

Wrap It Up

- Externally Bonded Wraps -

Will Potter

FDOT

Outline

- ◇ Brief Background
- ◇ Implementation Efforts - Standardization
- ◇ Practical Applications
- ◇ What's Still Needed – Gaps?
- ◇ The Future

Background



- ◆ Initiation – Late 1970s and 1980s
 - ◆ Confinement Applications (Columns) – 1980s
 - ◆ Concrete Flexural Applications – 1987
- ◆ Extensive Research Over the Past 30+ Years
 - ◆ State Agencies, NCHRP, Consortiums, Industry, etc.
- ◆ Alleviated an Immediate Need for Maintenance
 - ◆ Limited Alternatives

Adoption Rationale

- ◇ Installation – Quick, Diverse and Low Impact
 - ◇ High Strength-to-Weight Ratio
 - ◇ Maintenance - Preservation
 - ◇ Durability
 - ◇ Aesthetics
-
- ◇ Considered a “Standard” Repair Material by Many Agencies

fib Bulletin 90



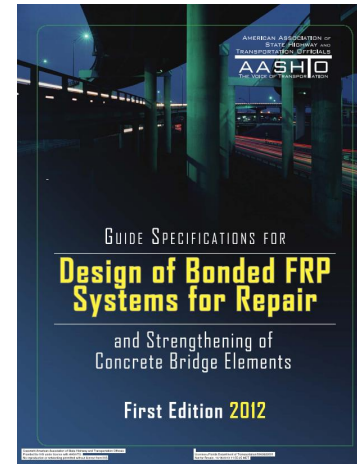
Externally applied FRP reinforcement for concrete structures

Technical report



S6-14

Canadian Highway Bridge Design Code



GUIDE SPECIFICATIONS FOR

Design of Bonded FRP Systems for Repair

and Strengthening of Concrete Bridge Elements

First Edition 2012

ACI 440.2R-17

Guide for the Design and Construction of Externally Bonded FRP Systems for Strengthening Concrete Structures

Reported by ACI Committee 440



Codification and References

- ◇ ACI 440.2R
- ◇ JSCE
- ◇ CSA
- ◇ fib
- ◇ AASHTO
- ◇ State/Agency Specific Guidance
- ◇ Textbooks Available

Practical Applications

- ◆ Impact Damaged Concrete
- ◆ Corrosion Damage Concrete
- ◆ Strengthening
- ◆ Protective Wrapping
- ◆ Seismic Retrofit
- ◆ Confinement
- ◆ Impact Damaged Metal Poles
- ◆ Fatigue Damaged Sign Structures
- ◆ Culvert Liner
- ◆ Likely several more...



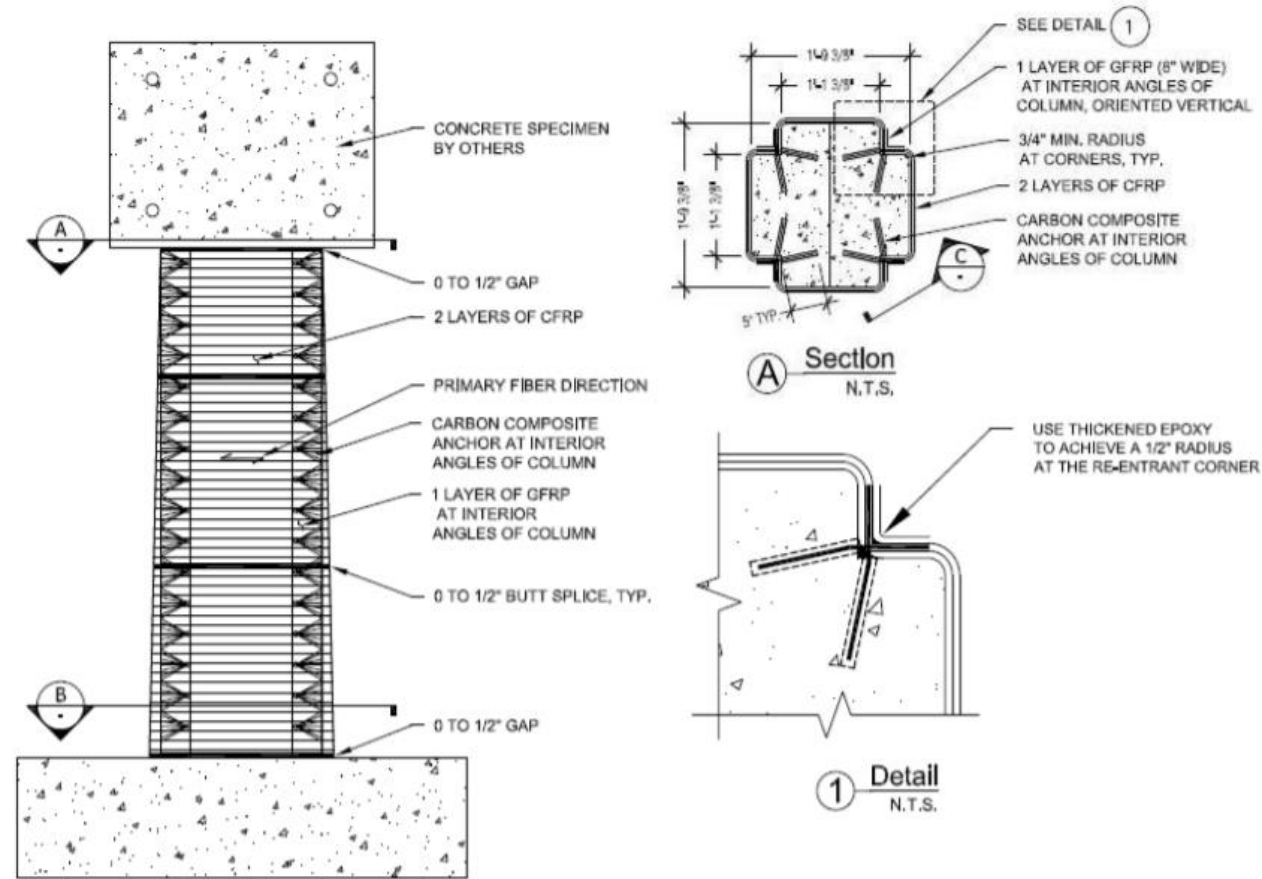


Impact Damaged Concrete





Strengthening – Corrosion Damage



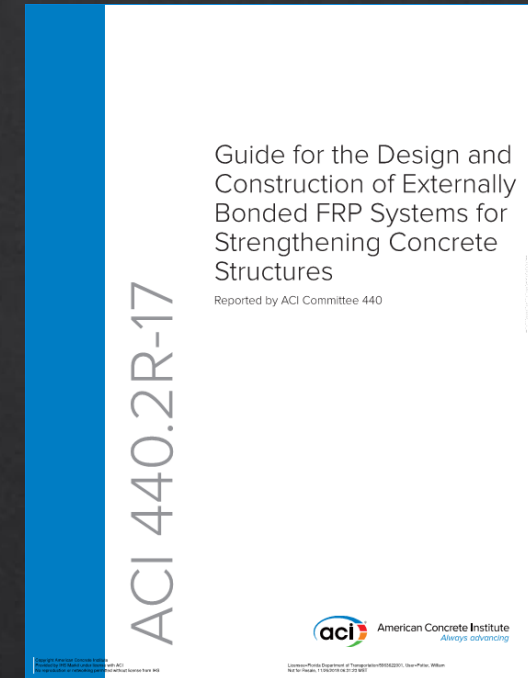
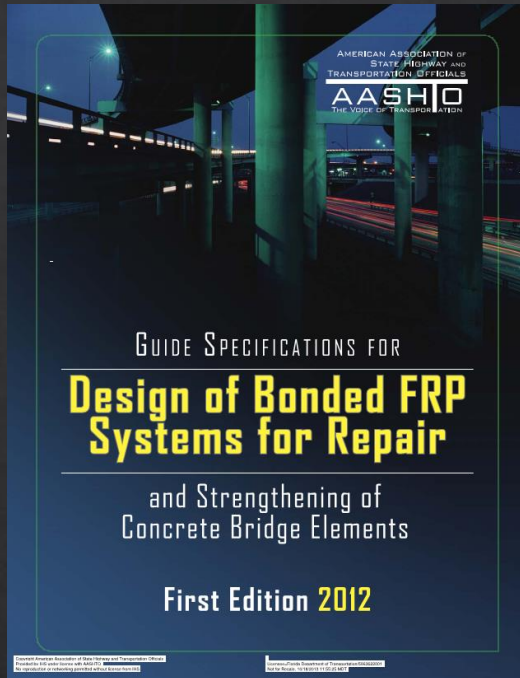
Seismic Retrofit – Aesthetics - Preservation



Confinement

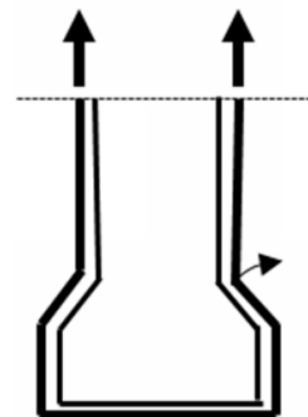
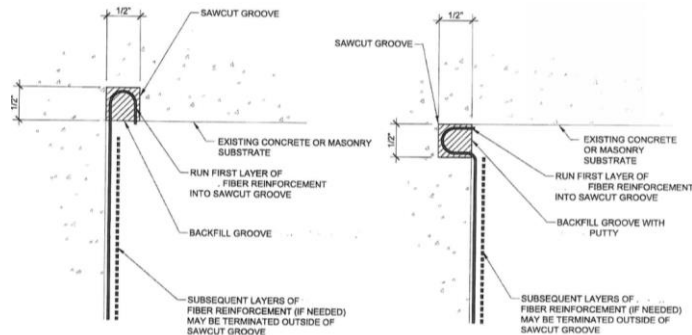
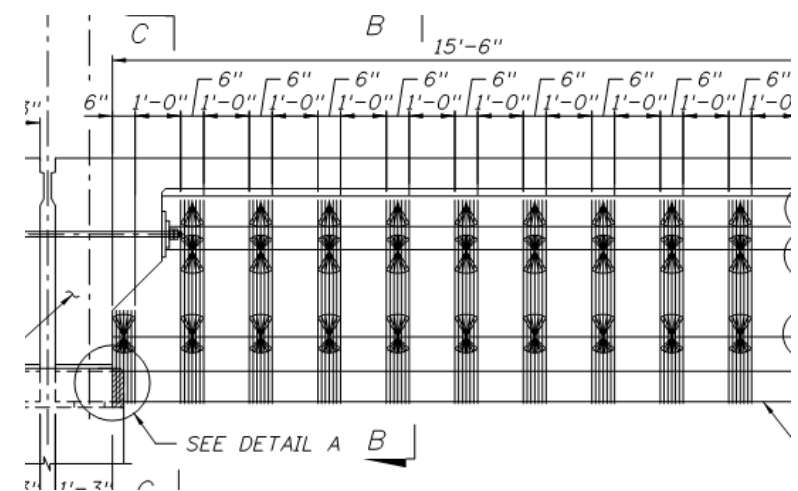


Culvert Liner



Gaps – Design Process

NCHRP 20-07 Task 428 – Update AASHTO Guide Specification



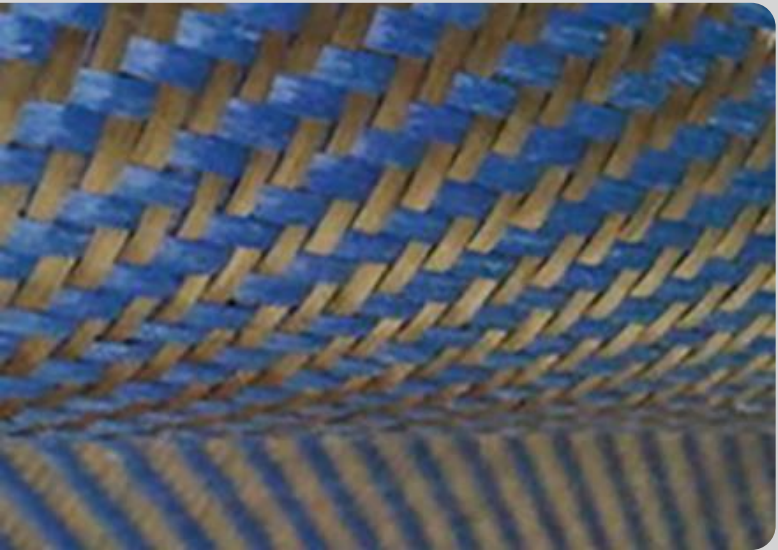
- Gaps -
Anchorage and Detailing



Gaps - Durability

- ◇ How long with it last?
- ◇ Band-aid or long-term solution?
- ◇ Inspection methods?





Future

- ◇ Fiber-Reinforced Cementitious Material (FRCCM)
 - ◇ ACI 549.4R-13
- ◇ Hybrid Fabrics
- ◇ Codification of New Materials/Methods
- ◇ Others?



Questions

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