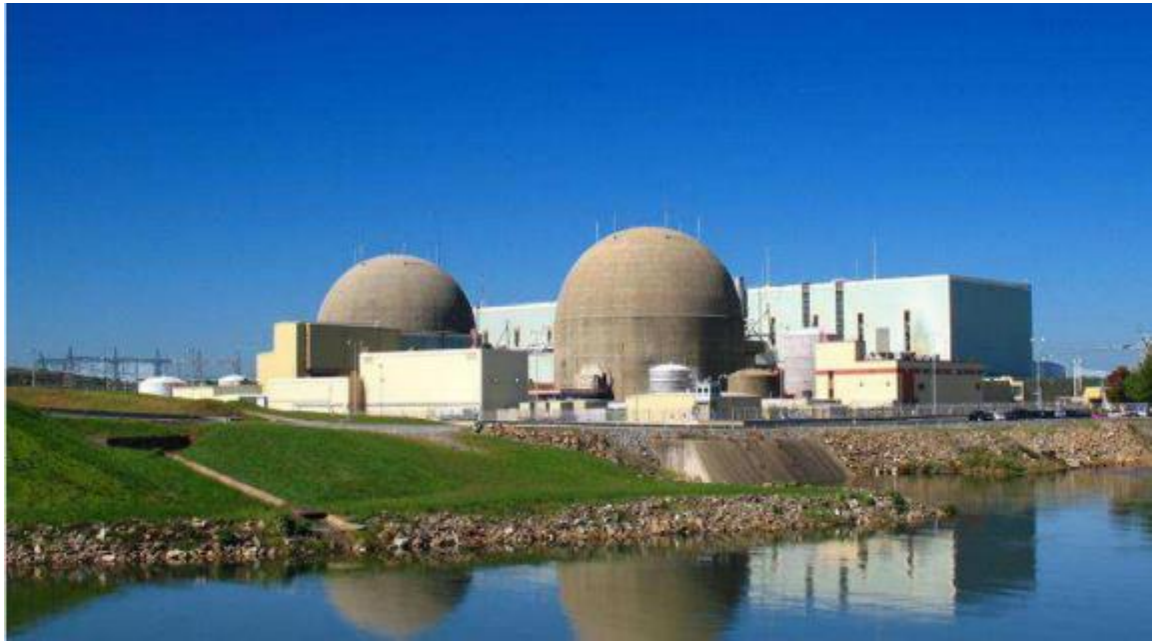


Surry Power Station
Carbon Fiber Reinforced Polymer (CFRP)
Alternative Request
Pre-submittal Meeting
September 7, 2016

Introductions

- NRC Attendees
- Licensee Project Team Attendees
  - Dominion Surry Nuclear Station – Licensee
    - Gary Miller (Licensing)
    - Janean Sealey (Projects)
    - John Henderson (Design Manager)
    - Lars Gordon (Engineering)
  - Structural Technologies, LLC – CFRP Material Manufacturer
    - Jason Alexander, Anna Pridmore and Leo Nadeau
  - Simpson Gumpertz & Heger (SGH) – CFRP Designer
    - Rasko Ojdrovic
- Public Attendees

Presentation Agenda

1. Purpose of Today's Meeting
2. Overview of CFRP Process & Procedure
3. Scope of Proposed Alternative Request
4. Technical Basis
5. Duration of Proposed Alternative
6. Precedents
7. References
8. Regulatory Procedures

Purpose of Today's Meeting

- Surry Power Station intends to submit an inservice inspection alternative request in 2016 for the use of a Carbon Fiber Reinforced Polymer (CFRP) composite repair system for internal structural upgrade of selected safety related piping systems.
- Today's meeting serves as a pre-submittal discussion of the scope and content of the forthcoming alternative request.

Overview of CFRP Process and Procedure

Carbon Fiber Reinforced Polymer (CFRP) Pipe Repair

- No excavation
- Standalone design (no reliance on host pipe)
- Rapidly implemented
- Targeted or continuous repairs
- Minimal diameter reduction and effect on flow

Overview of CFRP Process and Procedure

History of Carbon Fiber Reinforced Polymer (CFRP)

- 1950s: CFRP for aerospace applications
- 1980s: CFRP is used to repair civil infrastructure
- 1990s – early 2000s: Various utilities start using CFRP to internally repair large diameter pipe
- Mid-2000s: CFRP repair of pipe is widespread
- 2009: AWWA Concrete Pressure Pipe Committee appoints a subcommittee
- 2011: AWWA Standards Council approved the development of a standard
- 2011: Water Research Foundation awards the first research project to form the technical basis of the standard
- 2012: ASME Task Group formed for Code Case Repair of Class 2 and 3 Piping by Carbon Fiber Reinforced Polymer Composite, ASME Section XI, Division 1
- 2013 – 2015: Additional research on watertightness, degree of cure, etc.
- 2015: AWWA Draft Standard for CFRP Renewal and Strengthening of PCCP is complete (currently balloted)
- 2016: ASME draft Code Case Repair of Class 2 and 3 Piping by Carbon Fiber Reinforced Polymer Composite, ASME Section XI, Division 1 (in progress)

Overview of CFRP Process and Procedure

Carbon Fiber Reinforced Polymer (CFRP) Pipe Repair

- Effective in repair of buried pipes which are 24 in. diameter and larger
- In use nearly 20 years on buried pipes
- More than 500 internal CFRP repairs on steel, prestressed concrete cylinder pipe (PCCP) and reinforced concrete pipe (RCP) pipes including numerous non-safety pipes at nuclear power plants

Dominion

Scope of Proposed Alternative Request

- **Piping included:** Surry Unit 1&2 Safety related Circulating Water System Inlet Piping and Service Water System pipe headers
- **Anticipated construction timeframe:** Spring 2018 – Fall 2025
- **Requested date of approval:** Within 12 months of submittal date
- **American Society of Mechanical Engineers (ASME) Code Class:** ASME Code Class 3

Scope of Proposed Alternative Request

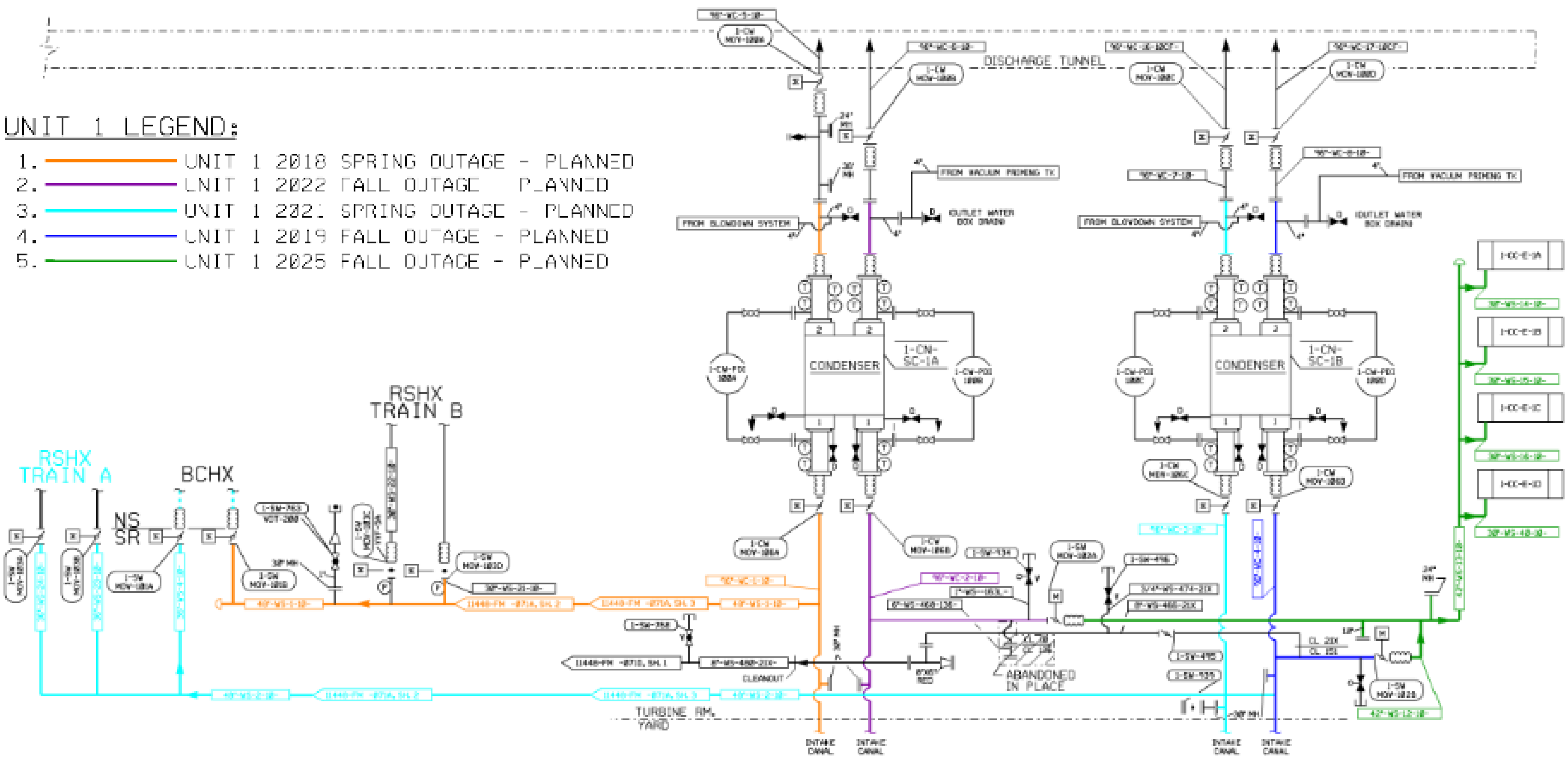
- **Affected piping in Surry Power Station Units 1 & 2**
  - 96” diameter Circulating Water System Inlet Piping (CW) from the Station Inlet Canal to the Main Steam (MS) Condenser and 24”, 30”, 36”, 42”, and 48” diameter Service Water (SW) System pipe headers from the CW system to the supply lines to the Recirculation Spray Heat Exchangers.
  - ***All of these lines are concrete encased and buried.*** The concrete encasement of the piping systems was designed as a Seismic Category I structure and provides the seismic support for these pipes. The piping was fabricated in accordance with American Water Works Association (AWWA) C201 “Standard Specification for Electric Fusion Welded Steel Water Pipe” with carbon steel materials conforming to American Society for Testing Materials (ASTM) A-283 Gr. B. The piping was designed and installed in accordance with ANSI B31.1 -1967 “Power Piping Code”.
  - A detailed listing of the piping sections to be replaced will be provided, which identifies the pipe number, size, configuration, preliminary construction schedule and function.

Scope of Proposed Alternative Request

- **Applicable Code Edition and Addenda**
  - ASME Section XI, “Rules for Inservice Inspection of Nuclear Power Plant Components”, 2004 Edition No Addenda
- **Applicable Code Requirement**
  - During the process of repairing this carbon steel piping, Article IWA-4000, subparagraph IWA-4221(b) requires that items used during a repair/replacement activity meet the original construction code.
- **Reason for Request**
  - The use of CFRP piping for ASME applications is a recent technology improvement which was not available in the 1960’s or 1970’s to meet the original construction code. There are no provisions in ASME Section XI or in an approved Code Case for installing CFRP piping as a replacement for carbon steel piping during a repair/replacement activity. Dominion is therefore submitting an ISI Alternative Request for NRC approval to use CFRP material for the repair of pipe sections.

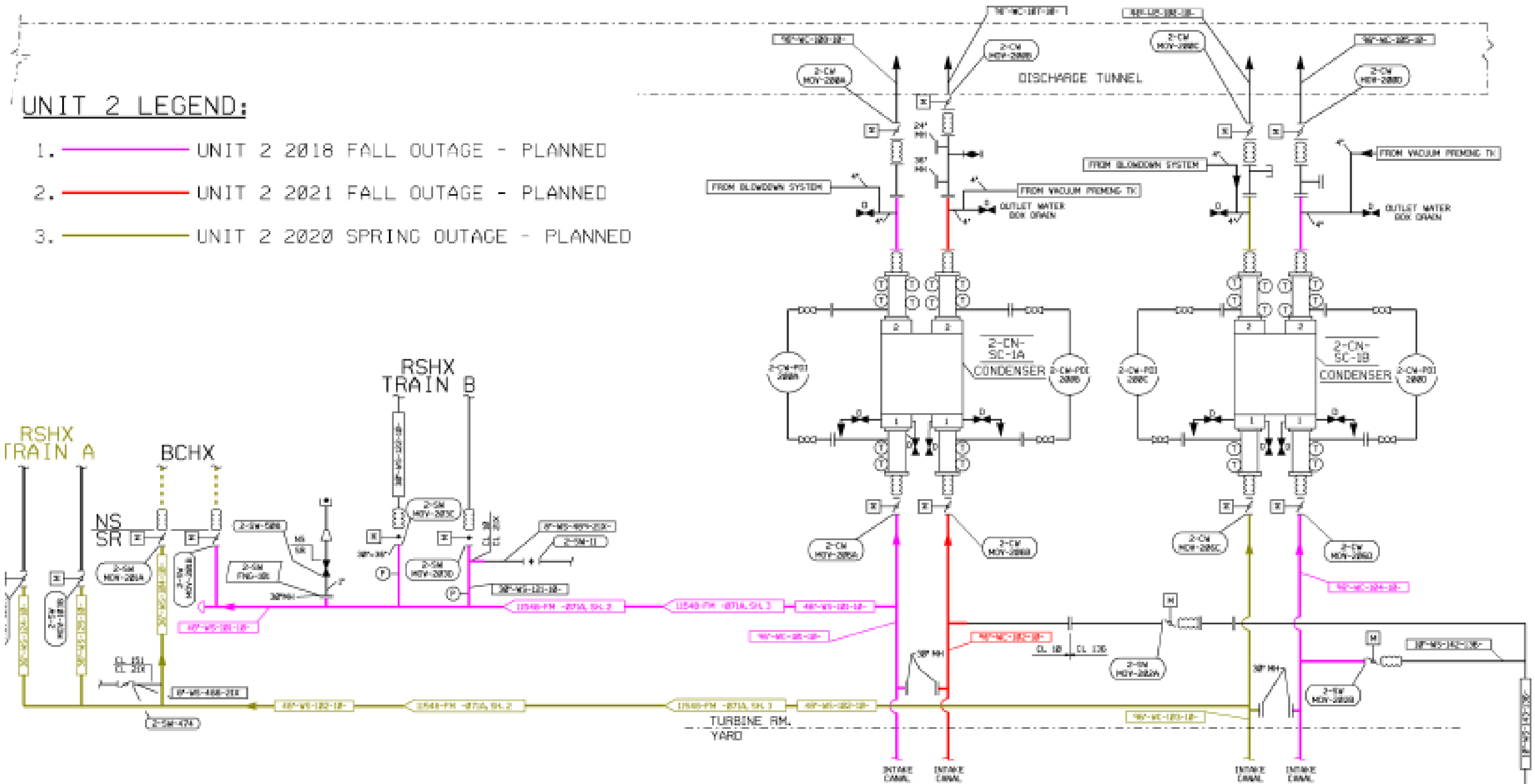
Scope of Proposed Alternative Request

Components Affected- Unit 1



Scope of Proposed Alternative Request

Components Affected- Unit 2

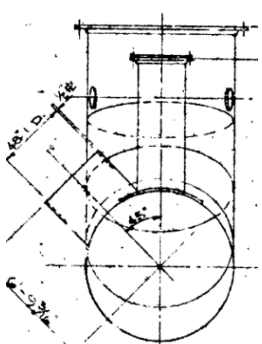


Scope of Proposed Alternative Request

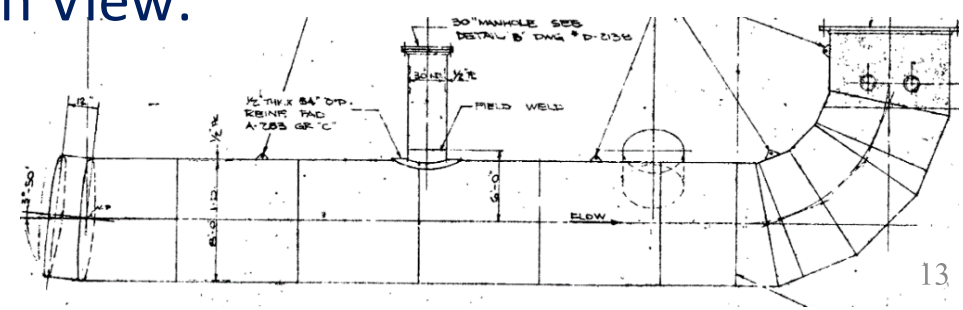
Sample Project Scope Detail

Unit 1- Spring 2018 Outage					
Pipe Designation	Pipe Number(s)	Diameter (in.)	Pipe Length (ft.)	Preliminary CFRP Design	Additional notes
Alpha inlet elbow	96"-WC-1-10	96	66.00	1D+2H+1L+1W+2H plus extra longitudinal CFRP layer through elbow and 10ft. beyond elbow (approx 32 ft.)	Includes one 90 degree vertical elbow. Surry to weld plates over two 4in. connections prior to installation of CFRP.
Manhole riser attached to Alpha inlet elbow	Manhole riser attached to Alpha inlet elbow	30	7.25	1D+1H+1L+1W+1H	Includes tie-in detailing between manhole and 96in. pipe.

End View:

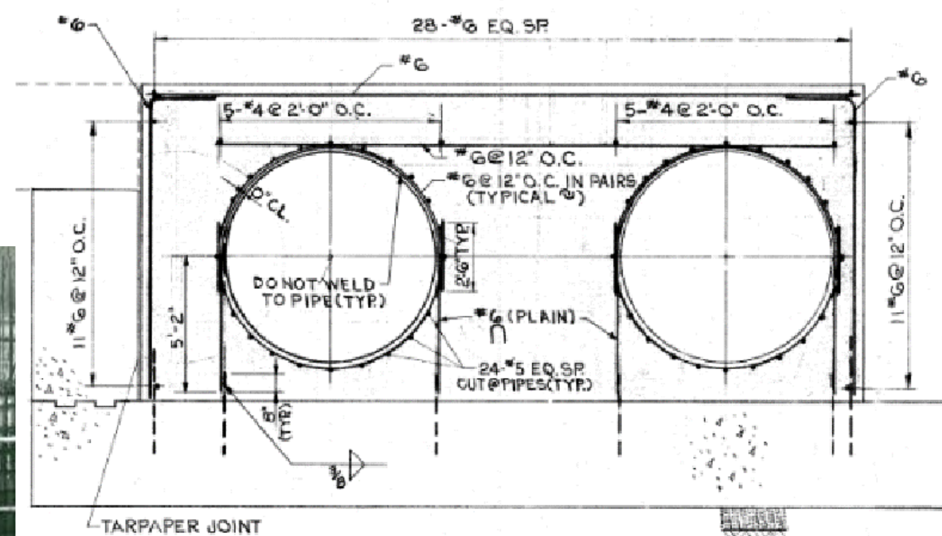


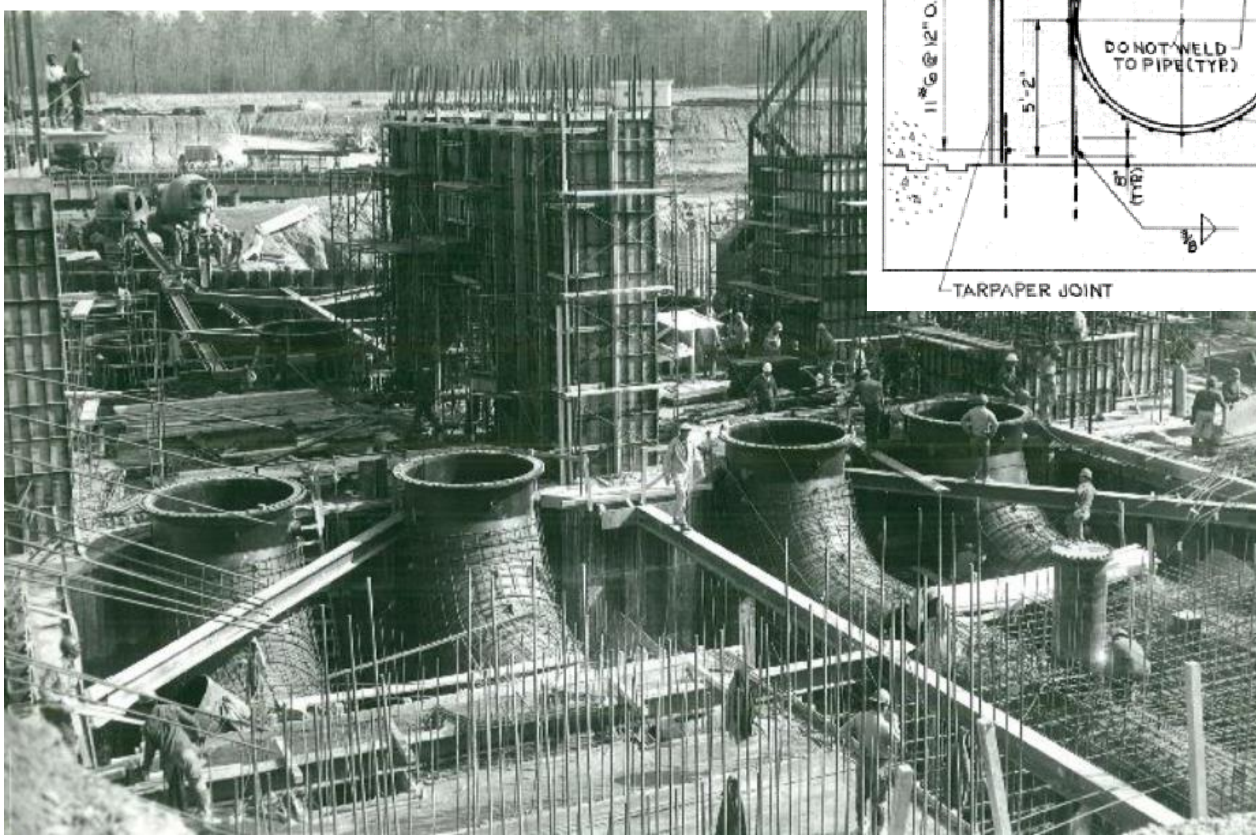
Elevation View:



Scope of Proposed Alternative Request

Sample Concrete Encasement around Pipelines





Technical Basis
Enclosures Included in Alternative Request

- **ASME Code Components Affected** (Enclosure 2- scope, schedule, definition of terms)
- **Material inspection and controls** (Enclosure 3- materials inspections, controls and qualification testing)
- **Design basis** (Enclosure 4- drawings), (Enclosure 5- calculations) (Enclosure 6- design specification)
- **Installation** (Enclosure 7- sample project installation procedures)
- **Examination and Testing** (Enclosure 8- sample project quality plan and QA/QC forms)
- **Qualifications and Training** (Enclosure 9- sample qualification and training package)
- **Operational Experience** (Enclosure 10- successful and failed applications)
- **In-service Inspection** (Enclosure 11- sample in-service inspection)

Technical Basis
Material Inspection and Controls

CFRP = Carbon Fiber Reinforced Polymer

GFRP = Glass Fiber Reinforced Polymer

- Carbon Fiber provides structural strength.
- Glass fiber provides water-tightness and dielectric barrier
- Epoxy resin provides durability.

Technical Basis
Material Inspection and Controls

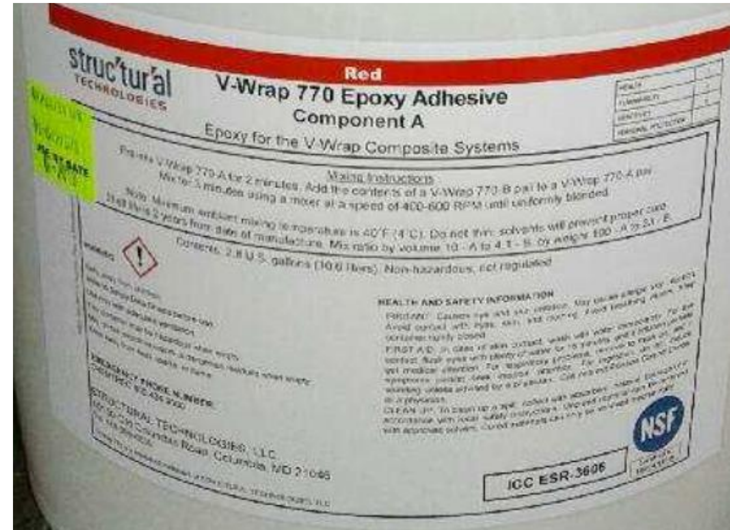
- Saturating epoxy: 100% solids epoxy used to saturate the glass and carbon fiber fabrics
- Primers: low viscosity 100% solids epoxy used to promote adhesion between host pipe and CFRP
- Thickened epoxy: silica fume mixed with epoxy and used to create smooth surface
- Structural reinforcing fabric: unidirectional carbon fiber fabric
- Non-structural fabric: glass fiber fabrics used as dielectric barrier, intermediate layer and water barrier
- Finish layer: thickened epoxy used to provide resistance to abrasion, chemical, flow, debris, etc.
- Termination materials: corrosion resistant metal expansion rings with rubber gaskets used to mechanically press CFRP against pipe at ends of repair(optional)

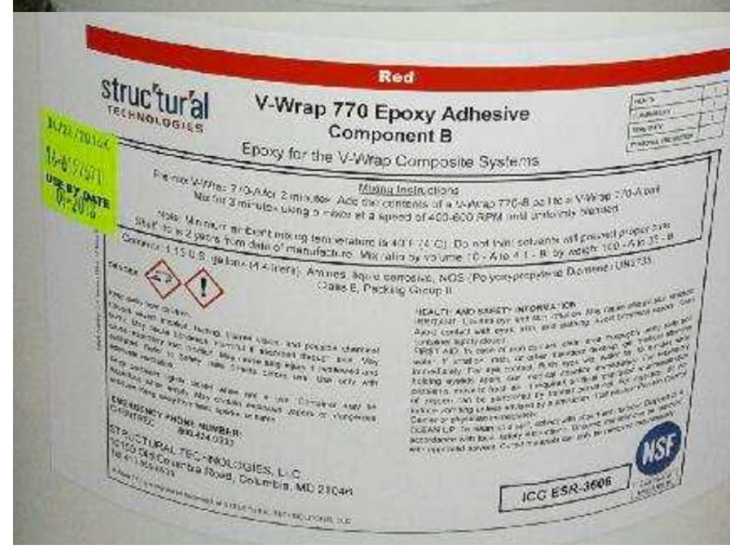
Dominion

Technical Basis
Material Inspection and Controls

Epoxy

- Two-part
- Ambient cure thermoset
- 100% solids
- Volatile organic compound (VOC) compliant





Technical Basis
Material Inspection and Controls

Application of primer coat

Primer

- Low viscosity epoxy providing an adhesive bond for the thickened epoxy.

Saturating epoxy

- Used to impregnate the reinforcing fabrics.

Thickened epoxy

- Typically made up of the saturating epoxy and silica fume mixed together in accordance with the manufacturer’s procedure. The thickened epoxy filler is used to even out the pipe substrate and it is also used in between layers of CFRP.

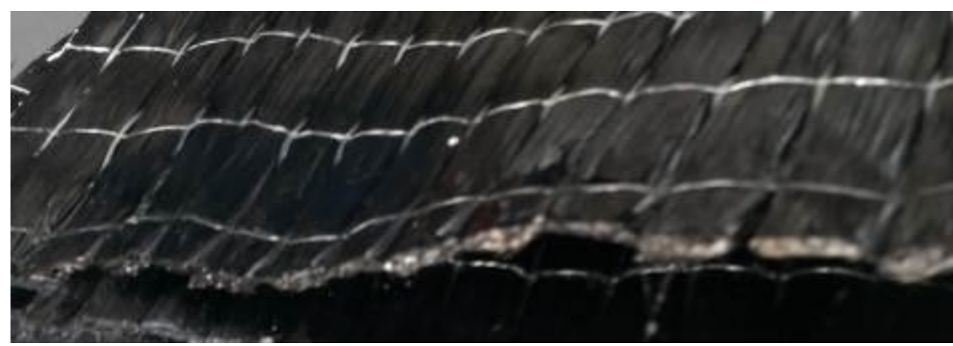
Material Inspection and Controls

Fabrics

- Unidirectional carbon fiber fabric layers applied longitudinally and circumferentially as strengthening component

- Glass fiber used as dielectric barrier and water-tightness layer

Glass fiber



Carbon fiber

Technical Basis
Material Inspection and Controls

- Epoxy components and carbon fiber material are manufactured as QA Category 1 in accordance with 10CRF 50 Appendix B and ASME NQA-1.
- The materials are controlled using a comprehensive process that includes;
  - Technical performance criteria.
  - Qualification testing at the component and end state levels.
  - Testing methods that assure components are verifiable and traceable from the manufacturer to installation.
  - Quality Control and Quality Assurance methods and records that verify manufacturing, storage and installation of epoxy and carbon fiber components as specified by the Design Authority.
  - Materials are delivered in factory sealed and labeled containers that bear the manufacturers name, product identification, component designation, lot number, date of manufacture, and shelf life.

Technical Basis - Design Basis

Design Approach for CFRP Lining

- CFRP liner is designed to take all the loads acting on the host pipe without reliance on the host pipe for structural integrity except at the termination locations.

Technical Basis - Design Basis

Water Research Foundation (WRF) Research Projects (2011-2015)

- Full-scale tests
  - Hydrostatic pressure
  - Three-edge bearing
- Laboratory tests
  - Shear bond strength
  - Degree of cure
  - Water-tightness
- Finite element analysis (FEA) of CFRP-lined pipe
- Based on Simpson Gumpertz & Heger research including Water Research Foundation project #4352, 4510 and 4592

Technical Basis - Design Basis

Full-Scale Hydrostatic Pressure Tests

54 in. pipe

48 in. pipe

Technical Basis - Design Basis

Full-Scale 3-Edge Bearing Tests

48 in. pipe - Control

48 in. pipe

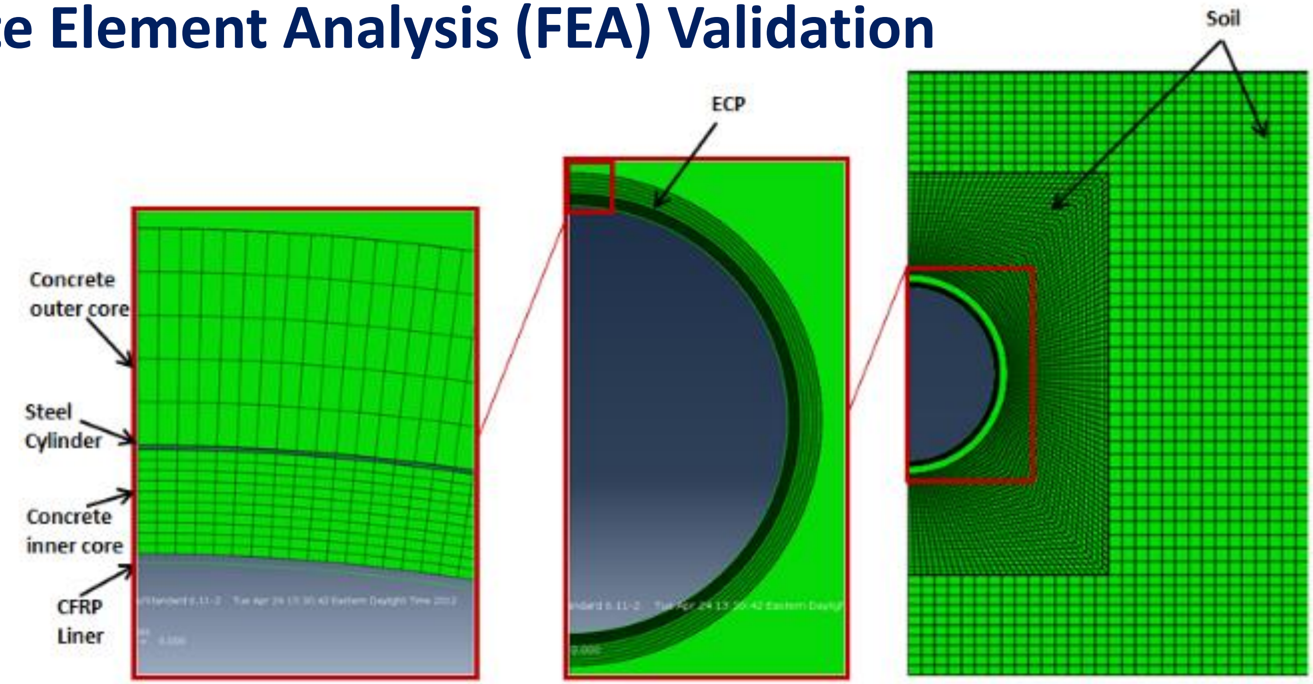
54 in. pipe

Dominion

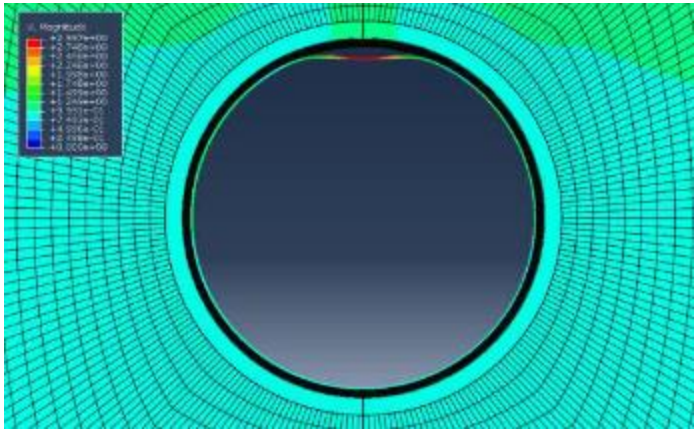
Technical Basis - Design Basis

Finite Element Analysis (FEA) Validation

Sequential analysis of buried CFRP-lined pipe that continues to degrade



Buckling analysis



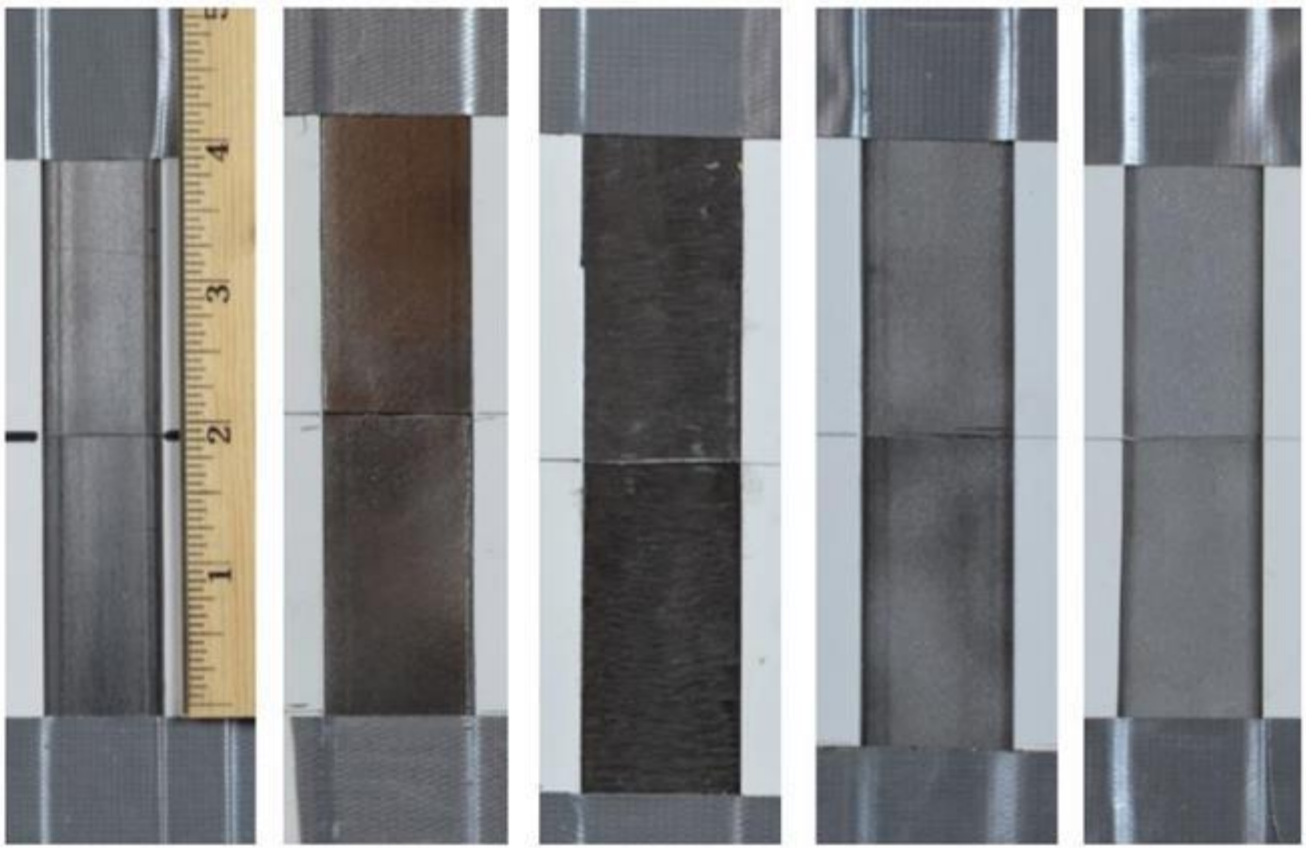
Technical Basis - Design Basis

Material Verification & Testing

- Witness panels – ASTM D3039
  - Validate tensile strength
  - Validate elastic modulus
  - Validate ultimate strain

Technical Basis - Design Basis

Shear Bond Strength on Steel Substrate

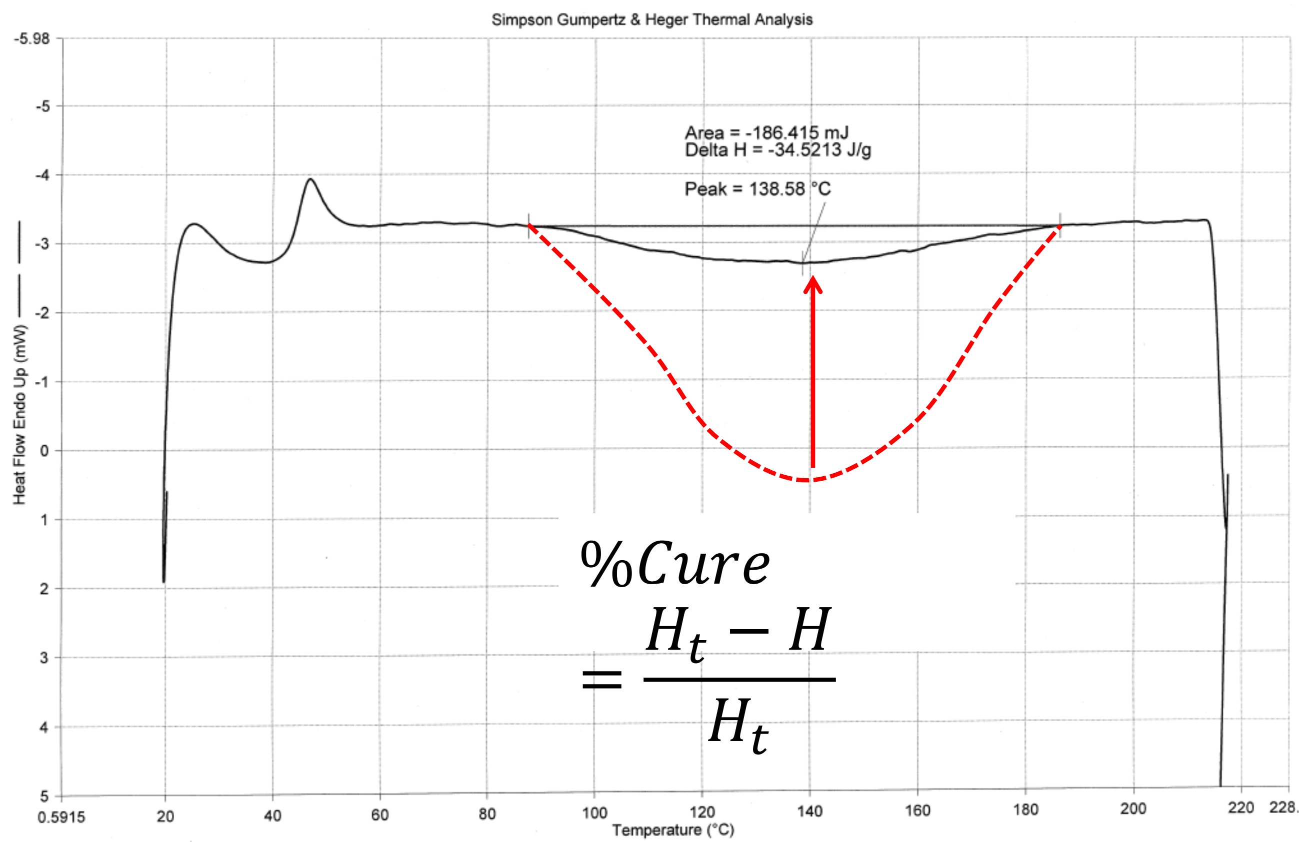


Cleaning with acetone | Cleaning with wirewheel | Grinding | Sandblasting to SSPC SP-10 near-white finish | Sandblasting to SSPC SP-5 white finish

Technical Basis - Design Basis

Degree of Cure

- Cure Testing – ASTM E2160
- Differential scanning calorimetry (DSC) on epoxy

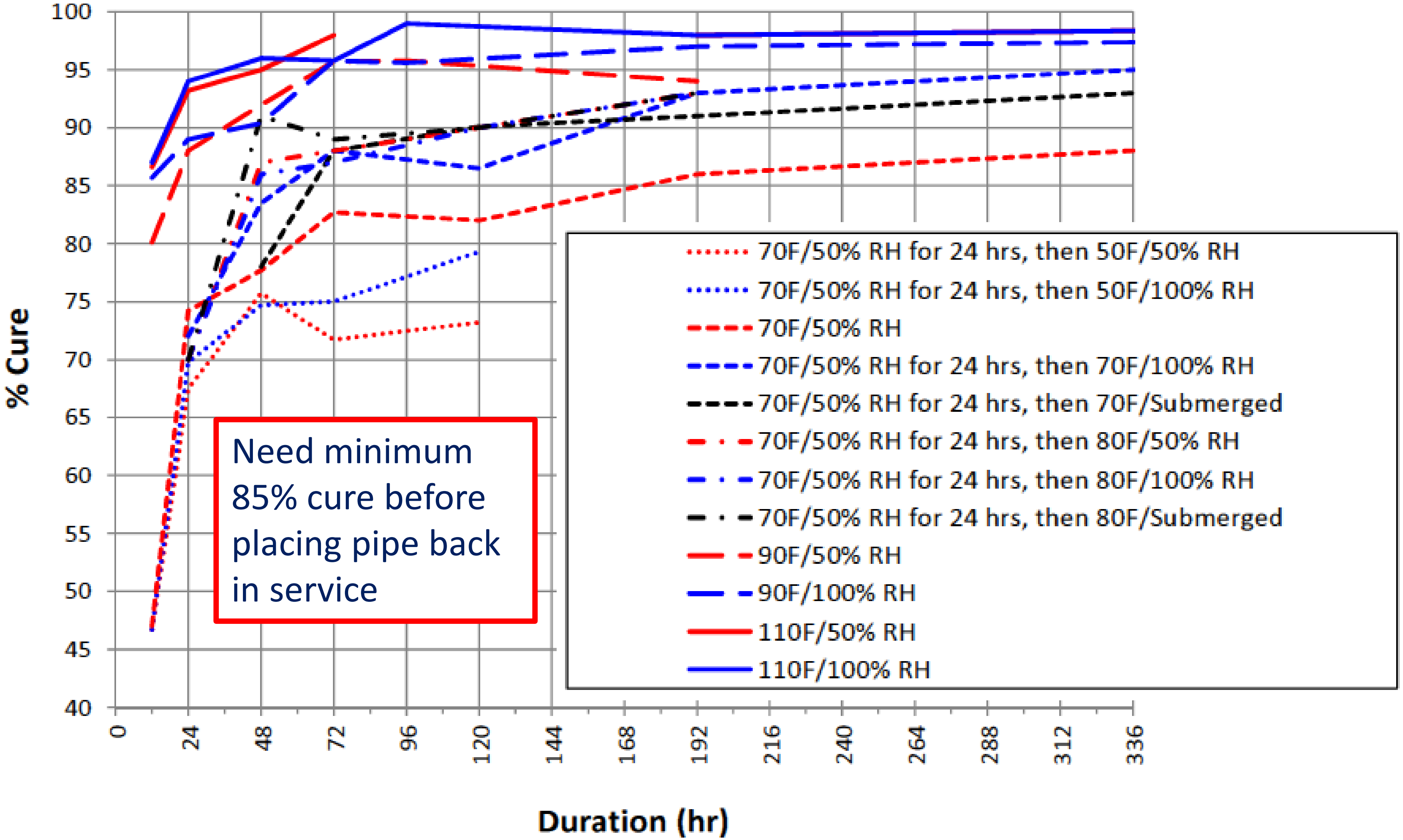


$$\%Cure = \frac{H_t - H}{H_t}$$

Technical Basis - Design Basis

Progression of Cure

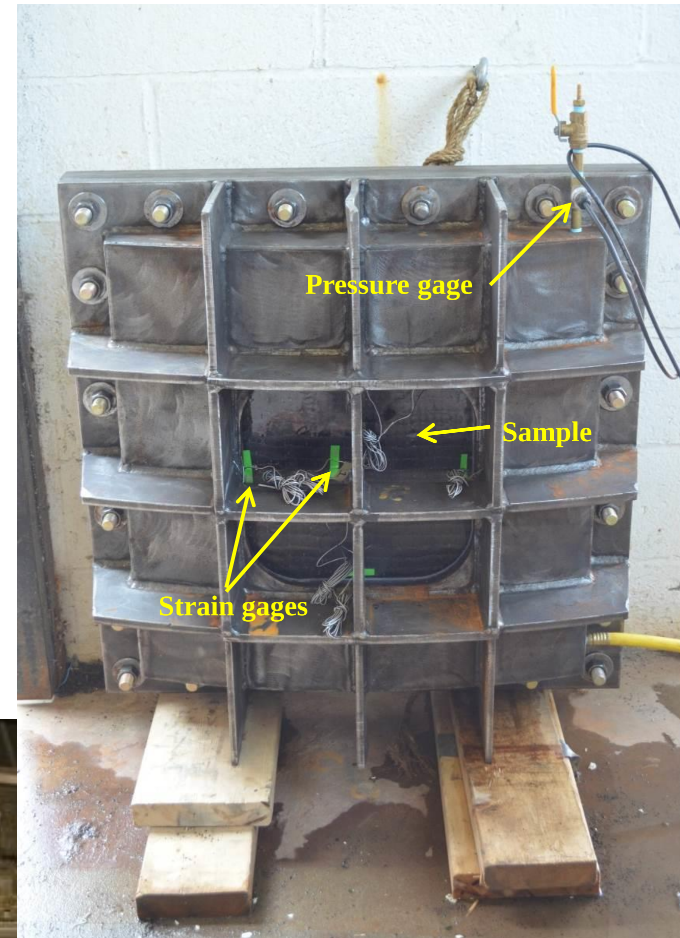
Varies by material



Technical Basis - Design Basis

Water-tightness Test

- Testing is performed to ensure that water will not permeate through the CFRP laminate
- Allows testing of laminates on a project-by-project basis
- 500 psi capacity test equipment



Technical Basis - Design Basis

Water-tightness Acceptance Criteria

- Depending on layers of CFRP installed, dedicated water-tightness layer or coating will be utilized

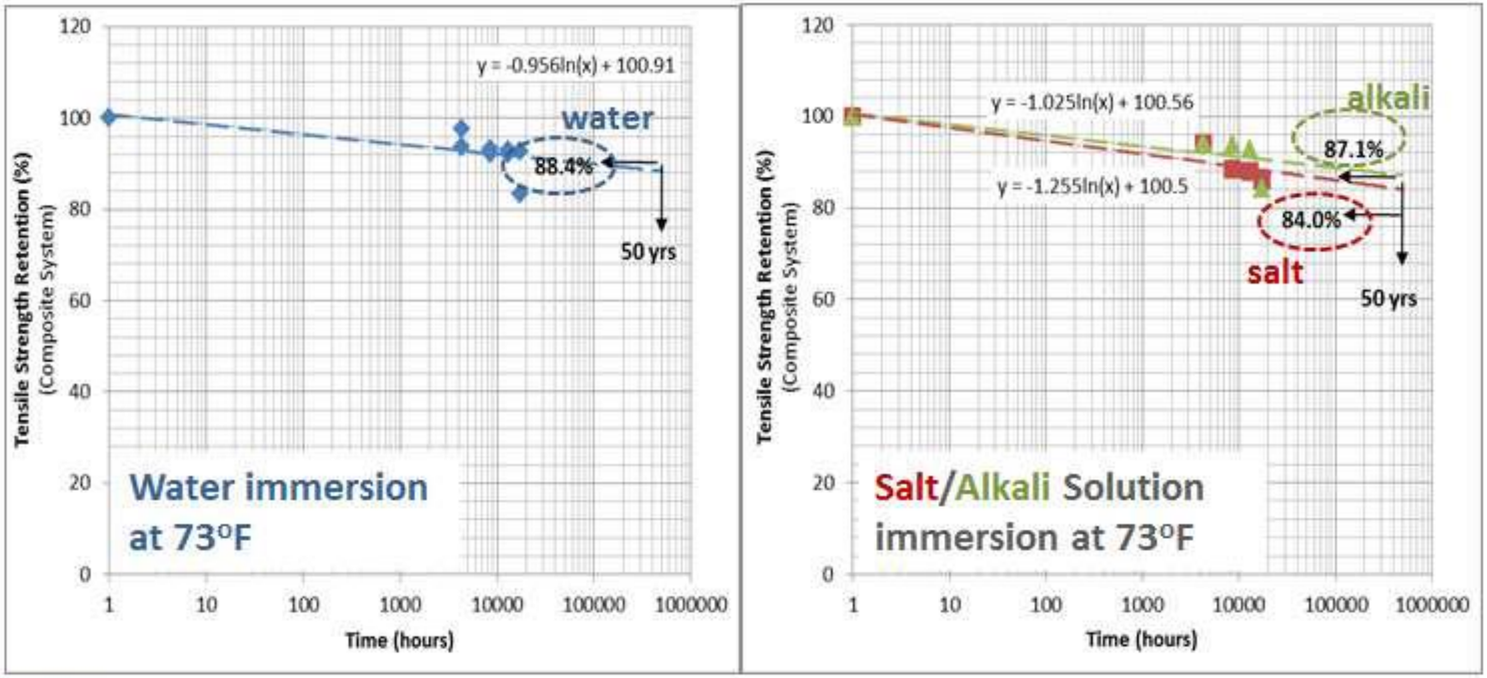
Specimen without water-tightness layer, with multiple weeps at 150 psi

Specimen with water-tightness layer, with no leaks at 400 psi

Technical Basis - Design Basis

Durability Testing

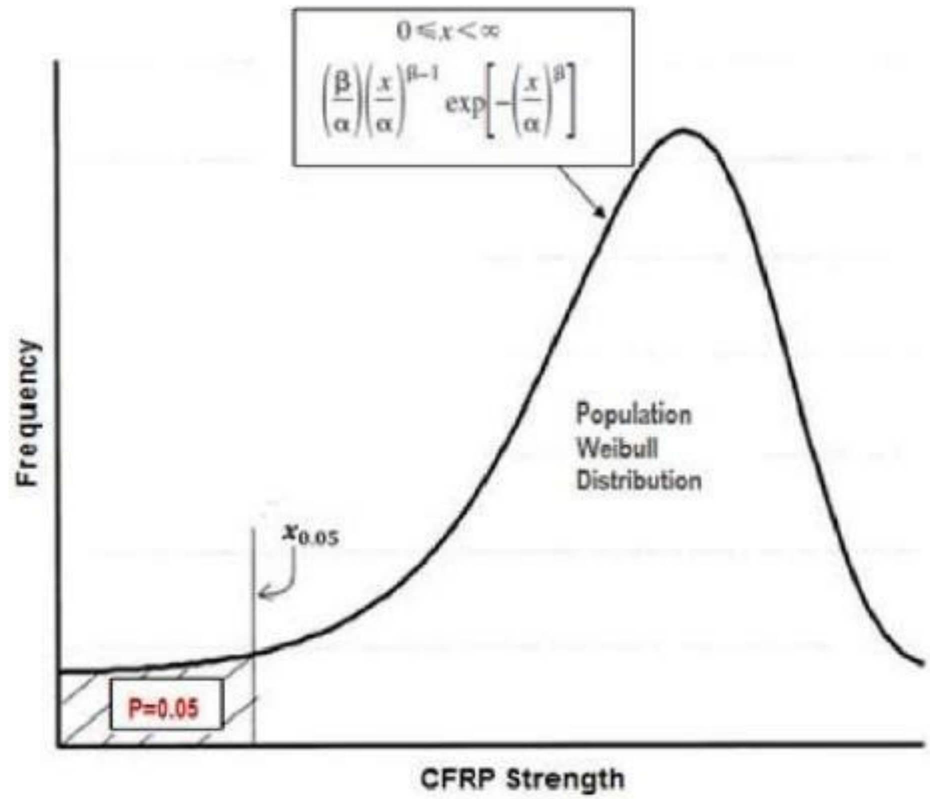
- Material adjustment factors established for each CFRP system through long-term exposure, testing for the retained strength, and extrapolating the test results out to the design life for the system (50-year service life).
- Time effect factor accounts for the creep rupture strength of CFRP.



Technical Basis - Design Basis

Determination of Material Properties

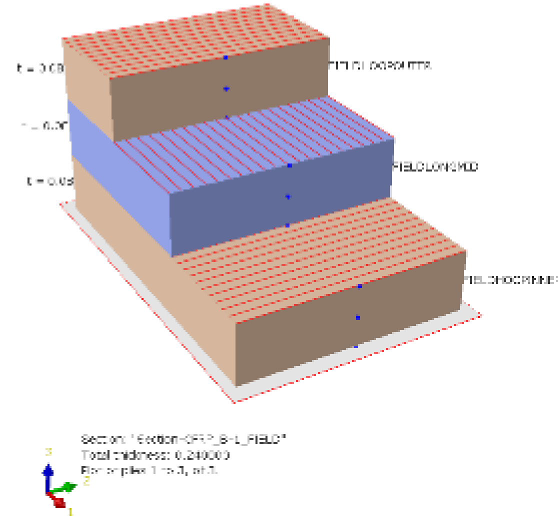
- Material properties based on tension tests of single-ply CFRP cured laminate (min 50 samples, ASTM D3039)
- Characteristic values of strength and modulus is the lower 5 percentile value with 80% confidence (ASTM D7290)

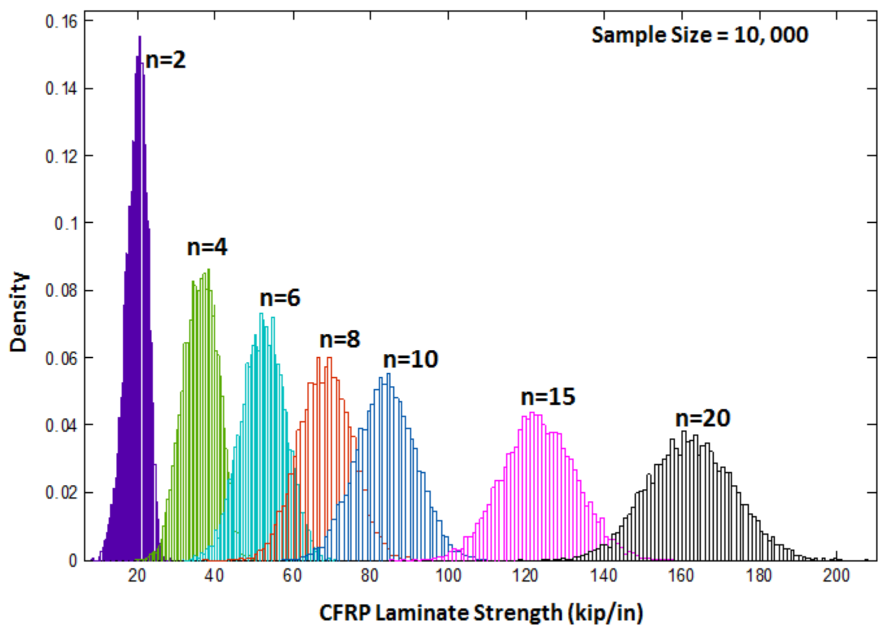


Technical Basis - Design Basis

Multi-Ply Strength

- Strength depends on the number of layers.
- Calculate the load-deformation relationship for an n-layer laminate by increasing deformations until the first lamina fails, and continue up to ultimate load.
- Ultimate tensile strength of the n-layer laminate is the ultimate load divided by the initial area of the laminate.
- Repeat sufficient number of times to obtain the probability density function (PDF) of tensile strength of the multi-ply laminate.





Technical Basis - Design Basis

Factor of Safety

- Based on reliability analysis in WRF 4352 report
- Provide a desired probability of failure of 10^{-6} per calendar year in accordance with NEI 96-07
- Desired minimum reliability index is 3.9

- Strength reduction factor ϕ_a = 0.65 for axial strain (average workmanship)
- Working pressure load factor is 1.4
- Safety factor is 1.4÷0.65 = 2.15
- Conservative factors of safety are provided

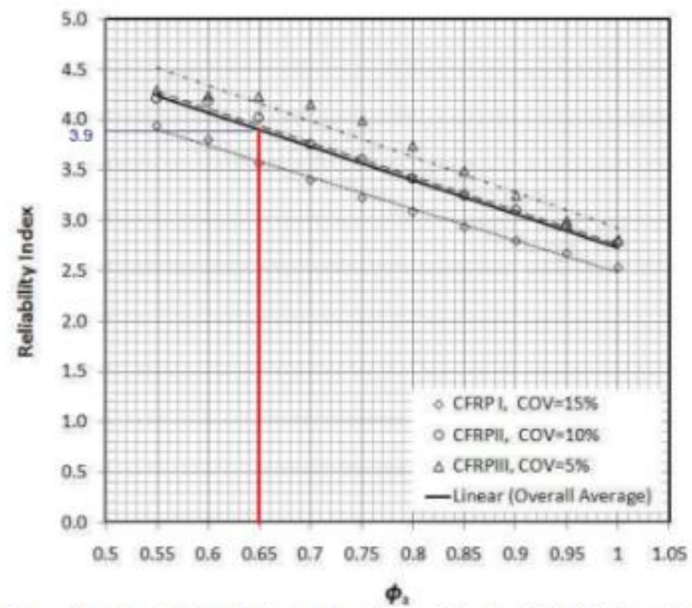


Figure 6.5 Variation in β as a Function of ϕ_a for CFRP Liner in Tension with Different Workmanship (D = 30-120 in.; Pw = 30-300 psi)

Dominion

Technical Basis - Design Basis

Unidirectional Design

- CFRP is designed independently in both circumferential and longitudinal directions.
- Circumferential CFRP minimum number of layers n_{minc} (corresponding to min. wall thickness)
- $n_{minc} = \frac{P_D D_{fc}}{2\lambda S_c t_{nomc}}$
    - D_{fc} = diameter of neutral axis of circumferential CFRP
    - P_D = design working pressure
    - S_c = C*S_u/4 allowable stress in the circumferential direction
    - t_{nomc} = nominal thickness of one CFRP layer in circumferential direction
    - λ = time effect factor

Technical Basis - Design Basis
Combined Stress

- Check independently circumferential and longitudinal stresses for applicable load combinations.
- Consider all loads that can act at the same time.
- Consider long term and short term loads to account for load duration effects.

Dominion

Technical Basis - Design Basis

Combined Circumferential Stress

- A limit state is considered satisfied when the following is met:

$$DSR = \frac{Demand}{Strength} = \frac{k_{PS}\sigma_a}{\lambda C_T S_{cu}} + k_{FS}R_c\frac{\overset{0}{\cancel{\sigma_{fs}}}}{\lambda C_f S_{cu}} + k_{PT}\frac{\sigma_{at}}{C_T S_{cu}} + k_{FT}R_c\frac{\overset{0}{\cancel{\sigma_{ft}}}}{C_f S_{cu}} \leq 1$$

- k_{PS} = 3.0 safety factor for sustained working pressure
- k_{PT} = 2.5 for transient pressure, 2.0 for service level C or D transient internal pressures, thermal stresses or earthquake induced stresses.
- k_{FS} = 4.7 for sustained flexural loads (e.g. earth load), 4.0 when σ_{fs} includes the effects of service level B transient internal pressures or thermally induced stresses, temporary soil surcharge loading, or negative internal pressure…

  R_c = re-rounding factor

  λ = time effect factor

  C = material adjustment factors

  σ = stress from hoop and flexural loads, long and short term

Technical Basis - Design Basis
Circumferential Buckling

- CFRP repair designed to resist sustained compressive hoop stresses without buckling failure as follows:

$$k_{bs}\left(\cancelto{0}{P_e} + \cancelto{0}{P_p} + \cancelto{0}{P_s} + P_{gw}\right) \leq P_{cr}$$

  – k_{bs} = 3.0
  – P – external pressures

- and concurrently occurring sustained and transient loads without buckling failure as follows:

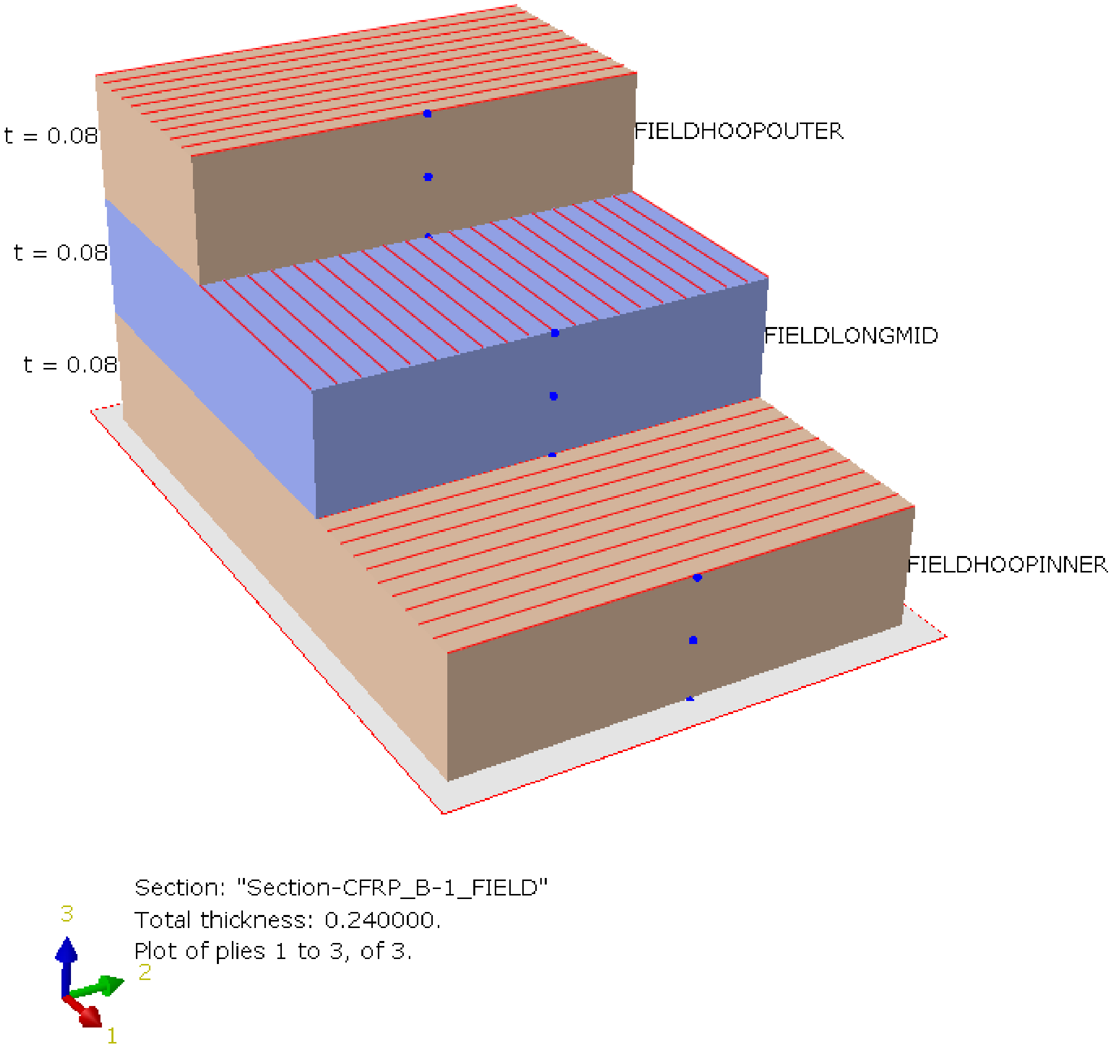
$$k_{bt}\left(\cancelto{0}{P_e} + \cancelto{0}{P_p} + \cancelto{0}{P_s} + \cancelto{0}{P_{tr}} + P_V + P_{gw}\right) \leq P_{cr}$$

  – k_{bt} = 2.75

- Consider Glock model for critical buckling pressure P_{cr} for pipe constrained by concrete encasement

Technical Basis - Design Basis
Longitudinal Stresses

- Similar approach as for circumferential stress



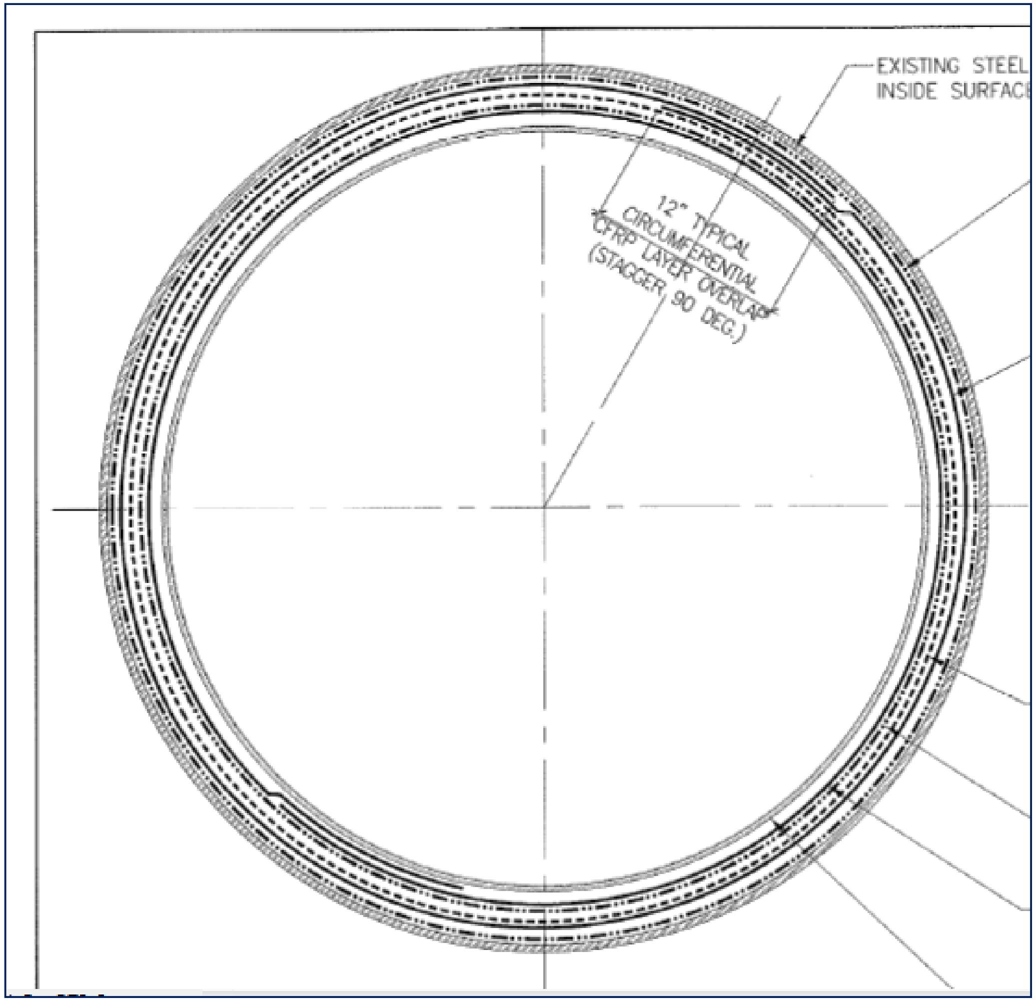
Technical Basis - Design Basis

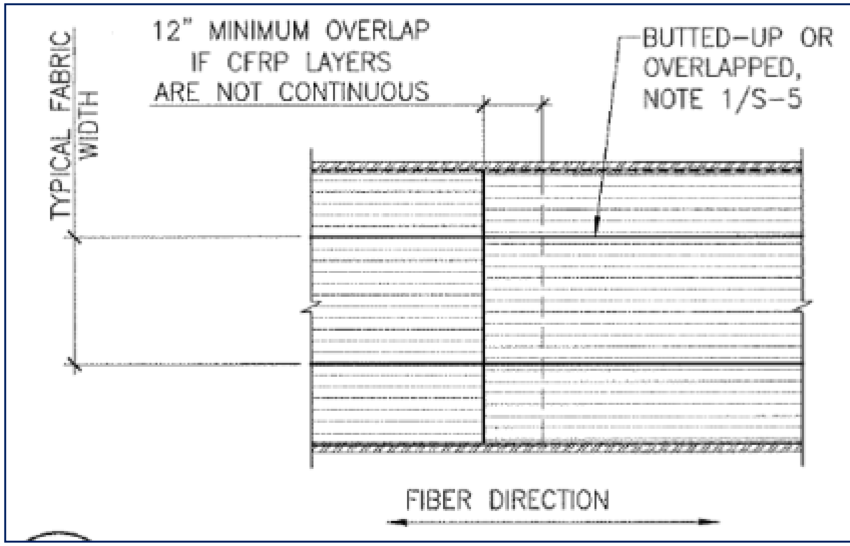
Sample Drawing Package

Sample CFRP layup for different pipe diameters

PIPELINE[(a,b)]	EXISTING INSIDE DIAMETER (a,b)	REPAIR SYSTEM[(g,h)] D = BIDIRECTIONAL GFRP FOR DIELECTRIC BARRIER W = BIDIRECTIONAL GFRP FOR WATERTIGHTNESS L = UNIDIRECTIONAL CFRP IN LONGITUDINAL DIRECTION H = UNIDIRECTIONAL CFRP IN HOOP DIRECTION	
	in.	PRODUCTS	LAYUP
CIRCULATING WATER DISCHARGE	96	D = W = V-WRAP EG50B (t=0.034 in./layer)	1D + 2H + 1L + 1W + 2H
SERVICE WATER BEARING COOLING DISCHARGE	42	V-WRAP C400H (t=0.08 in./layer)	1D + 1H + 1L + 1W + 1H
VERTICAL BRANCHES	30	ALL LAYERS IMPREGNATED WITH V-WRAP 770 EPOXY	1D + 1H + 1L + 1W + 1H

Technical Basis - Design Basis
Sample Drawing Package
Schematic cross section of pipe and overlaps



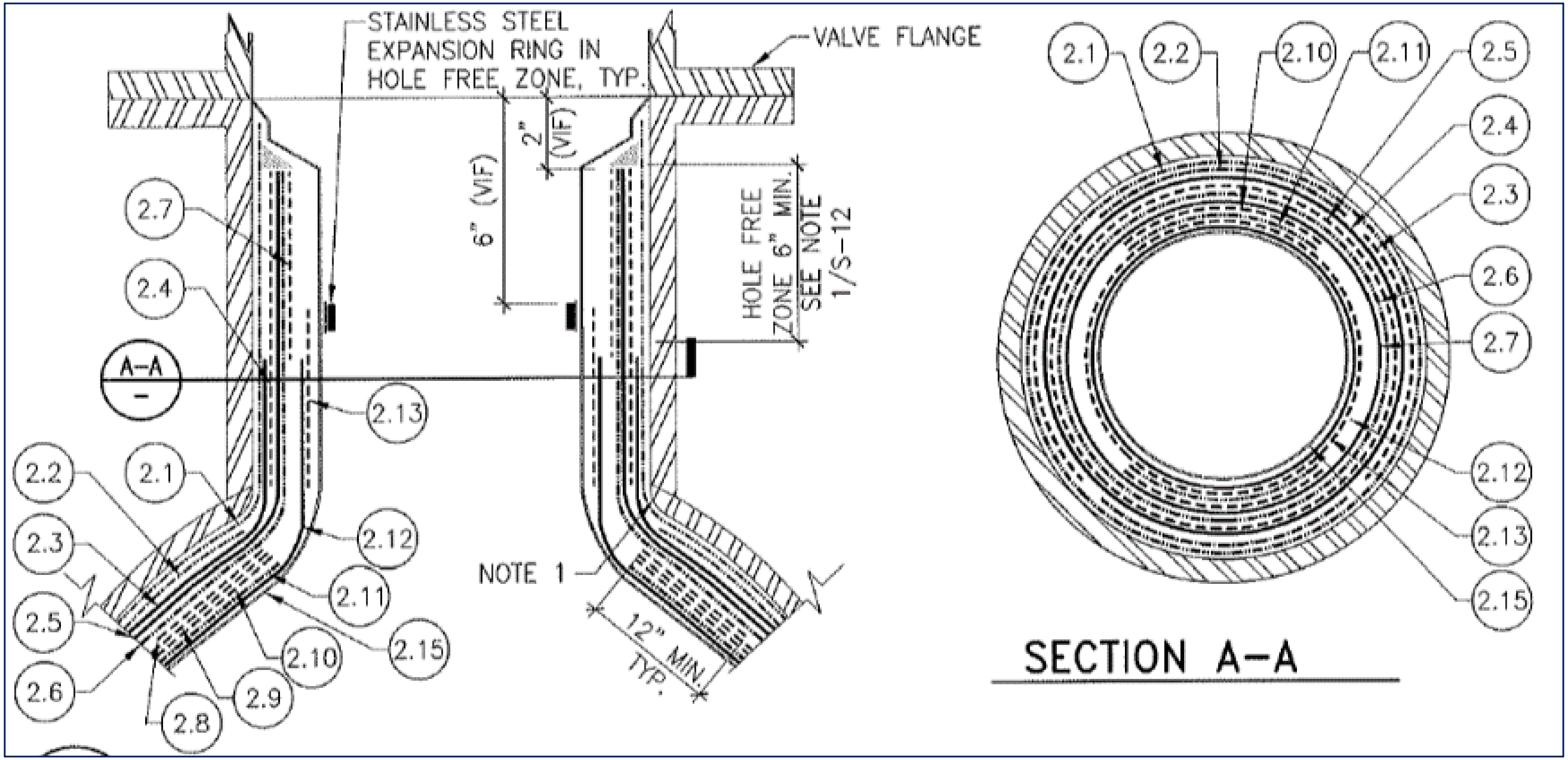


(Not to Scale)

Technical Basis - Design Basis

Sample Drawing Package

Schematic detailing for different pipe configurations



(Not to Scale)

Technical Basis - Installation

Pre-installation requirements:

- Identify and verify repair areas
- Verify controlled storage of materials
- Verify materials
- Verify installation of environmental controls

Material storage trailers

Environmental control unit

Technical Basis - Installation

CFRP installation requirements:

- Surface preparation
- Saturation of dry FRP fabric
- Application of primer
- Installation of GFRP
  - Dielectric barrier
  - Water-tightness layer
- Installation of CFRP
- Fabric alignment and overlaps
- Termination requirements
- Finish and top coat requirements
- Repair of fittings, other configurations
- Defect repair requirements
- System curing requirements

Mechanical saturator

Technical Basis - Installation

Sample Surry Procedures Developed

- SU-PROC-000-417012-01.3- “Project Quality Plan”
- SU-PROC-000-417012-02.6- “Project QA/QC Forms”
- SU-PROC-000-417012-03.3- “V-Wrap Installation Procedure”
- SU-PROC-000-417012-04.1- “Surface Preparation Procedure”
- SU-PROC-000-417012-05.2- “Compression Seal Installation Procedure”

Technical Basis – Examination and Testing

Inspections and tests:

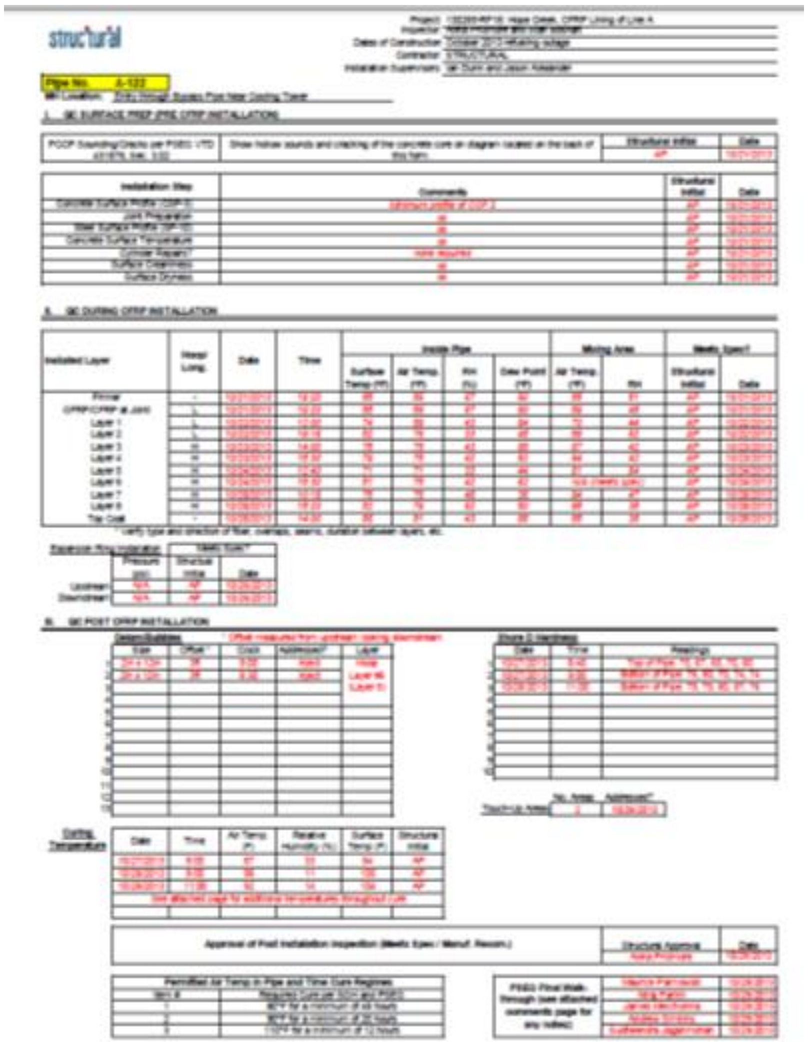
- Visual inspection
  - Prior to installation
  - During installation
  - Post-installation
- Instrument calibration
- Surface preparation verification
- UT readings of substrate at terminations
- Chloride testing
- Weight ratio test
- Adhesion test (ASTM D4541)
- Tensile test (ASTM D3039) (panels fabricated on site, tested off site)
- Material cure testing
- Acceptance criteria
- Qualifications of inspection personnel
- Records

Fabrication of witness panels

Dominion

Technical Basis - Examination and Testing

Key Project Step: Quality Control Program


structural

- Multiple QA/QC Personnel
  - 3rd Party inspector
  - Full time Quality Assurance Manager
- Project Oversight
  - Multiple Owner Representatives
  - Design Engineering Representative
- Documentation for each stage of implementation
  - Material verification
  - Temperature and humidity controls
  - Surface preparation
  - Mixing and saturation
  - CFRP liner installation
  - End details and special detailing
  - Top coat
  - Final cure

Technical Basis
Examination and Testing

Key Project Step: Mixing and Saturation

Installation Steps:

- Materials arrive on site in premeasured containers for part A and B components
- Designated mixing region is an isolated area to avoid material contamination
- Mechanical saturator ensures consistent application of epoxy to carbon fiber

Examination and Testing:

- Lot numbers of fabrics and epoxies are documented
- Gap between saturator rollers measured and calibrated using weigh test
- Weigh test verifies ratio of fabric to epoxy is within tolerance

Technical Basis
Examination and Testing

Key Project Step: Surface Preparation

Installation Steps:

- Surface preparation using abrasive blasting
- Water intrusion mitigation prior to CFRP installation
- Weld repairs as needed
- Chlor-rid rinse as needed to reduce chloride content on pipe substrate

Examination and Testing:

- Minimum surface roughness documented
- Surface preparation is verified by performing an adhesion test per ASTM D4541 on the prepared pipe
- UT measurements performed at terminal ends
- Document as-found pipe substrate

Technical Basis
Examination and Testing

Key Project Step: CFRP Installation

Installation Steps:

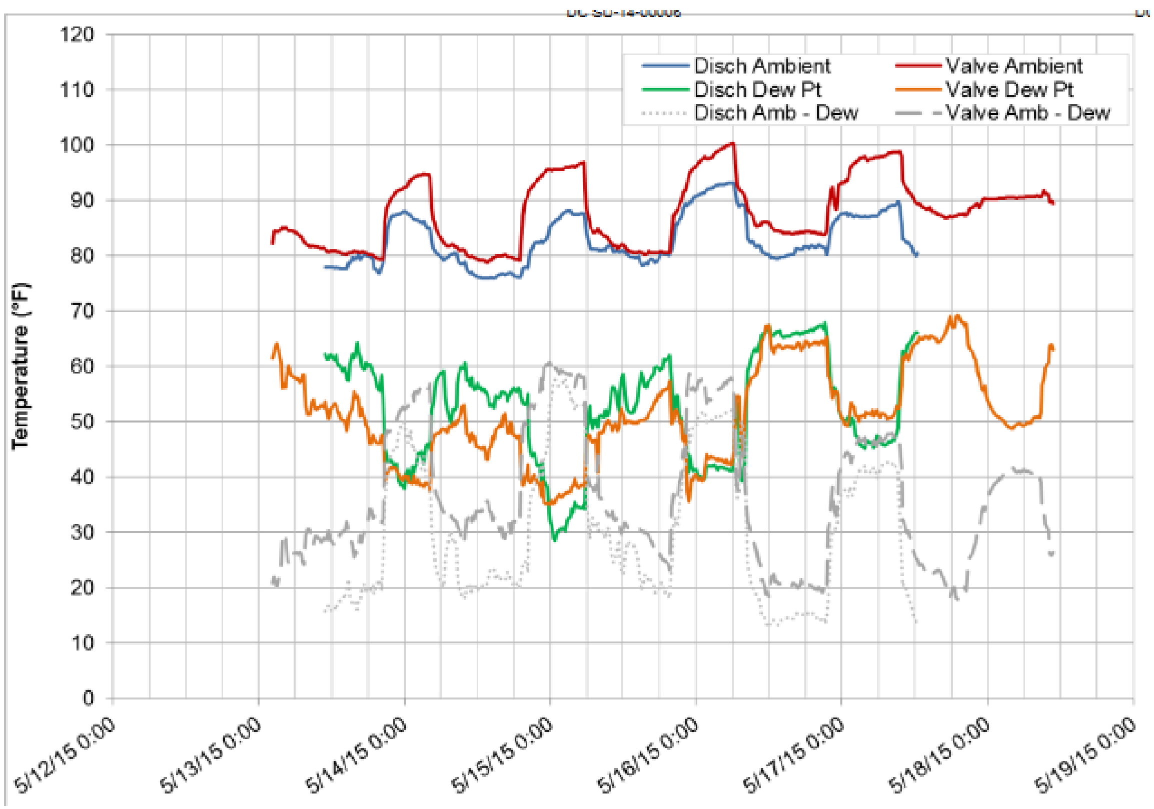
- Mechanically saturated carbon and glass fiber fabric installed in both longitudinal and circumferential directions
- CFRP design serves as stand alone system to resist all loads without reliance on host pipe
- In-process identification, documentations, and repairs of installation anomalies

Examination and Testing:

- Air temperature, surface temperature, and humidity during installation documented
- Alignment of CFRP layers verified
- Development lengths and overlaps verified
- Document repair of anomalies

Technical Basis - Examination and Testing

Key Project Step: CFRP Final Cure



Installation Step:

- After top coat is installed, final cure of CFRP system is performed at elevated temperature

Examination and Testing:

- Air temperature, surface temperature, and humidity during CFRP cure recorded
- Degree of cure testing performed to verify degree of cure achieved for CFRP system

Technical Basis - Qualifications and Training

- Qualification and training programs are in place for the following personnel:
  - Installer
  - Installation Supervision
  - 3rd Party Inspector
- Qualification process
  - Learning Objectives
  - Training
  - Knowledge Test
  - Performance Test

Technical Basis - Operational Experience
Recent Nuclear Piping CFRP OE

Pipe Type	Diameter	Project Dates
PCCP	66, 114-inch	1997-2016
PCCP	144-inch	2013-2016
Steel	84-inch	2013-2016
Steel	36, 42-inch	2013-2016
PCCP	138-inch	2015-2016
PCCP	144-inch	2015-2016
Steel	30, 42, 96-inch	2015-2016
PCCP	138-inch	2015-2016
Steel	36, 48, 54-inch	2015-2016

PCCP = Prestressed concrete cylinder pipe

Technical Basis – Operational Experience

Failures from previous CFRP Installations (done by others)	Mitigating actions to prevent similar failures (Alternative request team has had NO failures)
Improper saturation of fabric	Use of mechanical saturator, written procedure, training and qualifications, QA/QC verifications
Unqualified contractor	Training, qualifications, quality control programs, NQA1 vendor, extensive successful performance
Improper materials	Material qualifications testing
Insufficient surface preparation	Written procedure, training and qualifications, QA/QC verifications
Inadequate design	Extensive research and development for design validation (WRF program), training and qualifications
Inadequate environmental controls	Written procedure, training and qualifications, QA/QC verifications
Lack of QA/QC oversight	Written procedure, training and qualifications, QA/QC verifications

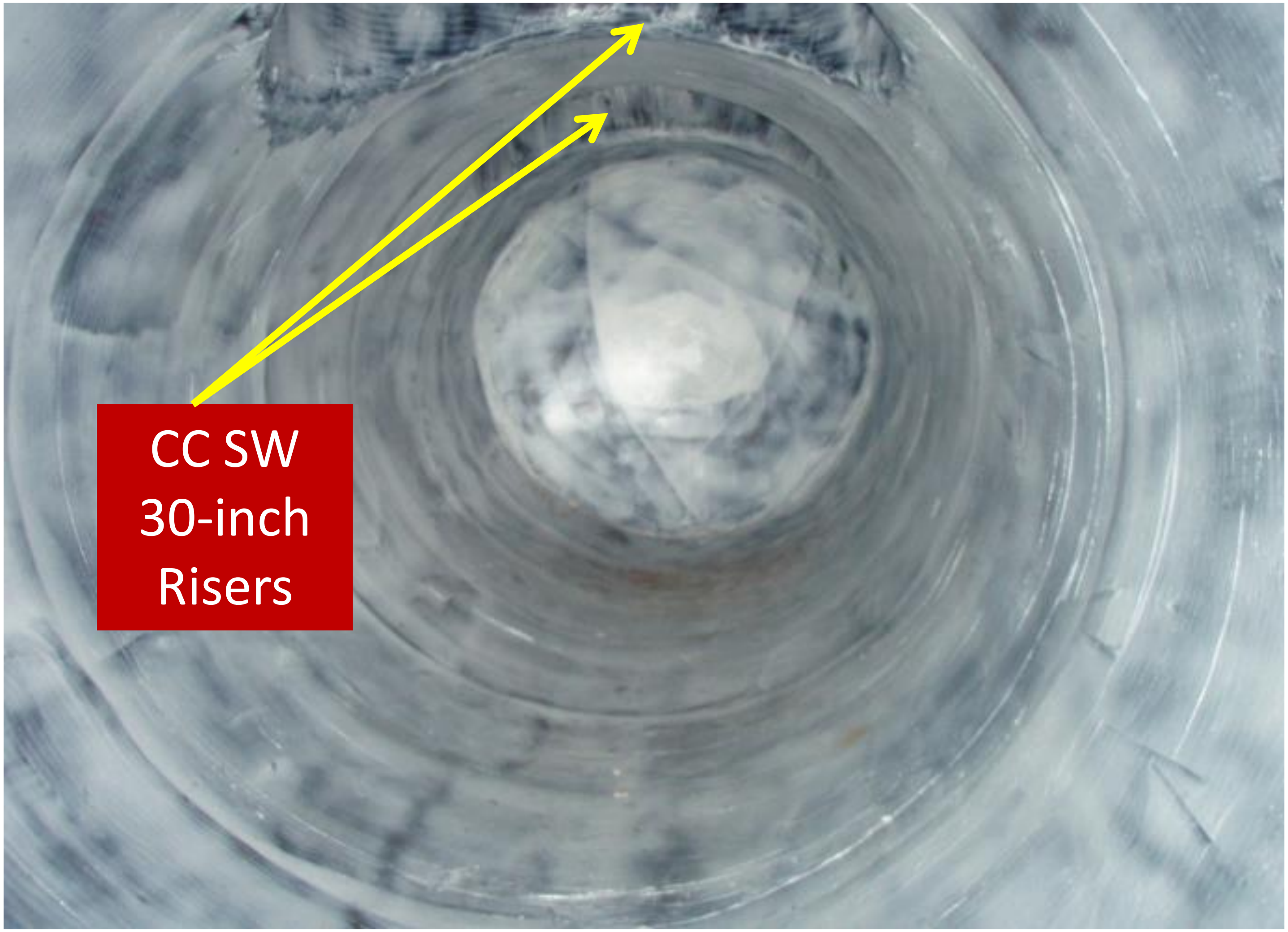
Technical Basis – Surry Operational Experience

- Surry has implemented multiple projects involving CFRP repairs with the same project team on approximately 600 LF of 30-inch, 42-inch, and 96-inch steel pipelines with similar configurations
- These projects were non-safety, enhanced quality projects performed in preparation for the upcoming proposed safety related applications
  - Developed and tested QA/QC forms, procedures, 3rd party inspection methods and project oversight
  - After each outage, lessons learned were incorporated

Technical Basis – Surry Operational Experience

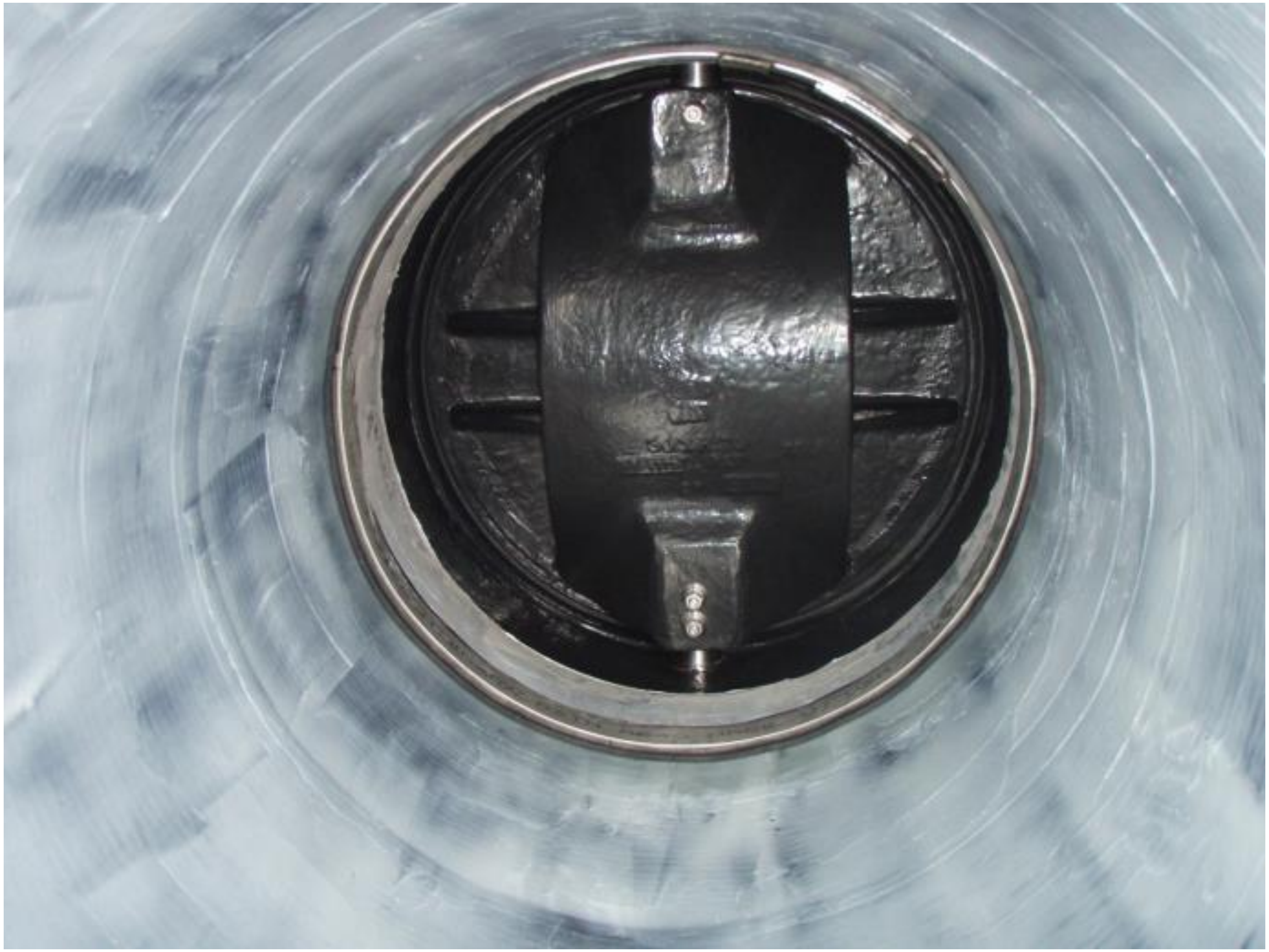
Surry Unit 1 CW 96-inch Discharge

Technical Basis – Surry Operational Experience
Unit 1 - CC SW 42-inch Discharge End Cap



Technical Basis – Surry Operational Experience

Unit 1 CC SW 30-inch Riser



Technical Basis - In-service Inspection

- For CFRP piping installed under this ISI Alternative, Inservice Inspection requirements will include the following:
  - Demonstration of CW and SW system integrity in accordance with the Inservice Inspection Program for buried CW components by documenting adequate flow through the 96-inch CW piping and the major SW supply piping.
  - Internal visual inspection of CFRP piping performed on a refueling frequency.
  - The visual inspection will include the following activities.
    - Determination of the extent of biological fouling, sediment buildup, and corrosion (including microbiologically influenced corrosion-MIC)
    - Assessment of the effectiveness of biofouling control mechanisms
    - Monitoring the material integrity of metallic components, CFRP, concrete, concrete to concrete, concrete to steel joints, Weko-Seals, and other joint seals

Dominion

Duration of Proposed Alternatives

- The proposed alternative is requested for the Unit 1 fifth 10-year Inservice Inspection (ISI) Interval that began on December 14, 2013 and ends on October 13, 2023, except for a common Unit 1 & 2 SW line which will be completed at the start of the sixth 10-year ISI Interval. The proposed alternative is requested for the Unit 2 fifth Inservice Inspection Interval which began on May 10, 2014 and ends on May 9, 2024.

Precedents

- None. The requested Alternative is a first-of-a-kind installation of CFRP in nuclear safety related piping.

References

- ASME Section XI, “Rules for In-service Inspection of Nuclear Power Plant Components”, 2004 Edition No Addenda
- ANSI B31.1 -1967 “USAS Code for Pressure Piping”

Regulatory Procedure

- Dominion is planning to submit an alternative request in accordance with 10 CFR 50.55a(z)(1), Acceptable level of quality and safety.

Questions