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 A370-12a[3] 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.

[1] The cover plates were labeled north and south for testing but were from the top and bottom of the chord.
[2] ASTM International, Standard Specification for High-Strength Low-Alloy Structural Steel.
[3] 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

TTML TENSILE TESTING
METALLURGICAL LABORATORY

A DIVISION OF J.T. ADAMS CO., INC.
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^{E1}

TEST RESULTS

		ID	Tensile, ksi	Yield .2%, ksi	Elong., % in 2"
Requirements (Min.:)			70	50	21
	1	**U3E East**	86.5	56.5	27.0
	2	**U3E East**	85.0	56.0	29.0
	3	**U3E East**	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	**U3E North**	89.0	50.5	25.0
	2	**U3E North**	90.0	50.5	25.0
	3	**U3E North**	89.5	52.0	24.0
Average			89.5	51.0	24.7
	1	**U3E South**	88.5	51.5	27.0
	2	**U3E South**	89.5	53.5	26.0
	3	**U3E South**	88.5	52.0	26.0
Average			88.8	52.3	26.3

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

[redacted]
Authorized Agent

ACCREDITED Testing Cert #0161

TTML TENSILE TESTING
METALLURGICAL LABORATORY

A DIVISION OF J.T. ADAMS CO., INC.
4520 WILLOW PARKWAY
CLEVELAND, OHIO 44125
PHONE (216) 641-3290
FAX (216) 641-1223
www.tensile.com

CERTIFIED TEST REPORT

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

Job No.: B4-094-502
Date: 4-16-14
Cust. PO#: 818

Description: 4 samples 1/2" Thick

Spec: ASTM A242M-04^{E1}

TEST RESULTS

	ID	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	**U3W North**	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.

[redacted]
Authorized Agent

ACCREDITED Testing Cert #0161

Attachment 2

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

Lehigh Testing Laboratories, Inc.
A Subsidiary of THE MMR GROUP, INC.
308 WEST BASIN ROAD • P.O. BOX 903 • NEW CASTLE, DE 19720
(302) 328-0500 • FAX (302) 328-0417

THE MMR GROUP, INC. an ESOP Company

TEST REPORT

NATIONAL TRANSPORTATION SAFETY BOARD
ATTENTION: EDWARD KOMARNICKI
490 L'ENFANT PLAZA EAST
WASHINGTON, DC 20594

DATE: May 12, 2014

PO NO: **VERBAL**

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

MATERIAL: HIGH-STRENGTH LOW-ALLOY STRUCTURAL STEEL
SPECIFICATION: ASTM A242-13
SAMPLE DESIGNATION: (1) SAMPLE: PLATE ½" THICK REMOVED FROM A SECTION OF BRIDGE, SAMPLE ID: U3E WEST

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

	1	2	3
Width (inches):	0.494	0.496	0.496
Thickness (inches):	0.501	0.504	0.504
Area (square inches):	0.2475	0.2500	0.2500
Yield Point (ksi): 0.2% offset:	50	52	53
Ultimate Tensile Strength (ksi):	84	82	82
Elongation (%) in 2":	26	27	27
Reduction of Area (%):	42	43	45

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

Lehigh Testing Laboratories, Inc.

[redacted]

Kenneth M. Petito, Supvr., Mechanical Testing