5	53.3	95	74
11x6	64.3	106	81
11x7	75.3	115	88
11x8	86.3	123	95
11x9	97.3	131	101
11x10	108.3	138	107
11x11	119.3	145	112
11x12	130.3	152	117
12x4	46.0	87	67
12x5	58.0	99	76
12x6	70.0	110	85
12x7	82.0	119	92
12x8	94.0	128	99
12x9	106.0	137	105
12x10	118.0	144	111
12x11	130.0	151	117
12x12	142.0	158	122

NOTES

- For accuracy, equivalent round and equivalent double round are not rounded to standard pipe sizes.
- Capacity of culverts may be governed by inlet conditions.
- For further information, see APCA concrete pipe design manual.



CP&P, A CMC Precast Business
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