

**EW-7**

Cost of Bars for crack control to be included in price bid per cubic yard concrete.

All cast in place concrete to be Class A3. For precast See Sheet 101.18.

Quantities given are for one endwall.

All dimensions not given in tables are same as those for Single Endwalls for same size pipe.

On shallow fills, where endwalls are 1' or less below shoulder line, the top of the endwall shall be constructed parallel to the grade of the road.

This item may be precast or cast in place.

In no case shall top of endwall project above fill slope, ditch slope, or shoulder.

Bevel edge is required on the headwall at the inlet end of the culvert (where the flow enters the culvert).

Headwall at the outlet end of the culvert may be either square edge or bevel edge.

Headwall to be beveled in all areas except where a conflict with invert or wingwalls occur.

3/4" Chamfer shall be provided on all exposed edges.

Shape to be beveled with mortar.

Do not bevel invert.

Flow

2 #4 Deformed crack control Bars

FOR CONCRETE PIPE

FOR CORRUGATED METAL PIPE

a = 1.25' ± /foot diameter  
b = 1' /foot diameter

DIAMETER OF PIPE	D	S	T	FILL SLOPE 1 1/2:1		FILL SLOPE 2:1		a	b	
				CONCRETE IN ONE ENDWALL	INCREASE FOR EACH ADDITIONAL PIPE	CONCRETE IN ONE ENDWALL	INCREASE FOR EACH ADDITIONAL PIPE			
42"	6'-0"	9'-6"	4.829	1.271	9.493	1.285	0'4 1/2"	0'3 1/2"	0'4 1/2"	0'3 1/2"
48"	6'-0"	10'-0"	5.954	1.591	6.802	1.572	0'4"	0'4"	0'4"	0'4"
54"	7'-0"	10'-2"	7.692	2.057	8.766	2.035	0'7"	0'4 1/2"	0'7"	0'4 1/2"
60"	8'-0"	10'-4"	9.689	2.600	11.112	2.574	0'10 1/2"	0'5"	0'10 1/2"	0'5"
66"	9'-0"	10'-6"	12.016	3.240	13.911	3.209	0'4 1/2"	0'6 1/2"	0'4 1/2"	0'6 1/2"
72"	10'-0"	10'-8"	14.663	3.961	16.885	3.927	0'5"	0'6"	0'5"	0'6"
78"	11'-0"	11'-0"	17.612	4.751	20.325	4.713	0'10"	0'6 1/2"	0'10"	0'6 1/2"
84"	11'-0"	16'-0"	21.148	5.686	24.587	5.617	0'10 1/2"	0'7"	0'10 1/2"	0'7"

**STANDARD ENDWALLS FOR MULTIPLE PIPE CULVERTS**  
42"-84" PIPE  
VIRGINIA DEPARTMENT OF TRANSPORTATION

SPECIFICATION REFERENCE 105.04 302

101.17

**EW-7 PC**

Headwall to be beveled in all areas except where a conflict with invert or wingwalls occur.

Shape to be beveled with mortar.

Flow

2 #4 Deformed crack control Bars

FOR CONCRETE OR CORRUGATED METAL PIPE

PIPE I.D.	DIM "H"	DIM "T"	DIM "S"	DIM "L" 1 1/2:1 Slope	DIM "L" 2:1 Slope	a	b
42"	5'-6"	12'-6"	6'-0"	6'-7 1/2"	8'-0"	0'-8 1/2"	0'-3 1/2"
48"	6'-0"	13'-0"	6'-10"	7'-6"	9'-0"	0'-8"	0'-4"
54"	6'-6"	15'-2"	7'-8"	8'-4"	11'-0"	0'-7"	0'-4 1/2"
60"	7'-0"	16'-4"	8'-6"	9'-3"	12'-1 1/2"	0'-7 1/2"	0'-5"
66"	7'-6"	17'-0"	9'-4"	10'-1 1/2"	13'-3 1/2"	0'-8 1/2"	0'-5 1/2"
72"	8'-2"	19'-2"	10'-2"	11'-0"	14'-5 1/2"	0'-9"	0'-6"
78"	8'-8 1/2"	20'-6"	11'-0"	11'-10"	15'-7"	0'-10"	0'-6 1/2"
84"	9'-3"	24'-4"	11'-0"	12'-8 1/2"	16'-9"	0'-10 1/2"	0'-7"

a = 1.25' ± /foot diameter  
b = 1' /foot diameter

CONCRETE TO BE 4000 PSI MINIMUM COMPRESSIVE STRENGTH. IF PIPE IS TO BE STRENGTHENED THE OPENING WILL BE ADJUSTED TO ACCOMMODATE ORIGINAL UP TO 10".

REINFORCING STEEL IN ACCORDANCE WITH ASTM A-615 (REINFORCING BARS).

PIPE OPENING AS REQUIRED, 4" MIN. 8" MAX. LARGER THAN O.D. PIPE.

IN NO CASE SHALL TOP OF ENDWALL PROJECT ABOVE FILL SLOPE, DITCH SLOPE, OR SHOULDER.

DIMENSIONS SHOWN ARE MINIMUM. ACTUAL MEASUREMENTS MAY VARY WITH MANUFACTURER'S TOLERANCES.

BEVEL EDGE IS REQUIRED ON THE HEADWALL AT THE INLET END OF THE CULVERT (WHERE THE FLOW ENTERS THE CULVERT).

HEADWALL AT THE OUTLET END OF THE CULVERT MAY BE EITHER SQUARE EDGE OR BEVEL EDGE.

HEADWALL TO BE BEVELED IN ALL AREAS EXCEPT WHERE A CONFLICT WITH INVERT OR WINGWALLS OCCUR.

3/4" CHAMFER SHALL BE PROVIDED ON ALL EXPOSED EDGES.

CONCRETE INSERTS & #4 LAY BARS

3/4" CHAMFER SHALL BE PROVIDED ON ALL EXPOSED EDGES.

See Detail A

Flow

See Detail B

**PRECAST ENDWALLS FOR MULTIPLE PIPE CULVERTS**  
42"-84" PIPE  
VIRGINIA DEPARTMENT OF TRANSPORTATION

SPECIFICATION REFERENCE 105.04 302

101.18

**EW-7S**

Headwall to be beveled in all areas except where a conflict with invert or wingwalls occur.

Bevel edge is required on the headwall at the inlet end of the culvert (where the flow enters the culvert).

Headwall at the outlet end of the culvert may be either square edge or bevel edge.

All cast in place concrete to be Class A3. For precast See Sheet 101.21.

Quantities given are for One Endwall.

All dimensions not given in table are same as those for Single Endwalls for same size pipe.

On shallow fills, where endwalls are 1' or less below shoulder line, the top of the endwall shall be constructed parallel to the grade of the road.

This item may be precast or cast in place.

In no case shall top of endwall project above fill slope, ditch slope, or shoulder.

Cost of Bars for crack control to be included in price bid per cubic yard concrete.

Shape to be beveled with mortar.

Flow

2 #4 Deformed crack control Bars

FOR CONCRETE PIPE OR CORRUGATED METAL PIPE

DIA. OF PIPE	D	S	S <sub>30</sub>	T <sub>30</sub>	FILL SLOPE 1 1/2:1		FILL SLOPE 2:1	
					Concrete In One Endwall CU YDS.	Increase For Each Additional Pipe CU YDS.	Concrete In One Endwall CU YDS.	Increase For Each Additional Pipe CU YDS.
42"	6'-0"	6'-11 1/2"	10'-11 1/2"	5.098	1.467	5.759	1.449	
48"	6'-0"	7'-10 1/2"	12'-6 1/2"	6.295	1.836	7.129	1.814	
54"	7'-8"	8'-10 1/2"	14'-0 1/2"	8.121	2.376	9.218	2.350	
60"	8'-6"	9'-9 1/2"	15'-7"	10.224	3.001	11.640	2.971	
66"	9'-4"	10'-9 1/2"	17'-1 1/2"	12.663	3.729	14.450	3.693	
72"	10'-2"	11'-8 1/2"	18'-8"	15.437	4.552	17.650	4.512	
78"	11'-0"	12'-8 1/2"	20'-2 1/2"	18.558	5.482	21.261	5.438	
84"	11'-0"	13'-8 1/2"	21'-9"	22.081	6.537	25.351	6.488	

a = 1.25' ± /foot diameter  
b = 1' /foot diameter

3/4" Chamfer shall be provided on all exposed edges.

Do not bevel invert.

Shape to be beveled with mortar.

Flow

2 #4 Deformed crack control Bars

FOR CONCRETE PIPE

FOR CORRUGATED METAL PIPE

a = 1.25' ± /foot diameter  
b = 1' /foot diameter

**STANDARD ENDWALLS FOR MULTIPLE PIPE CULVERTS**  
42"-84" PIPE - 30° SKEW  
VIRGINIA DEPARTMENT OF TRANSPORTATION

SPECIFICATION REFERENCE 105.04 302

101.19

**EW-7S**

Headwall to be beveled in all areas except where a conflict with invert or wingwalls occur.

Bevel edge is required on the headwall at the inlet end of the culvert (where the flow enters the culvert).

Headwall at the outlet end of the culvert may be either square edge or bevel edge.

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Quantities given are for One Endwall.

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This item may be precast or cast in place.

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Cost of Bars for crack control to be included in price bid per cubic yard concrete.

Shape to be beveled with mortar.

Flow

2 #4 Deformed crack control Bars

3/4" Chamfer shall be provided on all exposed edges.

FOR CONCRETE PIPE

DIA. OF PIPE	D	S	S <sub>45</sub>	T <sub>45</sub>	FILL SLOPE 1 1/2:1		FILL SLOPE 2:1	
					Concrete In One Endwall	Increase For Each Additional Pipe	Concrete In One Endwall	Increase For Each Additional Pipe
42"	6'-0"	8'-5 1/2"	13'-5 1/2"	6.030	1.799	6.919	1.776	
48"	6'-0"	9'-0"	15'-3 1/2"	7.443	2.252	8.479	2.225	
54"	7'-8"	10'-4 1/2"	17'-5 1/2"	9.821	2.909	10.949	2.878	
60"	8'-6"	12'-0"	19'-1 1/2"	12.124	3.677	13.935	3.640	
66"	9'-4"	13'-8 1/2"	20'-11 1/2"	15.003	4.562	17.148	4.520	
72"	10'-2"	15'-4 1/2"	22'-4 1/2"	18.287	5.573	20.933	5.524	
78"	11'-0"	16'-8 1/2"	24'-9 1/2"	21.991	6.715	25.247	6.662	
84"	11'-0"	18'-6 1/2"	26'-11 1/2"	26.156	8.008	30.089	7.947	

FOR CORRUGATED METAL PIPE

DIA. OF PIPE	D	S	S <sub>45</sub>	T <sub>45</sub>	FILL SLOPE 1 1/2:1		FILL SLOPE 2:1	
					Concrete In One Endwall	Increase For Each Additional Pipe	Concrete In One Endwall	Increase For Each Additional Pipe
42"	5'-3 1/2"	7'-0"	12'-4 1/2"	6.331	1.769	7.118	1.767	
48"	6'-0"	8'-6"	14-2"	7.886	2.262	8.900	2.236	
54"	6'-6"	9'-7 1/2"	15'-8 1/2"	10.223	2.949	11.526	2.917	
60"	7'-6"	10'-8 1/2"	17'-8"	12.944	3.785	14.750	3.717	
66"	8'-6"	12'-0"	19'-6"	16.090	4.690	18.236	4.646	
72"	9'-6"	13'-0"	21'-6"	19.690	5.763	22.347	5.712	
78"	10'-6"	14'-0"	23'-6"	23.767	6.974	27.003	6.917	
84"	11'-6"	15'-0"	25'-6"	28.347	8.350	32.265	8.284	

**STANDARD ENDWALLS FOR MULTIPLE PIPE CULVERTS**  
42"-84" PIPE - 45° SKEW  
VIRGINIA DEPARTMENT OF TRANSPORTATION

SPECIFICATION REFERENCE 105.04 302

101.20

**EW-7S PC**

Headwall to be beveled in all areas except where a conflict with invert or wingwalls occur.

Bevel edge is required on the headwall at the inlet end of the culvert (where the flow enters the culvert).

Headwall at the outlet end of the culvert may be either square edge or bevel edge.

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Shape to be beveled with mortar.

Flow

2 #4 Deformed crack control Bars

FOR CONCRETE OR CORRUGATED METAL PIPE

PIPE I.D.	DIM "H"	DIM "T"	DIM "S"	DIM "L" 1 1/2:1 Slope	DIM "L" 2:1 Slope	a	b
42"	5'-6"	12'-6"	6'-0"	6'-7 1/2"	8'-0"	0'-8 1/2"	0'-3 1/2"
48"	6'-0"	13'-0"	6'-10"	7'-6"	9'-0"	0'-8"	0'-4"
54"	6'-6"	15'-2"	7'-8"	8'-4"	11'-0"	0'-7"	0'-4 1/2"
60"	7'-0"	16'-4"	8'-6"	9'-3"	12'-1 1/2"	0'-7 1/2"	0'-5"
66"	7'-6"	17'-0"	9'-4"	10'-1 1/2"	13'-3 1/2"	0'-8 1/2"	0'-5 1/2"
72"	8'-2"	19'-2"	10'-2"	11'-0"	14'-5 1/2"	0'-9"	0'-6"
78"	8'-8 1/2"	20'-6"	11'-0"	11'-10"	15'-7"	0'-10"	0'-6 1/2"
84"	9'-3"	24'-4"	11'-0"	12'-8 1/2"	16'-9"	0'-10 1/2"	0'-7"

a = 1.25' ± /foot diameter  
b = 1' /foot diameter

CONCRETE TO BE 4000 PSI MINIMUM COMPRESSIVE STRENGTH. IF PIPE IS TO BE STRENGTHENED THE OPENING WILL BE ADJUSTED TO ACCOMMODATE ORIGINAL UP TO 10".

REINFORCING STEEL IN ACCORDANCE WITH ASTM A-615 (REINFORCING BARS).

PIPE OPENING AS REQUIRED, 4" MIN. 8" MAX. LARGER THAN O.D. PIPE.

IN NO CASE SHALL TOP OF ENDWALL PROJECT ABOVE FILL SLOPE, DITCH SLOPE, OR SHOULDER.

DIMENSIONS SHOWN ARE MINIMUM. ACTUAL MEASUREMENTS MAY VARY WITH MANUFACTURER'S TOLERANCES.

BEVEL EDGE IS REQUIRED ON THE HEADWALL AT THE INLET END OF THE CULVERT (WHERE THE FLOW ENTERS THE CULVERT).

HEADWALL AT THE OUTLET END OF THE CULVERT MAY BE EITHER SQUARE EDGE OR BEVEL EDGE.

HEADWALL TO BE BEVELED IN ALL AREAS EXCEPT WHERE A CONFLICT WITH INVERT OR WINGWALLS OCCUR.

3/4" CHAMFER SHALL BE PROVIDED ON ALL EXPOSED EDGES.

CONCRETE INSERTS & #4 LAY BARS

3/4" CHAMFER SHALL BE PROVIDED ON ALL EXPOSED EDGES.

See Detail A

Flow

See Detail B

**PRECAST ENDWALLS FOR MULTIPLE PIPE CULVERTS**  
42"-84" PIPE 45° SKEW  
VIRGINIA DEPARTMENT OF TRANSPORTATION

SPECIFICATION REFERENCE 105.04 302

101.21