

INDEX FOR  
SPECIFICATIONS FOR THE  
SUPPLY AND DELIVERY OF CORRUGATED STEEL CULVERTS

		<u>Page</u>
1285. 1.	Scope.....	1
2.	Supply Requirements .....	1
2.1	Corrugation Profiles .....	1
2.2	Standard Dimensions .....	1
2.3	Recorrugated Ends.....	2
2.4	Couplers .....	3
2.5	Coupler Fasteners .....	3
<b>2.6</b>	<b>Inspection of Culverts.....</b>	<b>3</b>
3.	Surface Staining .....	4
4.	Delivery Requirements .....	4
4.1	Station Identification .....	4
4.2	Delivery of Culverts.....	4
5.	Liquidated Damages.....	5
6.	Final Acceptance .....	5
7.	Method of Measurement.....	5
9.	Basis of Payment.....	6
	Table 1.....	6

**SPECIFICATIONS FOR  
THE SUPPLY AND DELIVERY OF  
CORRUGATED STEEL CULVERTS**

1285. 1. Scope

These Specifications govern all operations necessary for and pertaining to the supply, fabrication and delivery of corrugated steel culverts for the Department of Highways and Transportation of the Province of Manitoba.

2. Supply Requirements

Table 1 indicates the maximum section length and required number of couplers to be supplied for each culvert installation.

The material and fabrication shall conform to Specification CAN/CSA-G401-M, except as modified herein.

2.1 Corrugation Profiles

CORRUGATION PROFILE		INSIDE DIAMETER (mm)	APPLICATION
PITCH (mm)	DEPTH (mm)		
38	6.5	250 or less	Subsurface Drainage Culvert
68	13	300 - 1 800	Standard Profile for Helical or
68	13	All Sizes	Arch Culvert Helical or Riveted
125	26	1 200 - 1 800	*Alternate Profile for Helical Culvert

\*The alternate profile will only be permitted when specified in the Invitation to Tender.

2.2 Standard Dimensions

1. Riveted Corrugated Steel Culvert

INSIDE DIAMETER (mm)	MINIMUM OUTSIDE CIRCUMFERENCE (mm)
450	1 470
600	1 940
750	2 410
900	2 880
1 050	3 360
1 200	3 830
1 400	4 460
1 500	4 770
1 600	5 080
1 800	5 700

## 1285. 2. Helical Corrugated Steel Culvert

INSIDE DIAMETER (MM)	CORRUGATION DEPTH (mm)		
	6.5	13	26
	MIN. OUTSIDE CIRCUMFERENCE (mm)		
100	350	-	-
150	500	-	-
200	660	-	-
250	820	-	-
300	-	1 000	-
450	-	1 490	-
600	-	1 960	-
750	-	2 430	-
900	-	2 910	-
1 050	-	3 380	-
1 200	-	3 850	3 920
1 400	-	4 480	4 550
1 500	-	4 790	4 870
1 600	-	5 110	5 170
1 800	-	5 730	5 800

## 3. Riveted and Helical Arch Culverts

SPAN (mm)	RISE (mm)	EQUIVALENT DIAMETER (mm)	MINIMUM CORNER RADIUS (mm)
730	470	600	80
900	580	750	100
1 080	690	900	120
1 260	790	1 050	140
1 460	920	1 200	160
1 670	1 050	1 400	180
1 810	1 150	1 500	200
1 880	1 260	1 600	220
2 130	1 400	1 800	225

## 2.3 Re-Corrugated Ends

The ends of helical culverts having a diameter of 300 mm or greater, shall be re-corrugated to a 68 mm x 13 mm annular profile.

## 1285 2.4 Couplers

Annular corrugated couplers with the 68 mm x 13 mm profile shall be provided for culverts having a diameter of 300 mm or greater. The coupler shall conform to Appendix C of Specification CAN/CSA-G401-M, Figure C2. Couplers shall meet the following requirements:

Culvert Diameter mm	COUPLERS		
	Minimum Dimensions		No. of Pieces per coupler
	Thickness mm	Width mm	
300 - 450	1.60	300	1
600 - 750	1.60	600	1
900 - 1 050	1.60	600	2
1200 - 1 500	2.00	600	2
1800	2.80	600	2

The top section of the two piece coupler shall cover 1/3 to 1/2 of the culvert circumference.

## 2.5. Coupler Fasteners

1. Coupler flanges shall consist of rolled or formed angles, or lugs, which are to be riveted or welded to the coupler.
2. Where flanges are riveted to couplers, minimum rivet diameter shall be 10 mm. The minimum number of rivets per flange shall be 4 for the 300 mm wide coupler, and 9 for the 600 mm wide coupler.
3. Flanges on one piece couplers shall be located within 25 mm of one end and at least 100 mm from the other end.
4. On two piece couplers, the flanges on the top section shall be located within 25 mm of both ends. The flanges on the bottom section of the coupler shall be located at least 100 mm from both ends.
5. Bolts and nuts shall be supplied for connecting coupler flanges. Couplers of 300 mm width shall have at least three 12 mm diameter galvanized bolts per connection and the 600 mm wide couplers shall have at least five 12 mm diameter galvanized bolts per connection. The bolts shall be equally spaced along the connection.
6. The coupler ends shall have a minimum overlap of 50 mm after the connection is tightened.

2.6 Inspection of Culverts

**Corrugated Steel Culverts will be inspected and tested by the Department between the working days of Monday to Friday. The Supplier shall contact the Materials and Research Branch, Phone Number (204) 945-2114, at least two working days prior to the desired inspection date. Inspections will not be done on culverts stacked more than two metres high, nested or loaded on trucks.**

1285 2.6 Inspection of Culverts (Cont'd)

**Culverts which are inspected and meet the specifications will be stamped by the Department.**

**a) Manitoba Culvert Suppliers**

**The Manitoba culvert supplier shall contact the Department when an order or part of the order is ready for inspection prior to delivery. The culvert order shall be placed in one location in the Supplier's yard completely separated from any other order, unless otherwise permitted. Culverts shall not be loaded until approval for shipping has been given by the Department.**

**b) Out-of-Province Culvert Suppliers**

**Inspection of culverts from out-of-province suppliers will be carried out when an order or part of the order has been delivered to the designated location/s. Culverts will be considered delivered and complete when the post-delivery inspection has been conducted and all culverts are accepted.**

3. Surface Staining (White Rust)

Supplementary to Specification CAN/CSA-G401-M, Section 3.5.1.2.6, the surface condition called "white rust" will be evaluated according to severity of staining.

Where the staining covers more than 10% of the surface area of the culvert or has developed into grey spotting, test coupons shall be cut from the culvert. These coupons shall be chemical strip tested in accordance with Specification ASTM A-90. Culverts will be rejected if testing shows insufficient coating thickness.

When the staining has developed to dark grey or black spotting, the culvert will be rejected.

There will be no extensions to delivery dates specified due to delays caused by surface staining.

4. Delivery Requirements

4.1 Station Identification

The Supplier shall identify the station location, designated by the distribution sheets, on the interior of each culvert section. The lettering shall be unwashable, black and at least 100 mm in size.

4.2 Delivery of Culverts

The Supplier shall notify the Department or its representative at least 24 hours in advance of delivering culverts.

The Supplier shall deliver and unload culverts complete with necessary bolts, nuts and couplers to locations designated in the **Culvert** Order. Bolts and nuts shall be shipped in separate containers.

Nesting culverts for delivery will be allowed if the smaller culvert has a diameter at least 300 mm less than the larger culvert. Culverts of 1500 mm diameter or larger shall not be nested. Nested culverts shall be separated by the Supplier upon delivery.

## 1285. 4.2 Delivery of Culverts (Cont'd)

The Supplier shall provide a delivery slip to be signed by the Department or its representative at the time of delivery.

The delivery of culverts shall be completed on or before the completion date set forth in the **Culvert** Order.

5. Liquidated Damages

Time shall be of the essence. If all the work called for in the **Culvert** Order is not completed within the specified time limit, damage will be sustained by the Department. It will be impracticable and extremely difficult to ascertain and determine the actual damage which the Department will sustain in the event of and by reason of such delay. The Supplier shall therefore pay to the Department the amount set forth by way of Liquidated damages (and not as penalty) for each and every day after that fixed for the completion, (excluding Saturdays, Sundays and Statutory Holidays) during which the **Culvert** Order will not have been fully completed. The amount of Liquidated Damages set forth in the requisition will be an estimate of the cost which the Department may accrue due to delay of the supply of culverts and to the additional cost of inspection, supervision and continuing maintenance. The Engineer will have the right to deduct from any money owing to the Supplier the amount due the Department as Liquidated Damages.

The Supplier shall not be assessed with Liquidated Damages for any delay caused by Acts of God, or the Public Enemy, Acts of the Province or of any Foreign State, Floods, Epidemics, Quarantine Restriction, Strikes, Embargoes or delays of Sub-Contractors due to such causes. If the Supplier is delayed by alterations or changes or any other reasons not originally contemplated by the **Culvert** Order, the time of completion shall be extended for a period to be determined by the Engineer, and the Supplier shall not be liable for Liquidated Damages for the period of such extension.

Any extension of time that may be granted to the Supplier, shall be so granted and accepted without prejudice to any rights of the Department whatsoever under the **Culvert** Order, and all such rights shall continue in full force and effect after the time limit in the **Culvert** Order for the completion of the work. In the event of the Department granting an extension of time, time shall continue to be deemed as the essence of the **Culvert** Order.

The Engineer's certificate as to the number of days for which Liquidated Damages will be charged to the Supplier and the amount payable to the Supplier shall be final and binding on all parties.

6. Final Acceptance

Culverts and couplers will be subject to inspection upon delivery. Culverts unacceptable due to failure to meet specifications or due to damage in shipping or handling will be rejected and shall be immediately replaced or repaired by the Supplier.

7. Method of Measurement

## a) Helical Culvert

Helical culverts supplied shall conform to the length specified in the Culvert Distribution Sheet and will be measured to the nearest metre.

1285. 7. Method of Measurement (Cont'd)

## b) Riveted Culverts

Riveted culverts supplied for each installation shall be within 300 mm of the length specified in the Culvert Distribution Sheet. The length of the riveted pipe supplied will be measured to the nearest tenth of a metre.

9. Basis of Payment

The unit price per metre for "Corrugated Steel Culverts" will be payment in full for supplying and delivering culverts, **couplers** and for performing all work necessary or incidental thereto as herein described.

**Where couplers are shown as a separate bid item in the culvert order, the unit price for each coupler will be payment in full for supplying and delivering couplers and for performing all work necessary or incidental thereto as herein described.**

A copy of the delivery slip shall accompany the invoices.

**TABLE 1**  
**CULVERT LENGTH AND NUMBER OF COUPLERS**

MAXIMUM SECTION LENGTH: metres		REQUIRED NUMBER OF COUPLERS *
8	6	
Diameter (mm)	Arch Dimensions (mm)	
300 - 1 800	730 x 470 to 2 130 x 1 400	
CULVERT LENGTH FOR EACH INSTALLATION: metres		
- 8	- 6	0
9 - 16	7 - 12	1
17 - 24	13 - 18	2
25 - 32	19 - 24	3
33 - 40	25 - 30	4
41 - 48	31 - 36	5
49 - 56	37 - 42	6
57 - 64	43 - 48	7
65 - 72	49 - 54	8
73 - 80	55 - 60	9
81 - 88	61 - 66	10
89 - 96	67 - 72	11
97 - 104	73 - 78	12
105 - 112	79 - 84	13
113 - 120	85 - 90	14
121 - 128	91 - 96	15

**NOTE:** \* One extra coupler is required for each culvert extension.