

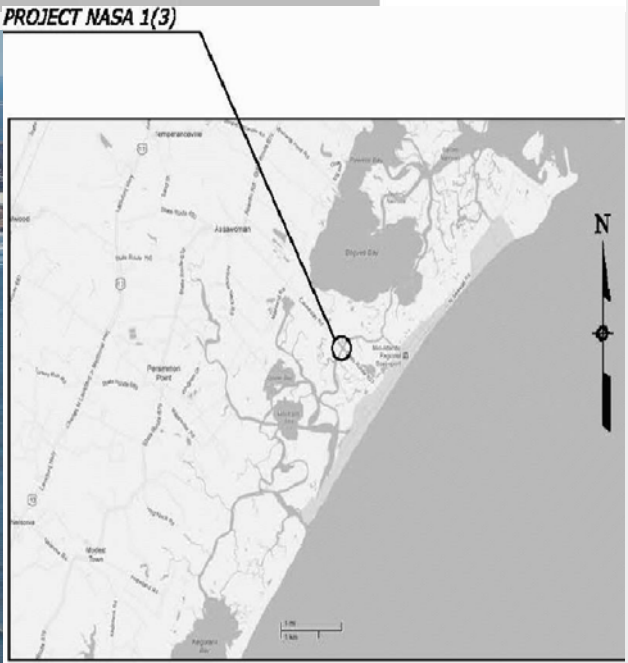
WALLOPS ISLAND CAUSEWAY BRIDGE OVER CAT CREEK

NASA 1(3)
Edward Kluckowski – Freyssinet, Inc.
April 9, 2018



• Wallops Island Flight Facility:

- Established in 1945
- Principal facility of suborbital research programs for government and private organizations
- Launched over 16,000 rockets over the years
- 1,400 full-time employees work on the premises



Project Description

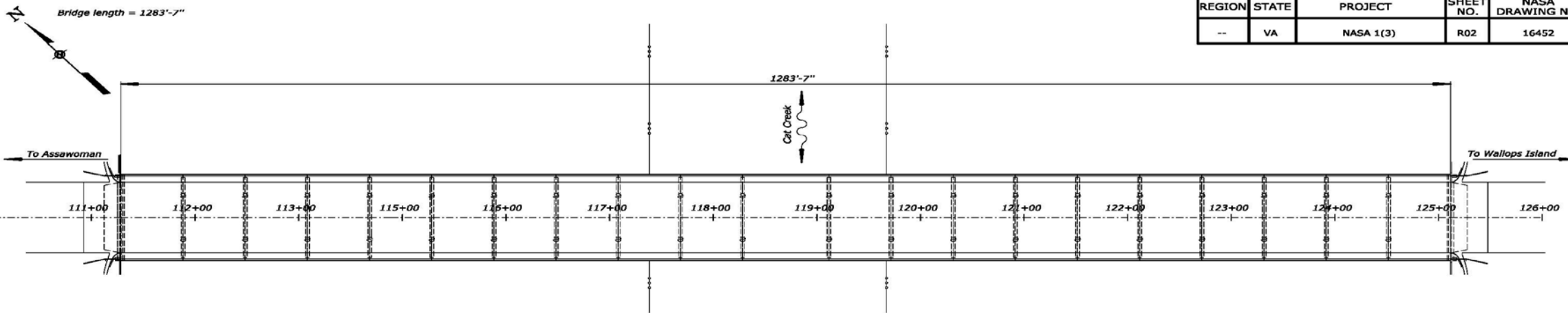
- Owner: NASA ; Project Administrator: Federal Highway
- Architect/Engineer: Clark Nexsen
- Constructed in 1959
- Twenty one span cast in place concrete deck bridge with twenty 60' long spans and one 83'-6" long span
- First Rehabilitation was performed in 1986
- Inspection made in 2011: concrete delamination, surface spalling, post-tensioning system deficiencies on span 8 and 11
- Owner Project Goal: Owner requested that recommended repairs prolong the life of the bridge for another 10 years.
- Overall Contract Price: \$1,325,894.11
- Project Duration: 08/12/2013 to 06/04/2014

ACTUAL FILE: R02_NASA1(3)_P.DWG

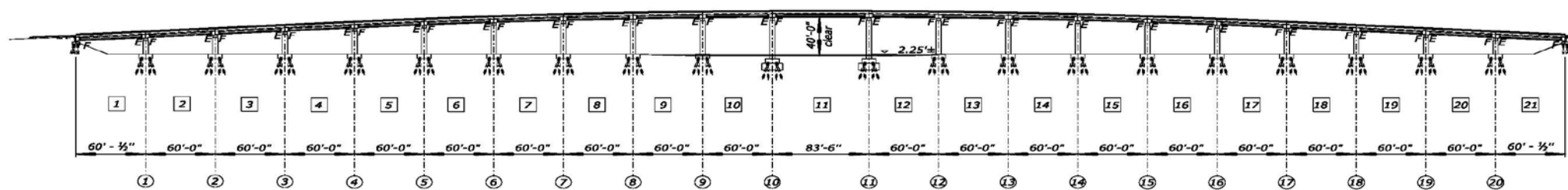
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REGION	STATE	PROJECT	SHEET NO.	NASA DRAWING NO.
--	VA	NASA 1(3)	R02	16452



PLAN



ELEVATION

KEY
 E = Expansion
 F = Fixed
 ⊕ = Ⓞ Pier #
 # = Span number

U.S. DEPARTMENT OF TRANSPORTATION
 FEDERAL HIGHWAY ADMINISTRATION
 EASTERN FEDERAL LANDS HIGHWAY DIVISION

WALLOPS FLIGHT FACILITY
 SCHEDULE A AND B
 WALLOPS ISLAND CAUSEWAY BRIDGE OVER CAT CREEK

PLAN AND ELEVATION

NO.	DATE	BY	REVISIONS	NO.	DATE	BY	REVISIONS	DESIGNED BY	DRAWN BY	CHECKED BY	SCALE	PROJECT TEAM LEADER	BRIDGE DRAWING	DATE	BRP NO.
								PCB	EMA	RE	Not to scale	Roger Lu	2 of 28	January, 2013	BRP-1154



NATIONAL BRIDGE PRESERVATION PARTNERSHIP CONFERENCE 2018

PRACTICES WE CAN NOT AFFORD TO DEFER



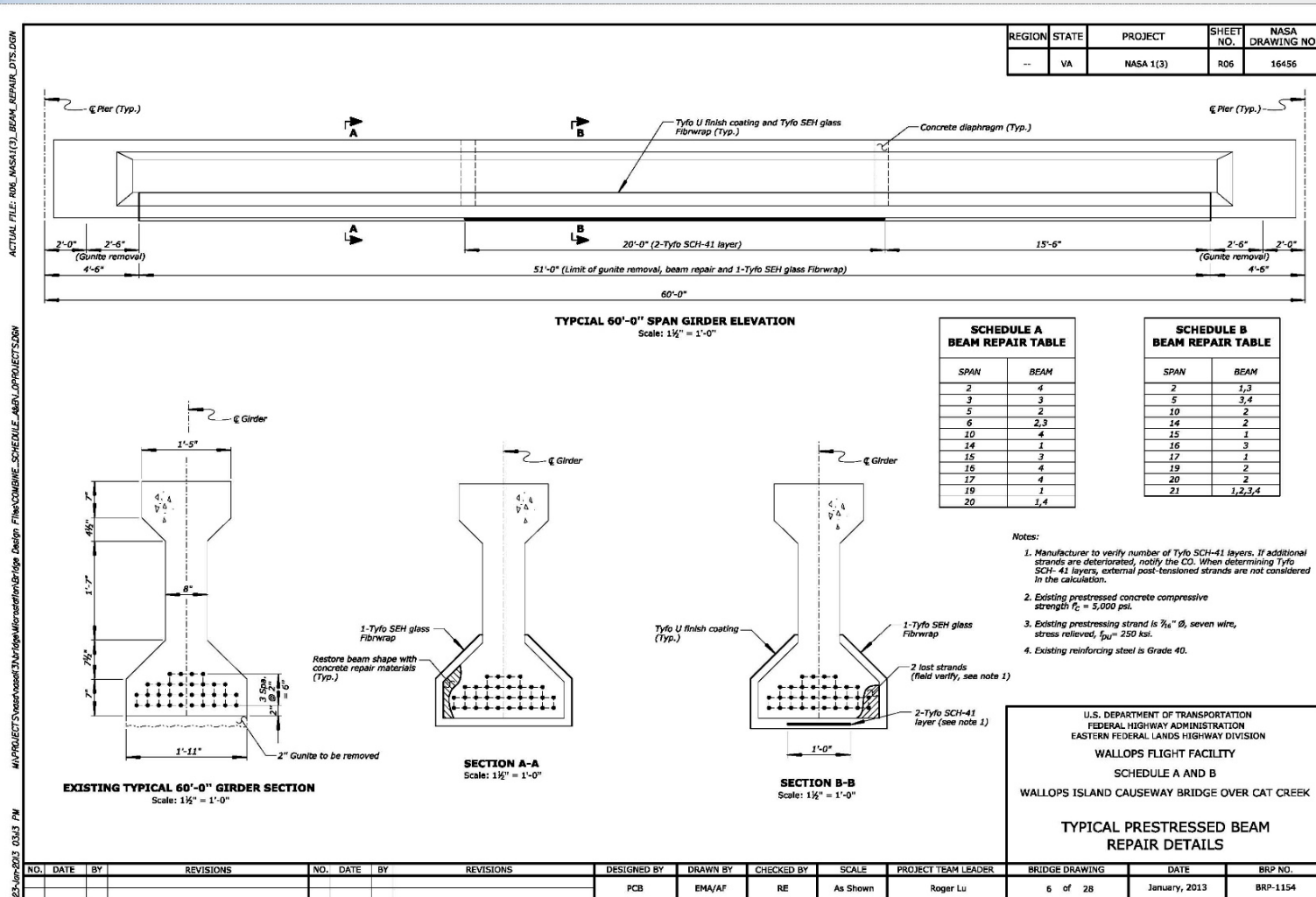
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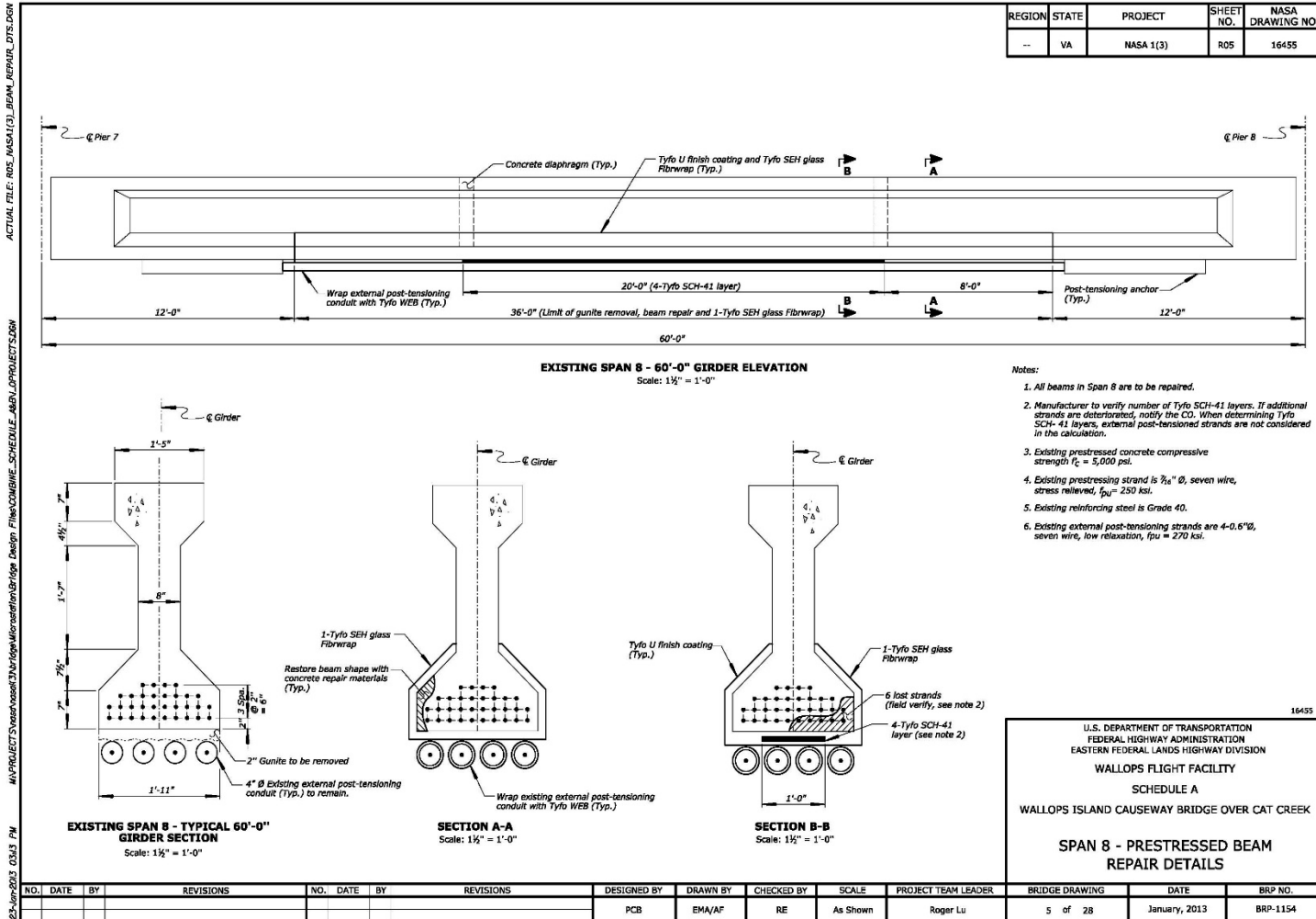
Work Performed

- Concrete Repairs – Superstructure and Substructure ~ 239 SY
- Repairs to Existing Pre-Stress Strand
- Installation of Beam Strengthening and Protection Systems
 - 4,256 SF of CFRP (Flexure strength)
 - 9,305 SF of GFRP (Protection)
 - Application of UV Topcoat (Protection)
- Maintenance of Traffic

Contract Drawing – Typical Span Repair Detail



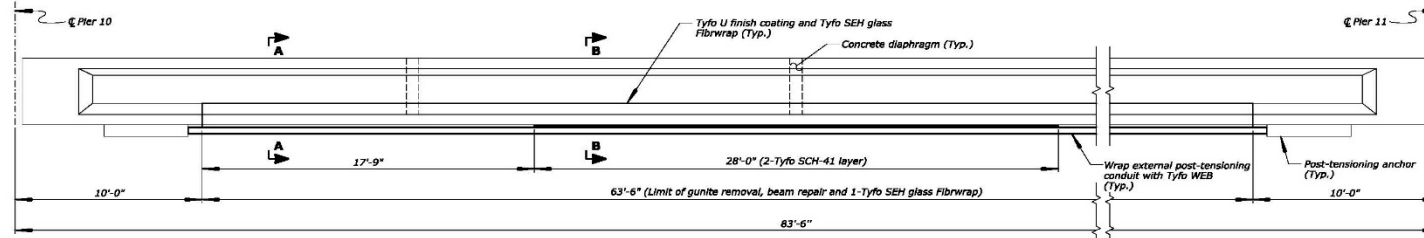
Contract Drawing – Span 8



Contract Drawing – Span 11

ACTUAL FILE: ROZ_NASKH\01_BEAM_REPAIR_DTS.DGN
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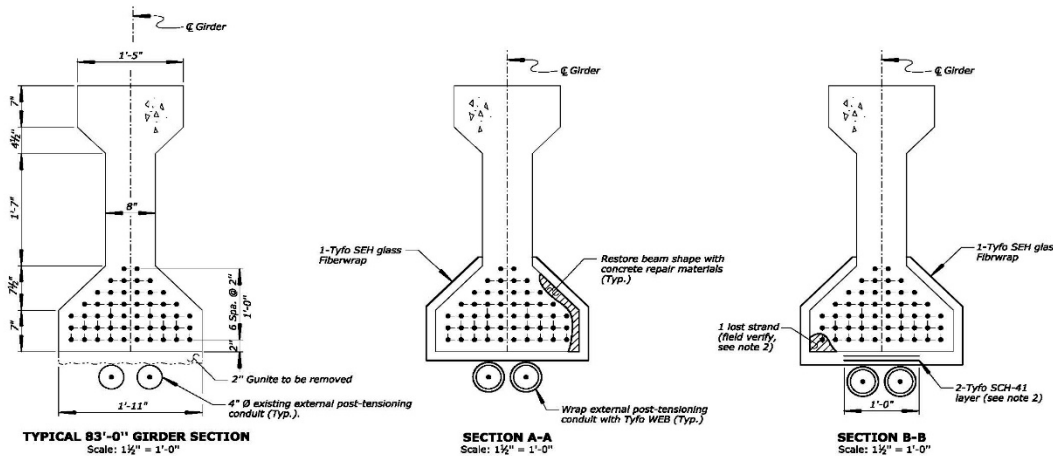
REGION	STATE	PROJECT	SHEET NO.	NASA DRAWING NO.
--	VA	NASA 1(3)	R07	16457



SPAN 11 - GIRDER ELEVATION
Not to scale

Notes:

- All beams in Span 11 are to be repaired.
- Manufacturer to verify number of Tyfo SCH-41 layers. If additional strands are deteriorated, notify the CO. When determining Tyfo SCH-41 layers, external post-tensioned strands are not considered in the calculation.
- Existing prestressed concrete compressive strength $f_c = 5,000$ psi.
- Existing prestressing strand is $\frac{7}{8}$ " \emptyset , seven wire, stress relieved, $f_{pu} = 250$ ksi.
- Existing reinforcing steel is Grade 40.
- Existing external post-tensioning strands are 2-0.6" \emptyset , seven wire, low relaxation, $f_{pu} = 270$ ksi.



TYPICAL 83'-0" GIRDER SECTION
Scale: 1 1/2" = 1'-0"

SECTION A-A
Scale: 1 1/2" = 1'-0"

SECTION B-B
Scale: 1 1/2" = 1'-0"

U.S. DEPARTMENT OF TRANSPORTATION
 FEDERAL HIGHWAY ADMINISTRATION
 EASTERN FEDERAL LANDS HIGHWAY DIVISION
 WALLOPS FLIGHT FACILITY
 SCHEDULE A
 WALLOPS ISLAND CAUSEWAY BRIDGE OVER CAT CREEK

**SPAN 11 - PRESTRESSED BEAM
 REPAIR DETAILS**

NO.	DATE	BY	REVISIONS	NO.	DATE	BY	REVISIONS	DESIGNED BY	DRAWN BY	CHECKED BY	SCALE	PROJECT TEAM LEADER	BRIDGE DRAWING	DATE	BRP NO.
								PCB	EBP/MAF	RE	As Shown	Roger Lu	7 of 28	January, 2013	BRP-1154

Typical Area Requiring Repair

Column Cracking and Pier Cap Deterioration



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Typical Area Requiring Repair

Column Cracking and Pier Cap Deterioration



Typical Area Requiring Repair



Typical Area Requiring Repair

Area Surveyed Ready for Demolition



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Typical Area Requiring Repair



Preparation of Bridge Work Platform

- Installation of a temporary platform provided by Safespan Platform Systems, Inc. underneath the bridge:



Platform Installation – Supporting Cable Anchorage

Preparation of Bridge Work Platform

**Platform Installation
– Supporting Cable
installation**



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Preparation of Bridge Work Platform



Platform Installation – Flooring



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Access Platform for Pier Cap and Column Repairs



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Challenges

- Construction during winter months: Implemented a weather plan that not only made the work environment safe for our workers but also allowed us to keep temperature at recommended levels to apply and get satisfactory bonding of the CFRP/GRFP:
 - Plastic Sheeting
 - Torpedo Heaters
- Flat/Consistent Concrete Surfaces – Bottom Flange
- Road & Bridge Closures – Rocket launches
- Work Platform – Initial set-up process

Work Platform – Access Ladders



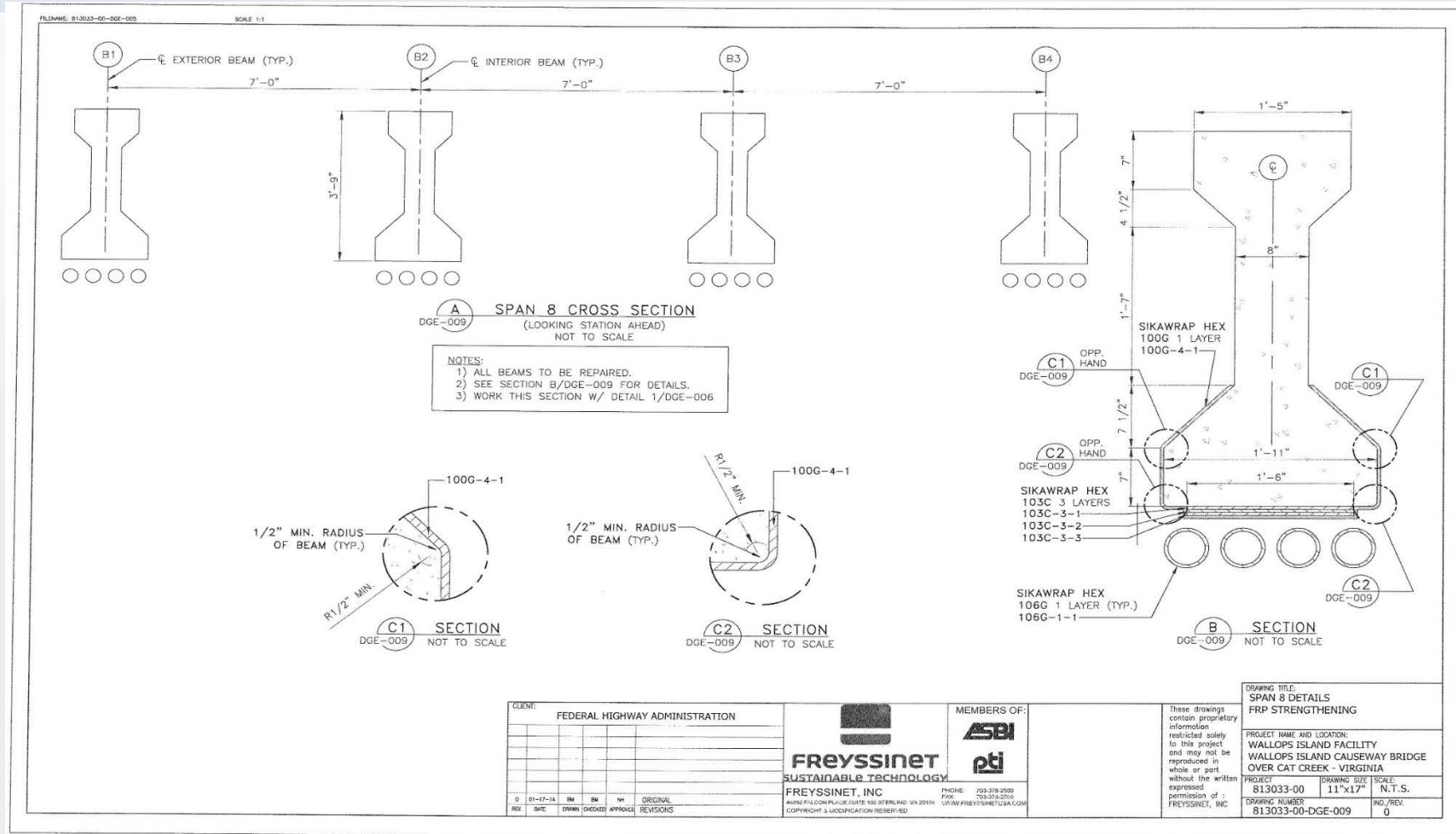
Work Platform – Winter Months



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Freyssinet CFRP-GFRP Shop Drawing



CFRP / GFRP Repairs – Preparation and Installation

Preparing Concrete & Rebar Surfaces



CFRP / GFRP Repairs – Preparation and Installation



All Surfaces Prepared Before Applying CFRP / GFRP



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CFRP / GFRP Repairs – Preparation and Installation

All Surfaces Prepared Before Applying CFRP / GFRP

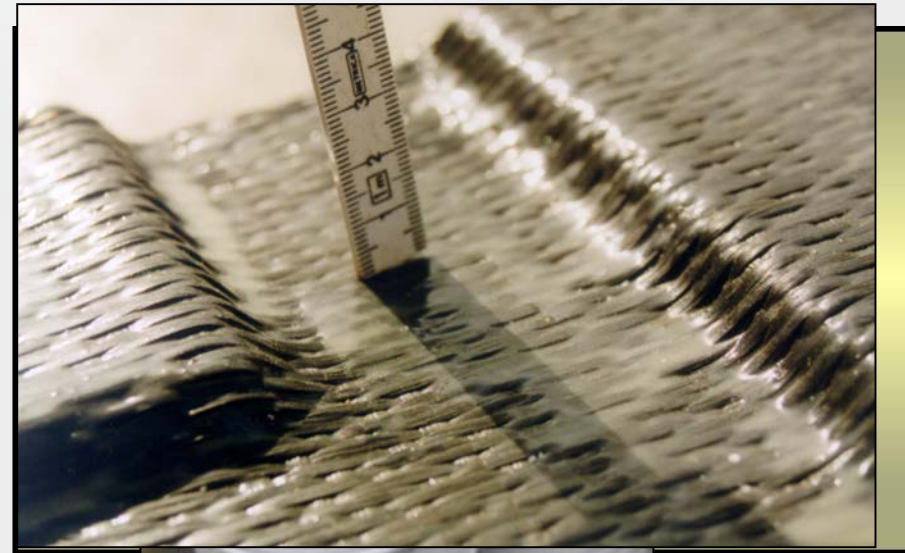
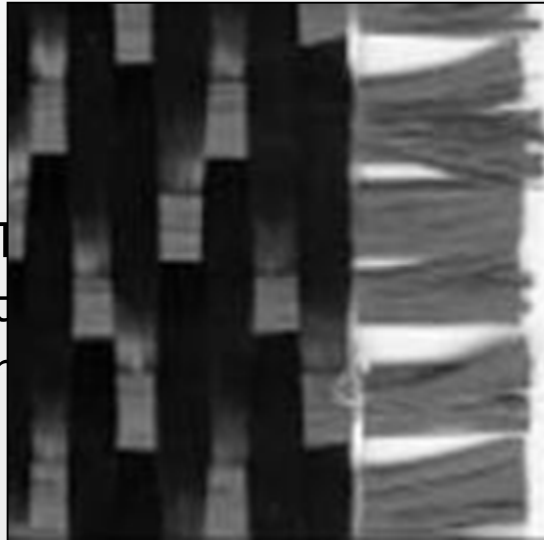


What is FRP?

- Two part System
 - Fibers
 - Carbon, Glass, Aramid

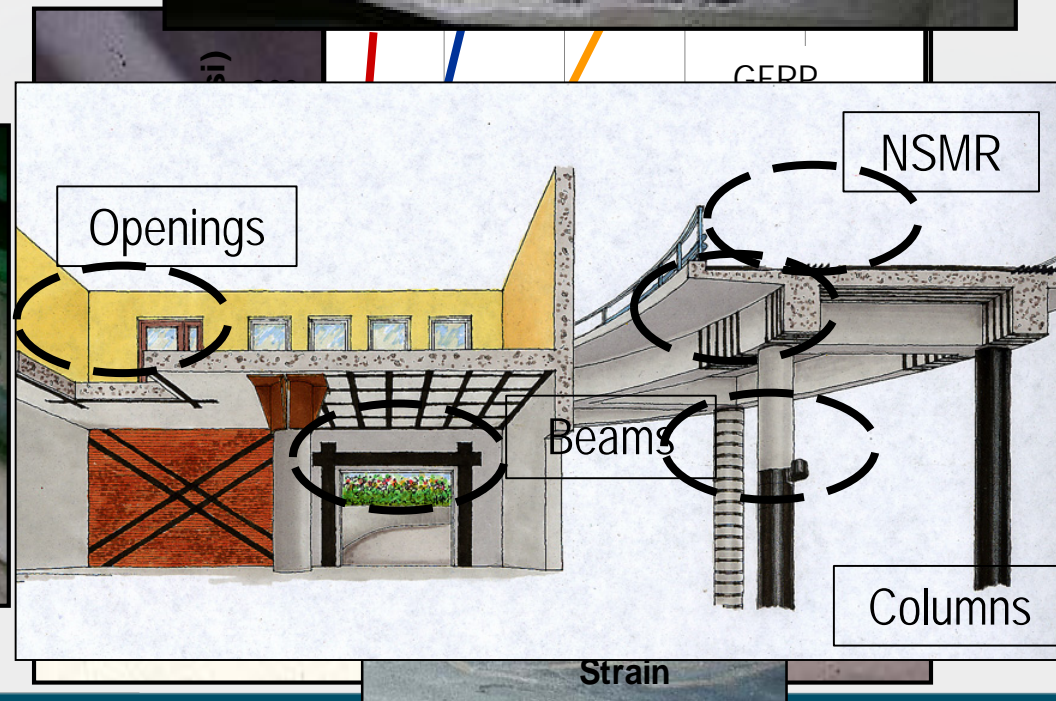
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Why use FRP?

- Need
 - Repair deteriorated/damaged structures
 - Increase load carrying capacity
 - Update Structure to meet current design codes
- Earlier Repair Technique
 - Steel Plate
- Recent Repair
 - Fiber Reinforced Polymer
- Advantages
 - Economical
 - Strength to weight ratio
 - Resistance to corrosion
 - Ease of Installation



CFRP / GFRP Repairs – Preparation and Installation

- Maintain Steady Production Rate: Work stations were located such that all repair areas were accessible at all times



CFRP Cutting Station Next to the Repair Area

CFRP / GFRP Repairs – Preparation and Installation



CFRP / GFRP Cutting Station

CFRP / GFRP Repairs – Preparation and Installation



**First Layer of resin has been applied,
setup for CFRP installation**



CFRP / GFRP Repairs – Preparation and Installation

CFRP/GFRP Fabric Installation



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CFRP / GFRP Repairs – Preparation and Installation



CFRP Fabric Installation



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CFRP / GFRP Repairs – Preparation and Installation



GFRP in Place over CFRP

CFRP / GFRP Repairs – Preparation and Installation



GFRP in Place With UV Topcoat



Finished Repairs



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After Repairs



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Thank you

