

## MATERIALS LABORATORY FACTUAL REPORT 14-029

Bridge Collapse Mount Vernon, WA; 05/23/2013

**HWY13MH012** 

(8 pages)

## NATIONAL TRANSPORTATION SAFETY BOARD

Office of Research and Engineering Materials Laboratory Division Washington, D.C. 20594

May 15, 2014



### MATERIALS LABORATORY FACTUAL REPORT

Report No. 14-029

### A. ACCIDENT INFORMATION

Place : Mount Vernon, Washington

Date : May 23, 2013

Vehicle : I-5 Bridge across the Skagit River

NTSB No. : HWY13MH012

Investigator : Robert Accetta, HS-20

#### **B. COMPONENTS EXAMINED**

Tensile samples from upper chord members between U3-U5 for east and west trusses of span 8.

### C. DETAILS OF THE EXAMINATION

Tensile properties were measured on the individual components of the upper chord members of the east and west trusses between nodes U3 and U5 of span 8. Each chord member contained four individual sub components that included two side channels (east and west) and two cover plates (north and south 1). The bridge drawing specified each component of these members to be manufactured and processed in accordance with ASTM A242M 2 with a minimum tensile strength of 70,000 psi, minimum yield strength of 50,000 psi and minimum elongation in 2 inches of 21%. Sample plates were excised from the members under the supervision of personnel from Washington State Department of Transportation.

Three longitudinal tensile bars (2 inch gage) were cut from each component (listed below) and tested in accordance with ASTM A370-12a³ by Tensile Testing Metallurgical Laboratory of Cleveland Ohio. Testing showed that all components met the minimum properties except for yield strength of the west side plate of the east truss (U3E West), attachment 1.

<sup>&</sup>lt;sup>1</sup> The cover plates were labeled north and south for testing but were from the top and bottom of the chord.

<sup>&</sup>lt;sup>2</sup> ASTM International, Standard Specification for High-Strength Low-Alloy Structural Steel.

<sup>&</sup>lt;sup>3</sup> ASTM International, Standard Test Methods and Definitions for Mechanical Testing of Steel Products.

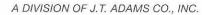
Component Identification	Thickness
East Truss	
U3E East	1/2 inch thick
U3E West -	1/2 inch thick
U3E North -	3/8 inch thick
U3E South -	3/8 inch thick
West Truss	
U3W East -	1/2 inch thick
U3W West -	1/2 inch thick
U3W North -	3/8 inch thick
U3W South -	3/8 inch thick

Three specimens of U3E West were then retested by Lehigh Testing Laboratories, Inc, New Castle Delaware. The properties of the retested component met the requirements of ASTM A242, attachment 2.

Joe Epperson Senior Metallurgist

## **Attachment 1**

# Tensile Testing Metallurgical Laboratories Report B4-094-502, 4-16-2014 2 pages





4520 WILLOW PARKWAY CLEVELAND, OHIO 44125 PHONE (216) 641-3290 FAX (216) 641-1223 www.tensile.com

CERTIFIED TEST REPORT -

National Trasportation Safety 490 L'enfant Plaza Sw Washington DC 20594

Job No.:

B4-094-501

Date:

4-16-14

Cust. PO#:

818

Description:

4 samples

1/2" Thick

Spec:

ASTM A242M-04<sup>E1</sup>

TEST RESULTS

	<u>ID</u>	Tensile, ksi	Yield .2%, ksi	Elong., % in 2"
Requirements (Min.:)		70	50	21
1	U3E East	86.5	56.5	27.0
2	<b>U3E East</b>	85.0	56.0	29.0
3	<b>U3E East</b>	87.0	60.0	28.0
Average		86.2	57.5	28.0
1	U3E West	78.0	*39.2	30.0
2	U3E West	77.5	*47.5	31.0
3	U3E West	78.0	*41.2	31.0
Average		77.8	42.6	30.7
1	<b>U3E North</b>	89.0	50.5	25.0
2	<b>U3E North</b>	90.0	50.5	25.0
3	<b>U3E North</b>	89.5	52.0	24.0
Average		89.5	51.0	24.7
1	<b>U3E South</b>	88.5	51.5	27.0
2	<b>U3E South</b>	89.5	53.5	26.0
3	<b>U3E South</b>	88.5	52.0	26.0
Average		88.8	52.3	26.3

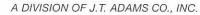
\*The above **Does Not Conform** to specifications listed.

Authorized Agent



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CERTIFIED TEST REPORT -

National Transportation Safety

490 L'enfant Plaza Sw Washington DC 20594 Job No.:

B4-094-502

Date: Cust. PO#: 4-16-14 818

Description:

4 samples

1/2" Thick

Spec:

ASTM A242M-04E1

TEST RESULTS -----

	<u>ID</u>	Tensile, ksi	Yield .2%, ksi	Elong., % in 2"
Requirements (Min.:)		70	50	21
1	U3W East	82.0	55.5	31.0
2	U3W East	83.5	55.5	30.0
3	U3W East	83.0	55.5 30.0	
Average		82.8	55.5	30.3
1	U3W West	80.5	55.0	32.0
2	U3W West	80.5	55.0	32.0
3	U3W West	81.0	54.5	32.0
Average		80.7	54.8	32.0
1	<b>U3W North</b>	87.0	51.5	26.0
2	U3W North	87.0	*49.8 26.0	
3	U3W North	87.0	*49.7 26.0	
Average		87.0	50.3	26.0
1	U3W South	89.0	52.0	24.0
2	U3W South	89.0	51.0 25.0	
3	U3W South	90.0	51.5	25.0
Average		89.3	51.5	24.7

Test Method: ASTM A370-12a

\*The above does not conform to specifications listed.

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## **Attachment 2**

Lehigh Testing Laboratories, Inc Report R-13-11, May 12, 2014 1 Page



DATE:

PO NO:

308 WEST BASIN ROAD . P.O. BOX 903 . NEW CASTLE, DE 19720 (302) 328-0500 • FAX (302) 328-0417



## TEST REPORT

NATIONAL TRANSPORTATION SAFETY BOARD

ATTENTION: EDWARD KOMARNICKI

490 L'ENFANT PLAZA EAST

WASHINGTON, DC 20594

May 12, 2014

**VERBAL** 

LEHIGH NO: **R-13-11** 

PAGE: 1 of 1

MATERIAL: HIGH-STRENGTH LOW-ALLOY STRUCTURAL STEEL

SPECIFICATION: ASTM A242-13

SAMPLE DESIGNATION: (1) SAMPLE: PLATE 1/2" THICK REMOVED FROM A SECTION

OF BRIDGE, SAMPLE ID: U3E WEST

## **MECHANICAL PROPERTIES (Per ASTM A370-12a)** TRANSVERSE TENSILES

<u>1</u>	<u>2</u>	<u>3</u>
0.494	0.496	0.496
0.501	0.504	0.504
0.2475	0.2500	0.2500
50	52	53
84	82	82
26	27	27
42	43	45
	0.501 0.2475 50 84 26	0.501 0.504   0.2475 0.2500   50 52   84 82   26 27

Based on the above testing this material meets the tensile requirements of ASTM A242-13.

Lehigh Testing Laboratories, Inc.