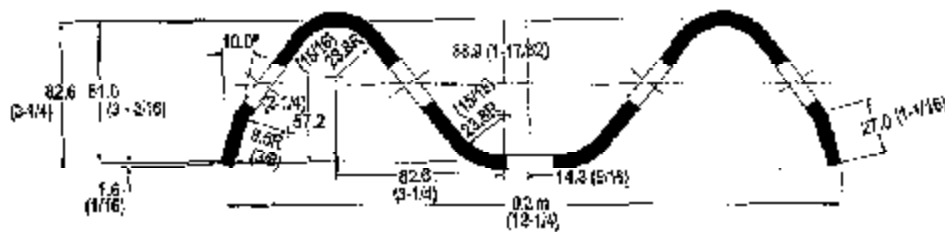


Deep Beam Rail

Normally sold under the Department's construction item 606, the materials specifications refer to section 710.06.

Under 710.06 the AASHTO specification for guardrail, M180 - Type II, Class A is called out.

Generally ODOT uses two types of beam elements. The W Beam (seen below) and the Thrie beam (shown later in this training)



The typical W-beam cross section is shown above. All Dimensions are show except thickness. Thickness is specified by the specification's Class designation. Class A, Type II requires a nominal 0.111" thickness.

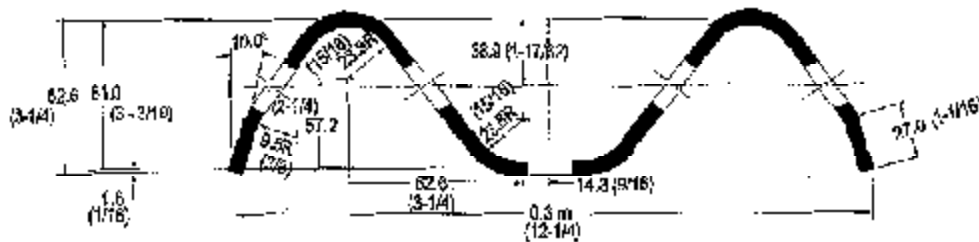
Dimensions

Dimensions should be verified to assure the delivered product meets what you ordered.

1. Measure the thickness of beam. Thickness should meet requirements of Table 1, AASHTO M180, Class A, Type II.
 - A) Nominal Thickness 0.111 inches.
 - B) Tolerance for under thickness - maximum 0.009 inches.



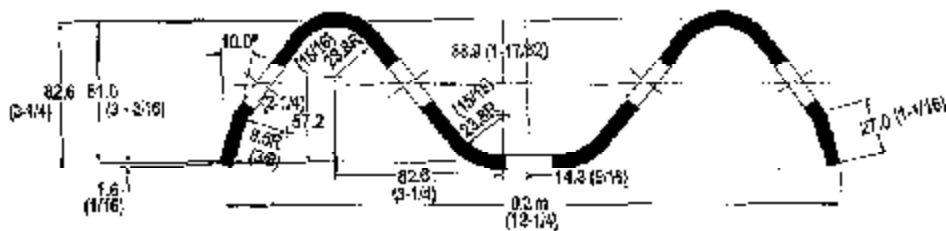
Proper measurement of sheet metal thickness is performed with a set of micrometers. They don't have to be digital but it does make the readout easier. Using a ruler is not acceptable.



2. Measure the width of beam. The width should meet the requirements of Section 10.2.1 of ASSHTO M180. The specification calls for a flat sheet width (before rolling the section) of 19". A nominal measurement described below should verify the 19" dimension.

- A. Total finished width 12 1/4 inches [total nominal sheet width 19"]
- B. Tolerance (for the 19" dimension) is 1/8 under.
- C. Pictured below is the 12 1/4 dimensional check
- D. Not pictured should be a vertical check for depth of 3 1/4"

The two (vertical and horizontal) dimensions should establish correct section



Coating Thickness Measurement

To Measure Coating Thickness:

1. The coating thickness requirement in the specification is the total amount of galvanizing ON BOTH SIDES of a beam. measured in ounces for sq. ft.
2. Minimum coating thickness requirements are shown in Table 2 of AASHTO M 180.
3. Typically the requirement is the single spot check 3.60 oz of zinc per square foot and the triple spot check is 4.00 oz of zinc per square foot. To be acceptable both the single and triple spot checks need to be met.
4. A single spot is defined as five (5) magnetic thickness gage readings in one area. A triple spot check is 3 single spot check readings. The three (3) spots should be distributed across the material. Measurements, when possible, should be taken on a flat surface to assure accuracy.



Readings with a magnetic thickness gage

Example of Spot Check Calculation

Spot Checks

#1	#2	#3
3.5	4.1	3.9
3.8	3.7	4.0
3.6	3.1	3.7
3.7	5.0	3.5
3.4	3.5	4.1
Total 18.0	Total 19.4	Total 19.2
Divide by (5) to get Average / Round off to nearest 10 th		
3.6	3.9	3.8

Multiply by 0.59 to convert to oz of zinc per square foot

Spot check	Reading (mils)	Multiplier	oz/sq. ft
#1	3.6	0.59	2.1
#2	3.9	0.59	2.3
#3	3.8	0.59	2.2

Multiply by 2 because the coating requirement is for the amount of galvanizing on both sides of beam.

#1	#2	#3	Avg
4.2	4.6	4.4	4.4

All single spot checks are required to be over 3.60 oz per. s.f. so these (3) are okay. And the average of these three for the triple spot check is 4.4 which is above the required minimum of 4.00 oz. per. s.f.

4 Markings And Material requirements

Guardrail elements require the following markings:

- A. Name or brand of manufacture
- B. Identification symbols or code for heat
- C. Number & coating lot
- D. AASHTO Specification Number
- E. Class & Type

Markings should be checked against certifications to see the material supplied you has the correct documentation. The traffic side of beam, and in the valley of the center of corrugation.



5. Mechanical Requirements

Along with Dimensional and coating requirements the other key issue is the mechanical properties of the material. Listed below is the information that can be found in the applicable specification for guardrail.

5.1 Base metal requirements are:

- A. Yield strength is 50,000 psi minimum
- B. Tensile strength is 70,000 psi minimum
- C. Elongation in 12% in a 2" gage length - minimum

Generally certified test data should be received with all material showing that they meet specification requirements. If certified test is not supplied, your firm has a choice. Reject the material or send it out to a private laboratory have the mechanical requirements tested.

AS A GENERAL STATEMENT: IF YOUR FIRM BOUGHT MATERIAL TO MEET AASHTO M180 CERTIFIED TEST DATA IS A REQUIREMENT OF THAT SPECIFICATION. WHY WOULD YOU PERFORM TESTING TO DOCUMENT MATERIAL QUALITY WHEN YOUR ORDER SHOULD HAVE PROVIDED YOU THAT DATA.

Certified test data is not a letter of certification. It is actual test results for the materials you have received showing all test data required under the specification to validate the specification has been met.

Certified Analysis EXAMPLE

CERTIFIED ANALYSIS

Doc

CUSTOMER STATE OF OHIO

ORDER NUMBER: N/A
CUSTOMER TO:

PRINT DATE:
PROJECT: STOCK
SHIPPED TO: OHIO

OH														B/L NUMBER:			
ROLL NO.	FIELD NO.	ITEM#	SIZE	W.	THK.	P.	S.	SL.	GR.	CR.	FR.	WT.	AVG No of Puncting	Quantity	Class	Type	DESCRIPTION
01197	61500	81400	24.0	.250	.750	.010	.004	.000	.000	.000	.000	.000	4.0	5000.0 PC	A	2	10/14"/BACKUP M-100
01198	61500	81400	24.0	.250	.750	.010	.004	.000	.000	.000	.000	.000	4.0	5000.0 PC	A	2	10/14"/BACKUP M-100
01199	61500	81400	24.0	.250	.750	.010	.004	.000	.000	.000	.000	.000	4.0	5000.0 PC	A	2	10/14"/BACKUP M-100
01200	61500	81400	24.0	.250	.750	.010	.004	.000	.000	.000	.000	.000	4.0	5000.0 PC	A	2	10/14"/BACKUP M-100
01201	61500	81400	24.0	.250	.750	.010	.004	.000	.000	.000	.000	.000	4.0	5000.0 PC	A	2	10/14"/BACKUP M-100
01202	61500	81400	24.0	.250	.750	.010	.004	.000	.000	.000	.000	.000	4.0	5000.0 PC	A	2	10/14"/BACKUP M-100
01203	61500	81400	24.0	.250	.750	.010	.004	.000	.000	.000	.000	.000	4.0	5000.0 PC	A	2	10/14"/BACKUP M-100
01204	61500	81400	24.0	.250	.750	.010	.004	.000	.000	.000	.000	.000	4.0	5000.0 PC	A	2	10/14"/BACKUP M-100
01205	61500	81400	24.0	.250	.750	.010	.004	.000	.000	.000	.000	.000	4.0	5000.0 PC	A	2	10/14"/BACKUP M-100
01206	61500	81400	24.0	.250	.750	.010	.004	.000	.000	.000	.000	.000	4.0	5000.0 PC	A	2	10/14"/BACKUP M-100

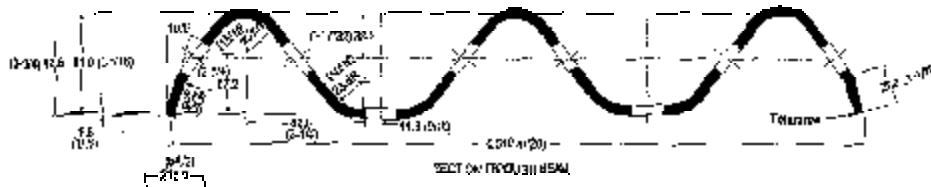
ALL STEEL USED IN THE MANUFACTURE IS OF DOMESTIC ORIGIN.
ALL CORRUGATED METAL SHEETING M-100, ALL STRUCTURAL STEEL SHEET M-100.
ALL OTHER GALVANIZED MATERIAL CONFORMS WITH ASTM A-123.
ALL BOLTS AND NUTS ARE OF DOMESTIC ORIGIN.
ALL BOLTS AND NUTS ARE OF DOMESTIC ORIGIN.
ALL BOLTS AND NUTS ARE OF DOMESTIC ORIGIN.
ALL BOLTS AND NUTS ARE OF DOMESTIC ORIGIN.
ALL BOLTS AND NUTS ARE OF DOMESTIC ORIGIN.

State of Ohio, County of Allen, Sworn and subscribed before me this 10th day of May, 2001.

Notary:
Notary:

Certified By:

B. Thrie Beam



All the requirements for the thrie beams are the same as W beams except for the width.

As per section 10.2.1 AASHTO M180

- A Overall finished Width 20 inches [Total Nominal width of metal if not bent 29 1/2']
- B Tolerance under nominal width is 1/8 inch



Certification should be received with all material showing it meets specification requirements. Any properties required by specification that aren't on the certification should be tested by the certified supplier.

Certified Analysis

Material Test Report

Customer:
Bill of Lading Number:
Project Number:

Ship Date: 4/27/11

County:

State:

HEAT NUMBER	CHEMICAL ANALYSIS						PHYSICAL ANALYSIS			AVERAGE GALV. COATING WT.	QTY. SHIPPED	ITEM NUMBER	DESCRIPTION
	C	MN	PHOS	S	SI	YIELD STRENGTH	TENSILE STRENGTH	% ELONG					
113-41/3317	0.002	0.480	0.011	0.003	0.020	58,100	72,300	30	5.4 MILS		RIS-905	12'-6"(6'-3") 10GA THREE BEAM	

Boles comply with ASTM A-367 Specifications are galvanized in accordance with ASTM A-163, unless otherwise stated.
RHS comply with ASTM A-563 Specifications are galvanized in accordance with ASTM A-163, unless otherwise stated.

All other galvanized materials conform with ASTM A-23.

All steel used in the manufacture is of domestic origin.

All guardrail meets AASHTO M-100, all structural steel meets AASHTO M-168.

All bolts and nuts are of domestic origin.

All material fabricated in accordance with D.O.T. Specifications.

State of Pennsylvania County of Luzerne

Signed and subscribed before me:

This _____ Day Of _____, 2011

Name of Producer:

Certified By: _____

Approved By: _____

Notary Public
My commission Expires March 26, 2016

Transition Section

All the requirements for the Transition Section are the same as for the “W” Beam & Thrie Beam.



Specifications For Materials

Certification should be received with all material showing it meets specification requirements. Any properties required by specification that aren't on the certification will require testing by the certified supplier.

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PRINT DATE:

PROJECT: STOCK

SHIPED TO: OFIC

P/I NUMBER :

Test No.	Test Point	Test Date	Sample Depth	Soil Properties										Avg Wt of		Quantity	Class	Type	DESCRIPTION
				C	PC	P	S	SL	CL	OL	LL	PL	Consistency						
1000001	10000	10/10	1000	20.0	11.0	0.50	0.08	0.02	0.00	0.00	0.00	0.00	0.00	1.0	25.0 PC	A		Topsoil	
1000002	10000	10/10	1000	20.0	11.0	0.50	0.08	0.02	0.00	0.00	0.00	0.00	0.00	1.0	25.0 PC	A		Topsoil	

THE CURRENTLY MEETS ASBESTO M-180, ALL STRUCTURAL STEEL MEETS ASBESTO M 185.

CTF-1 GALVANIZED MATERIAL CONFORMS WITH ASME 123

ALL BOLTS AND NUTS ARE OF DOMESTIC ORIGIN.

DO NOT COMPLY WITH ASTM A 307 SPECIFICATIONS AND ARE GALVANIZED IN ACCORDANCE WITH ASTM A 153, UNLESS OTHERWISE STATED.

THIS COMPLY WITH ASTM A-563 SPECIFICATIONS AND ARE GALVANIZED IN ACCORDANCE WITH ASTM A-153, UNLESS OTHERWISE SPECIFIED.

State of Ohio, County of Allen. Sworn and subscribed before me this 16th day of February, 2003.

2017-2018

$$\text{EXP} = \{ \langle M, x \rangle \mid M \text{ is a Turing machine and } x \in \Sigma^* \}$$

Contextio 34

D. Back-Up Plate



Back up plates, if specified for use at non-splice points, shall consist of 305-mm (1ft) sections of beams and shall be of the same Class and Type specified for the full-length beams.

The same criteria used for guardrail sections is used for back up plates. Certification should be received with all material showing it meets specification requirements. Any properties required by specification that aren't on the certification will need to be tested by the certified supplier.

Certified analysis will look similar to the one below (OR HAVE THE SAME DATA)

CERTIFIED ANALYSIS

Page: 1

CUSTOMER: STATE OF OHIO

ORDER NUMBER: N/A

PRINT DATE: 05/10/2001

CUSTOMER PO:

PROJECT: STOCK

SHIPPED TO: OHIO

OH

B/L NUMBER:

Test No.	Yield Point	Tensile Strength	Elong. 2"/8"	C.	SI.	P.	S.	SI.	CU.	CS.	CR.	VN.	Avg Wt of Coating	Quantity	Class	Type	DESCRIPTION
D1805	61900	83400	24.0	.200	.720	.012	.004	.030	.000	.000	.000	.000	4.0	5000.0 PC	A	2	12/12"/BACKUP M-180
D1805	61900	83400	24.0	.200	.720	.012	.004	.030	.000	.000	.000	.000	4.0	50.0 PC	A	2	12/6*3/8 M-180
D1149	59400	82400	25.0	.200	.730	.010	.006	.030	.000	.000	.000	.000	4.0	3000.0 PC	A	2	12/12*6*3/8 M-180
D1805	61900	83400	24.0	.200	.720	.012	.004	.030	.000	.000	.000	.000	4.0	3000.0 PC	A	2	M-180
D2260	59100	75900	27.0	.150	.650	.012	.006	.030	.000	.000	.000	.000	4.0	3000.0 PC	A	2	M-180
D1517	70000	85100	23.0	.210	.630	.009	.009	.040	.000	.000	.000	.000	4.0	120.0 PC	A	2	12/12*6*3/8 T M-180
D2150	59100	75900	27.0	.150	.650	.012	.006	.030	.000	.000	.000	.000	4.0	200.0 PC	A	2	12/25*6*3/8 M-180
D1805	61900	83400	24.0	.200	.720	.012	.004	.030	.000	.000	.000	.000	4.0	200.0 PC	A	2	M-180

ALL STEEL USED IN THE MANUFACTURE IS OF DOMESTIC ORIGIN.

ALL GUARDRAIL MEETS AASHTO M-180, ALL STRUCTURAL STEEL MEETS AASHTO M-183.

ALL OTHER GALVANIZED MATERIAL CONFORMS WITH ASTM-123.

ALL BOLTS AND NUTS ARE OF DOMESTIC ORIGIN.

BOLTS COMPLY WITH ASTM A-307 SPECIFICATIONS AND ARE GALVANIZED IN ACCORDANCE WITH ASTM A-153, UNLESS OTHERWISE STATED.

NUTS COMPLY WITH ASTM A-563 SPECIFICATIONS AND ARE GALVANIZED IN ACCORDANCE WITH ASTM A-153, UNLESS OTHERWISE STATED.

State of Ohio, County of Allen. Sworn and subscribed before me this 10th day of May, 2001.

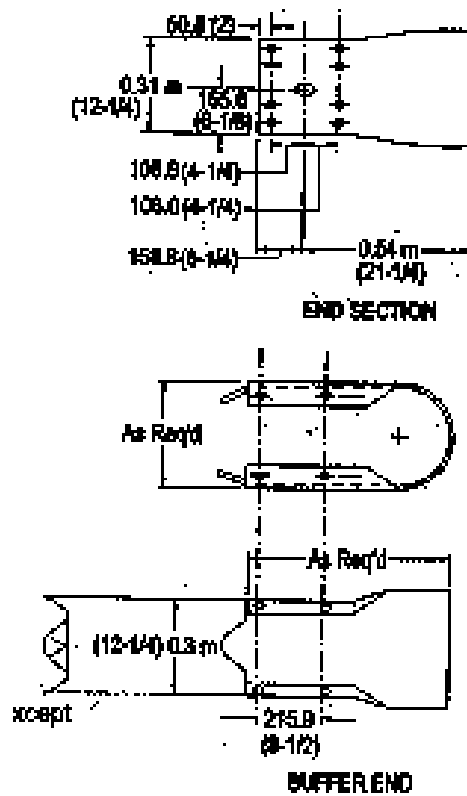
Public:

Expires:

End and Buffer Sections

End and Buffer have the same dimensional and coating requirements as guardrail. AASHTO currently requires the same metal thickness and actual dimensions as the guardrail is required to meet. Additionally AASHTO's specification provides sketches showing other dimensional requirements. The difference for end and buffer sections is the mechanical requirements.





Lower mechanical properties for end and buffer sections:

Yield Point, - 33000 psi ,minimum

Tensile Strength, - 45000 psi minimum



Certified Test Data example for End Sections

CERTIFIED ANALYSIS

Page: 2

CLASS OF 1920

ORDER NUMBER: N/A

PRINT DATE:

CUSTOMER NO:

PROJECT: STOCK

SMI-FED TC: CHIO

CLE

E/L NUMBER :

[illegible]

NOT USED IN THE MANUFACTURE OF DOMESTIC ORIGIN.

11. SHAPED STEEL: ASBESTO M-18C, AND STRUCTURAL STEEL: ASBESTO M-18C.

ALL STEEL GALVANIZED ELECTRICAL CONFORMS WITH ASTM-A29

ALL RULES AND NOTES ARE OF DOMESTIC ORIGIN.

POSSIBLY WITH ASTM A-307 SPECIFICATIONS AND ARE GALVANIZED IN ACCORDANCE WITH ASTM A-153, UNLESS OTHERWISE SPECIFIED.

NOTA COMPLY WITH ASTM A-240 SPECIFICATIONS AND ARE GUARANTEED IN ACCORDANCE WITH ASTM A-153, UNLESS OTHERWISE STATED.

State of Ohio County of Allen. Sworn and subscribed before me this 5th day of April, 2001.

Water Expires.

Created By

DOMESTIC STEEL

The Ohio Revised Code, section 153.011, requires all steel used in ODOT projects be made in the United States. This requirement also appears in ODOT project proposals. That means that documentation is required specifically defining that the steel was **“melted and manufactured” in the United States**. For example, we don’t want a bolt that was “made in the US”, but the steel was melted in Japan and shipped over here to be made into a bolt.

Acceptable Documentation Includes:

A mill certification from a United State producing steel mill that is located in the United States.

A certification from either the material producer or the supplier stating in writing the steel was melted and manufactured in the United States.

The Director may make exceptions to this rule for **bridge projects** only in the following cases. (Ohio Revised Code section 5525.21)

The cost of the contract item does not exceed one tenth of one percent of the total contract cost or \$2500, whichever is greater.

OR

The material is not produced in the US in sufficient quantity, or is not reasonably available.

If you have any questions about this policy, please contact the Office of Materials Management.