# Recommendations for Prestressed Rock and Soil Anchors, 5th Edition

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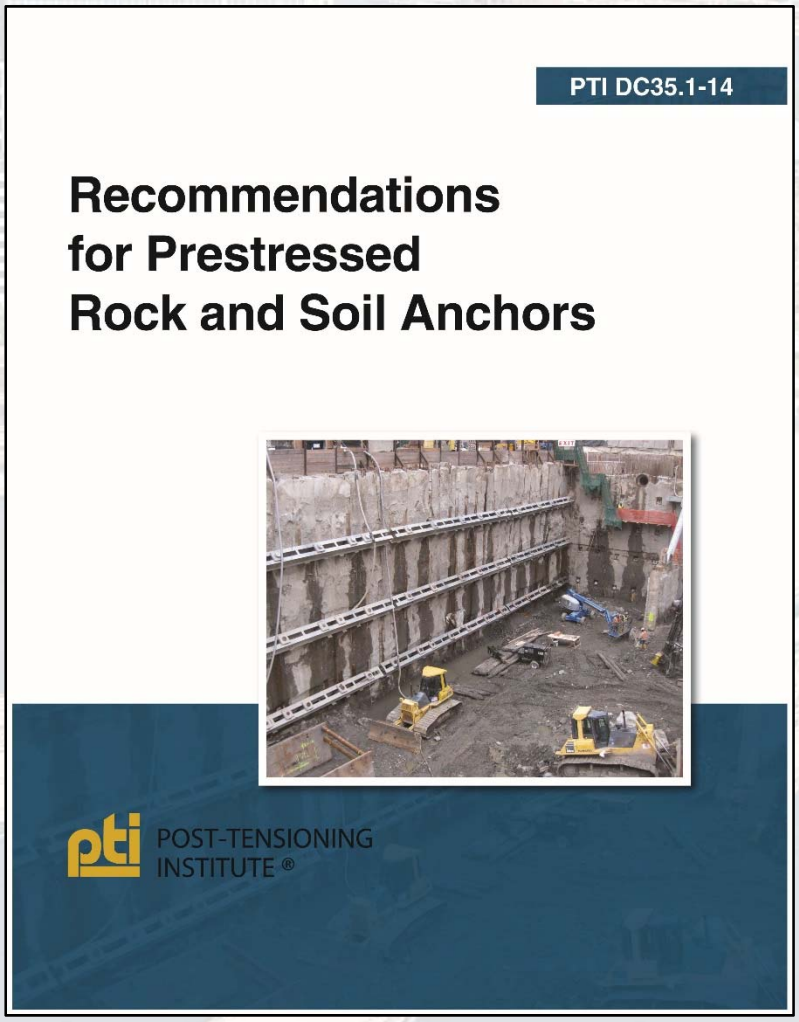
Schnabel Foundation Company

2014 PTI Convention May 6, 2014 Norfolk, VA

# The 5th Edition is here (almost)!



# Lots of Work

- Started re-assembling committee in Jan. 2011
- 6 days of meetings
- 21 web meetings
- Several ballots
- Thousands of emails

# Thanks to the following:

- DC-35 Committee
  - Frank Arland
  - Rich Barrows
  - Andy Baxter
  - Jim Bruce
  - Dom Galic
  - Eberhard Heinzemann
  - Dan MacLean
  - Michael McCray
  - Tom Printz
  - Ken Purinton
  - Tom Richards
  - Nagaraj Bommakanti (associate)
  - Donald Bruce (associate)
  - Clyde Ellis (associate)
- PTI Staff
  - Miroslav Vejvoda
  - Amy Dowell

# Rock and Soil Anchors?


USS Wisconsin, Norfolk, VA

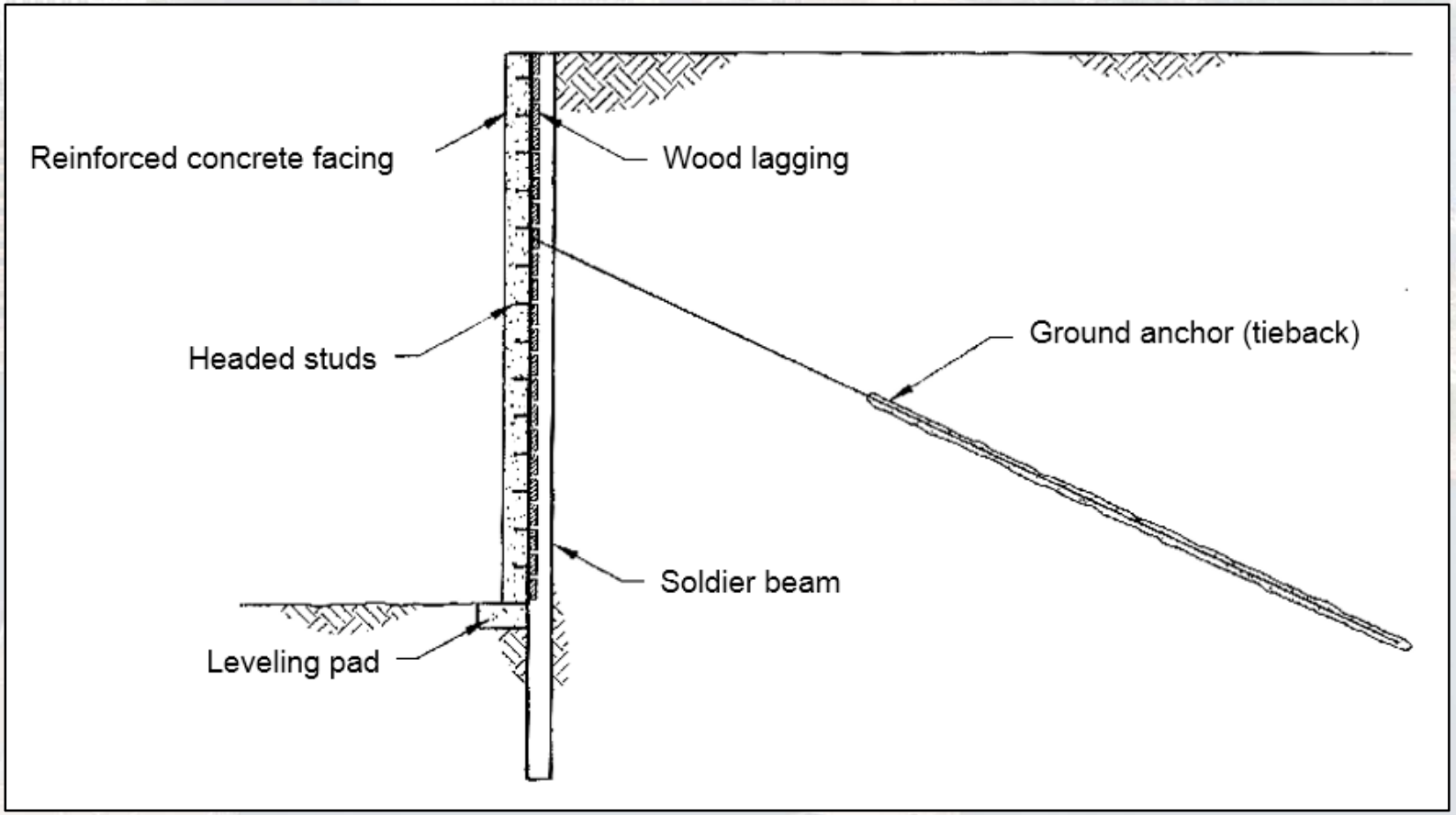
# Rock and Soil Anchors?

- Definition of an anchor:

  A tendon installed in a drilled and grouted hole in the ground (soil or rock) that is stressed after installation

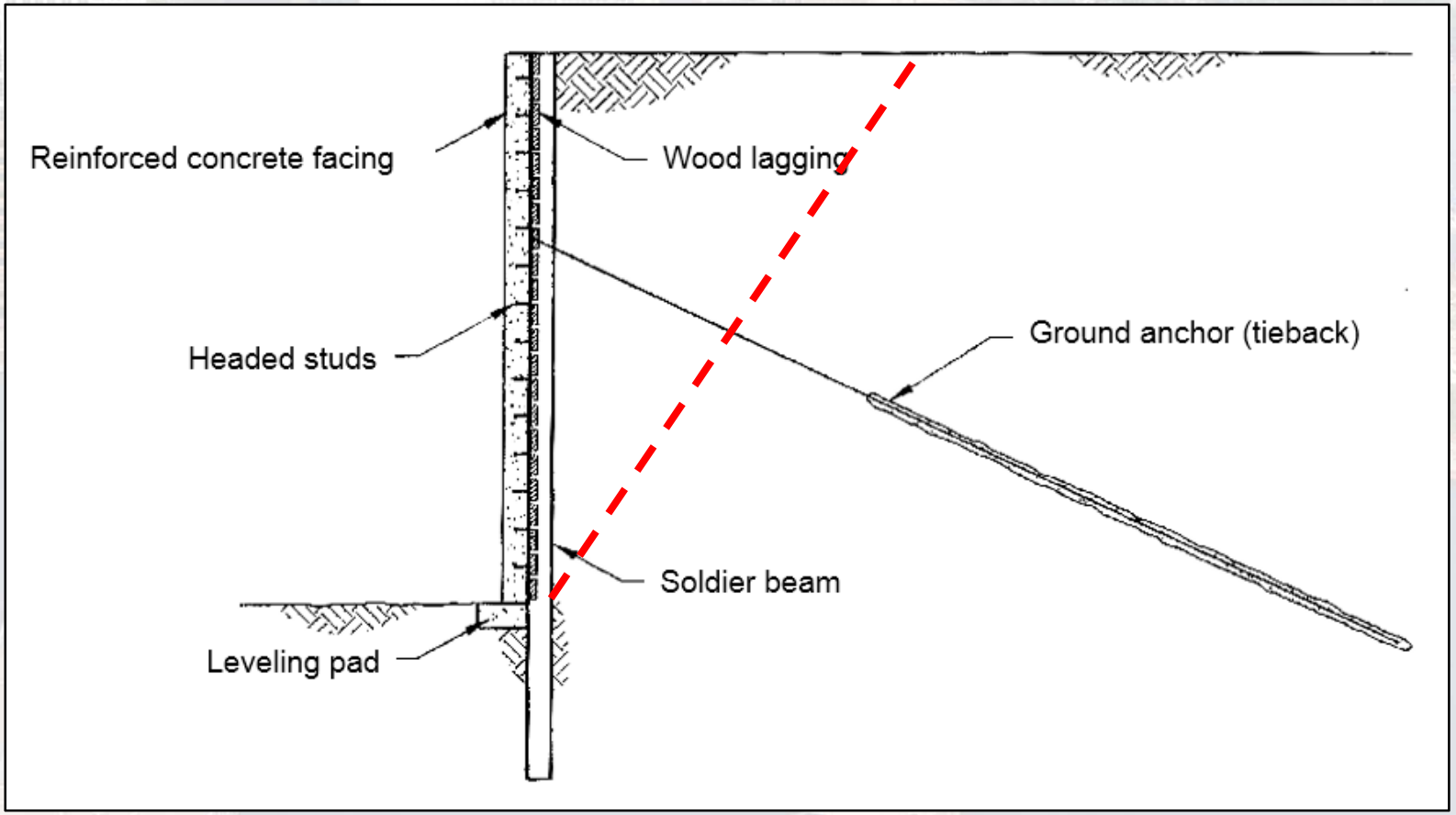
➡ Purpose is to apply a load to a structure

# Typical Application



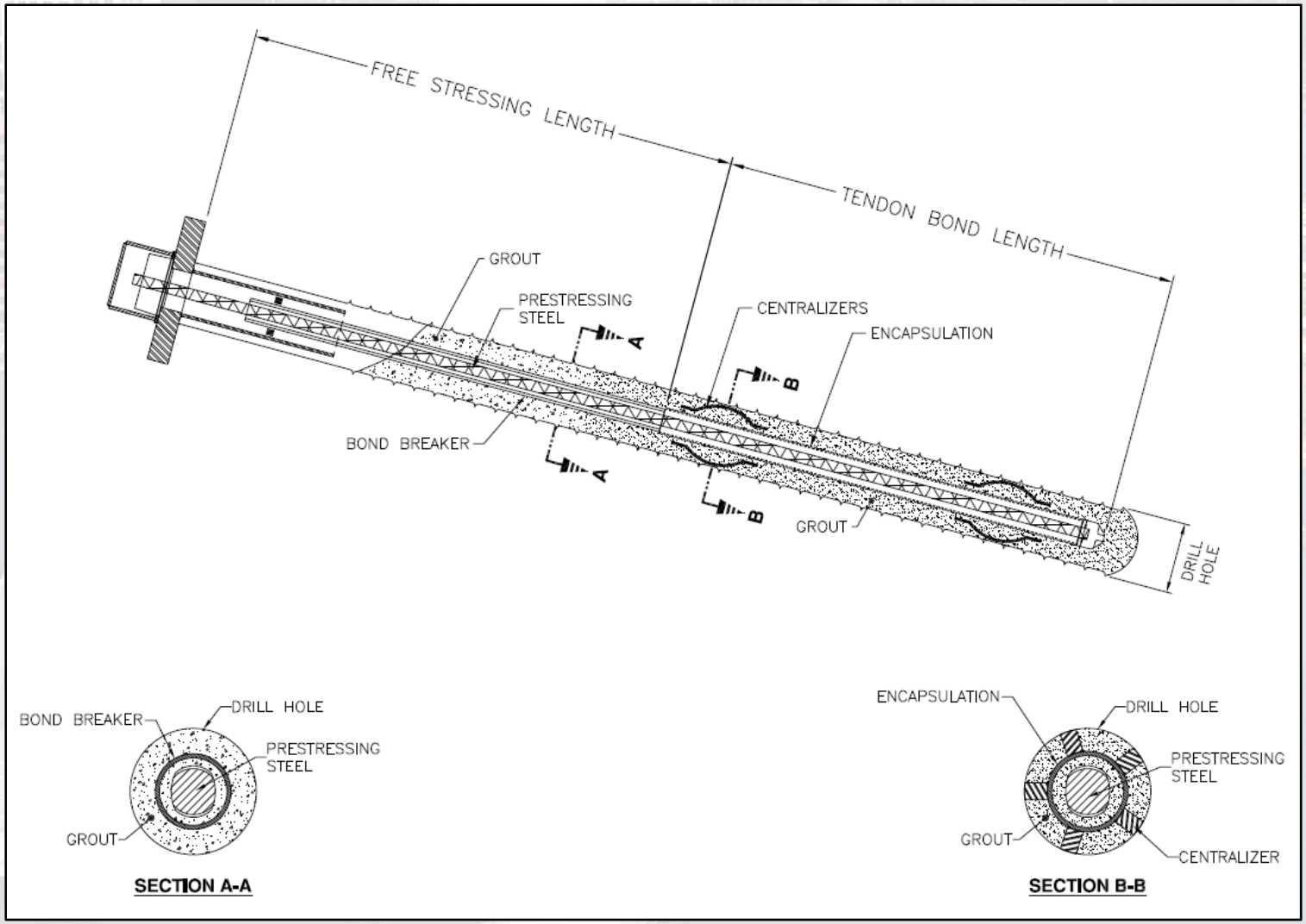

Typical retaining wall application utilizing ground anchors

# Typical Application




Typical retaining wall application utilizing ground anchors

# Components of an Anchor

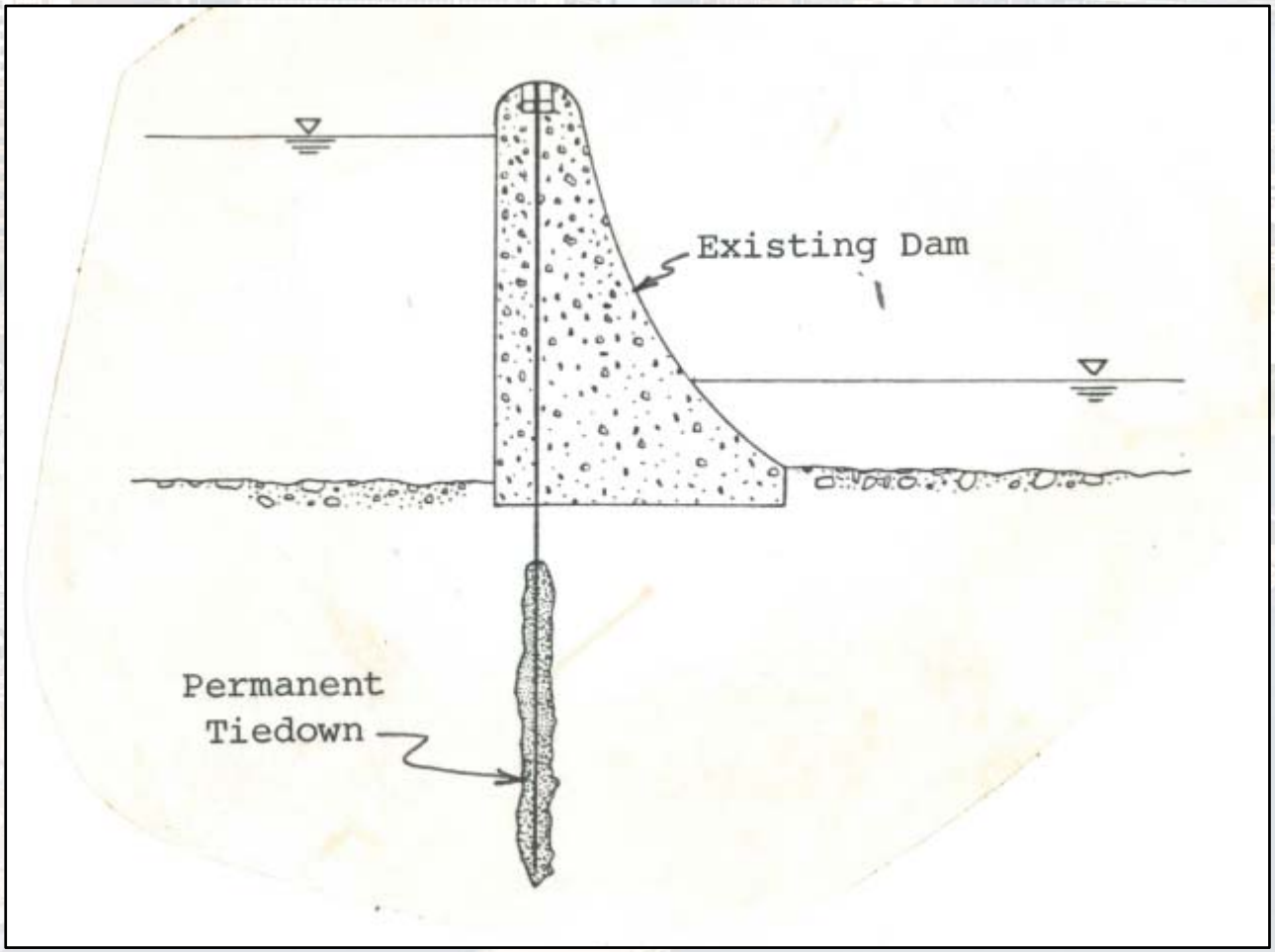


# Typical Anchor Cross-Sections

# Brief History of Rock and Soil Anchors

- 1934 – permanent rock anchors for Cheurfas Dam in Algeria
- 1950's – temporary soil anchors start being used for excavation support
- 1960's – permanent soil anchors start being used for excavation support

# Application – Dam Tiedowns



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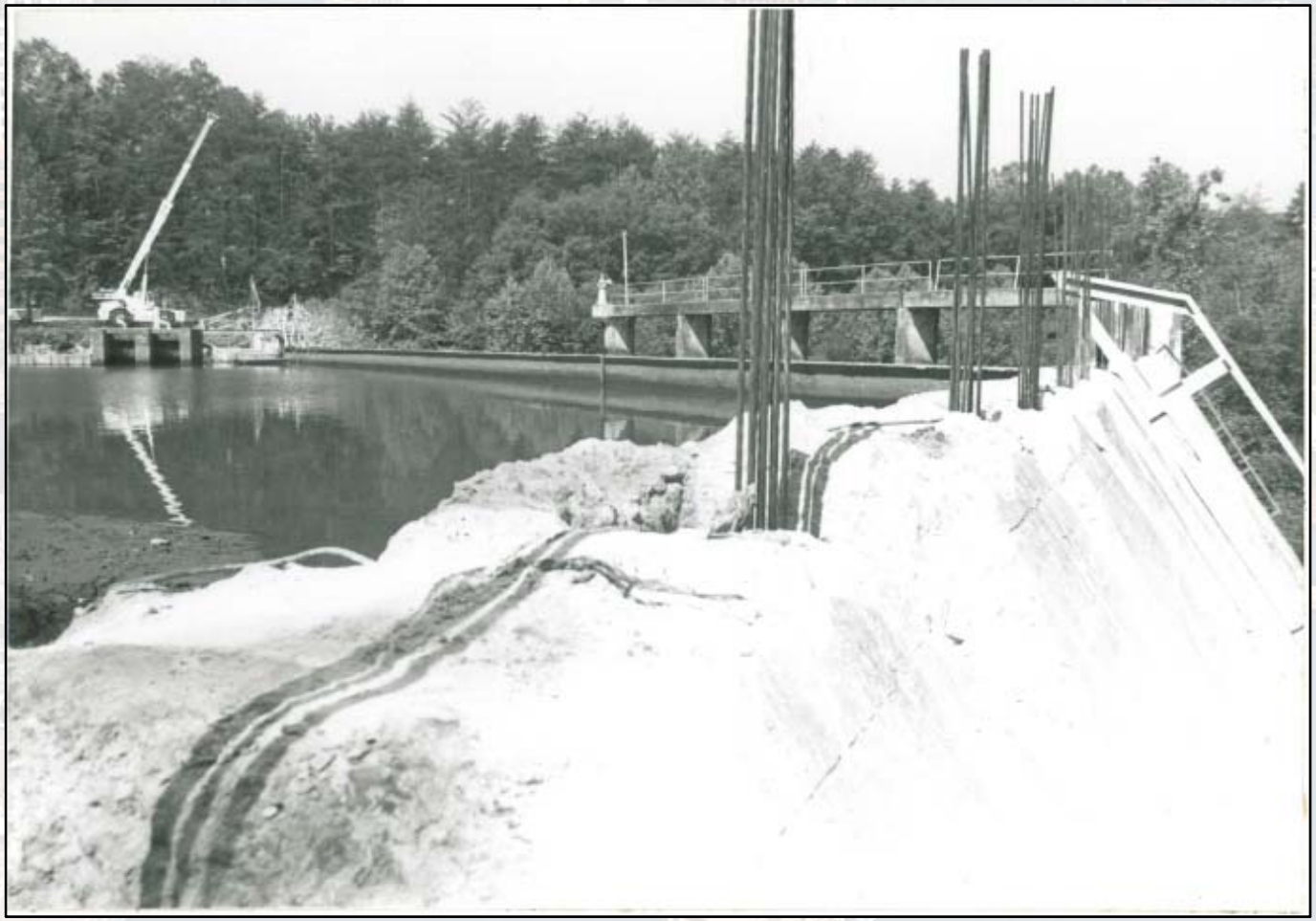

Habersham Mills Dam, Habersham County, Georgia

# Application – Temp. Excavation Support

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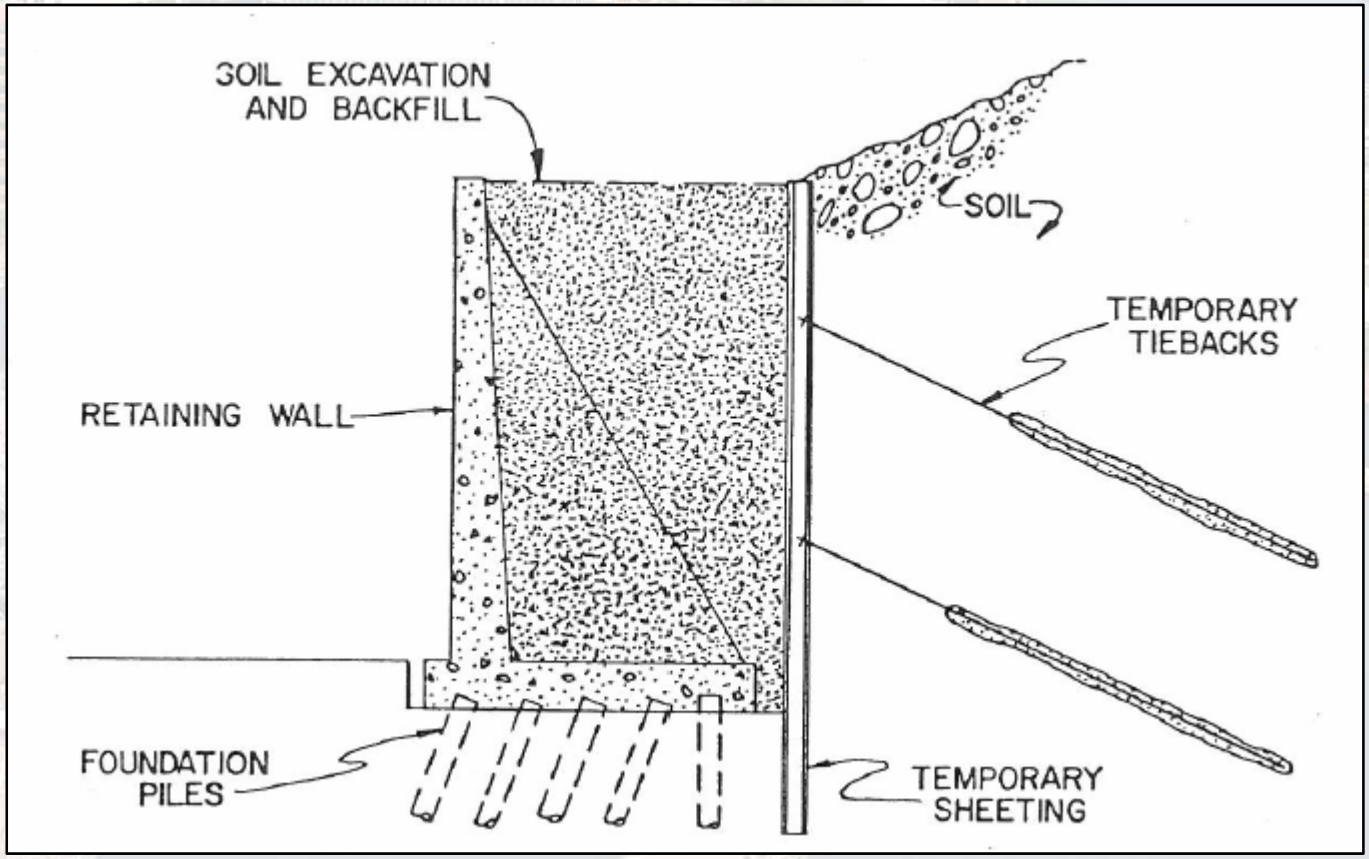

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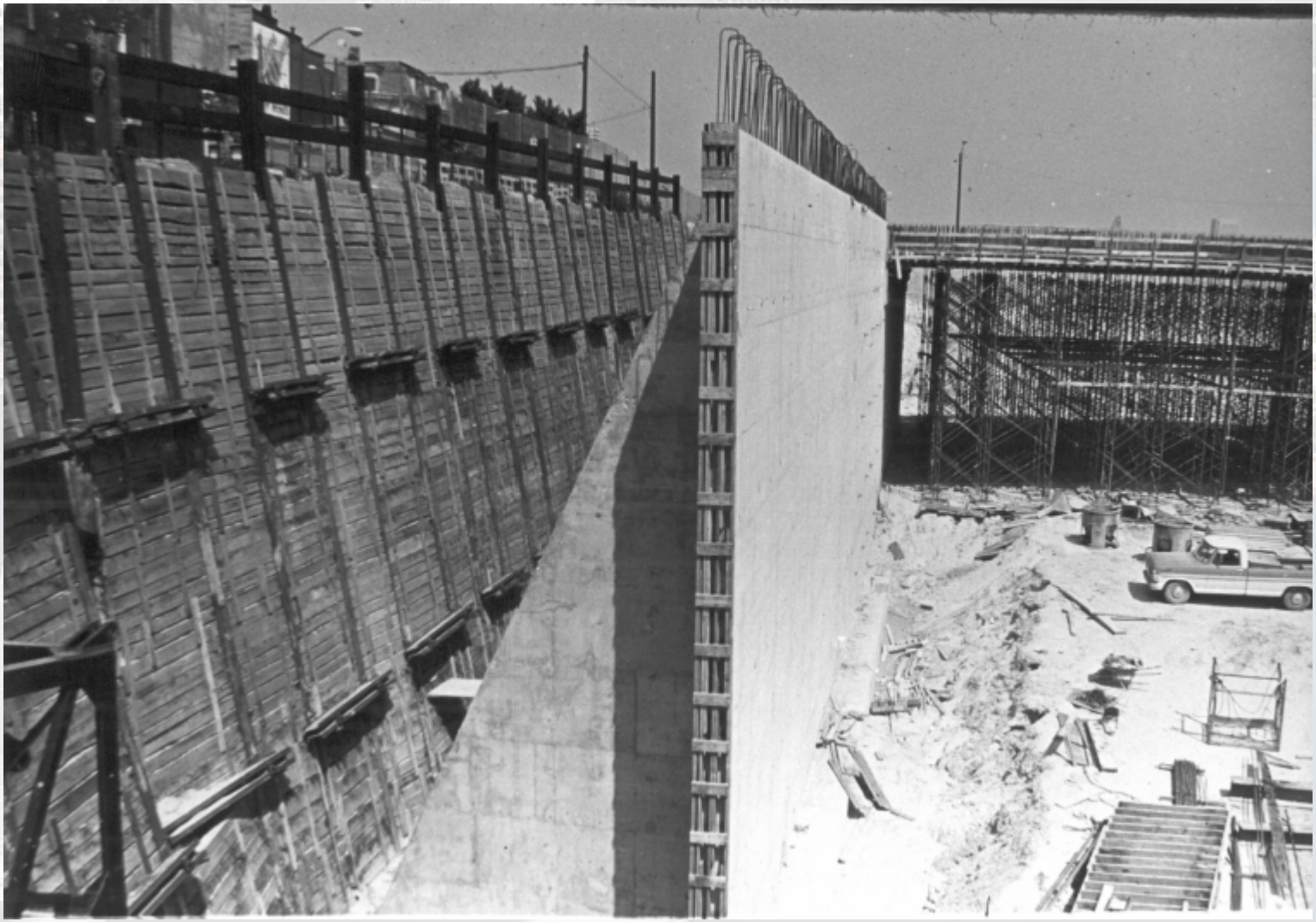
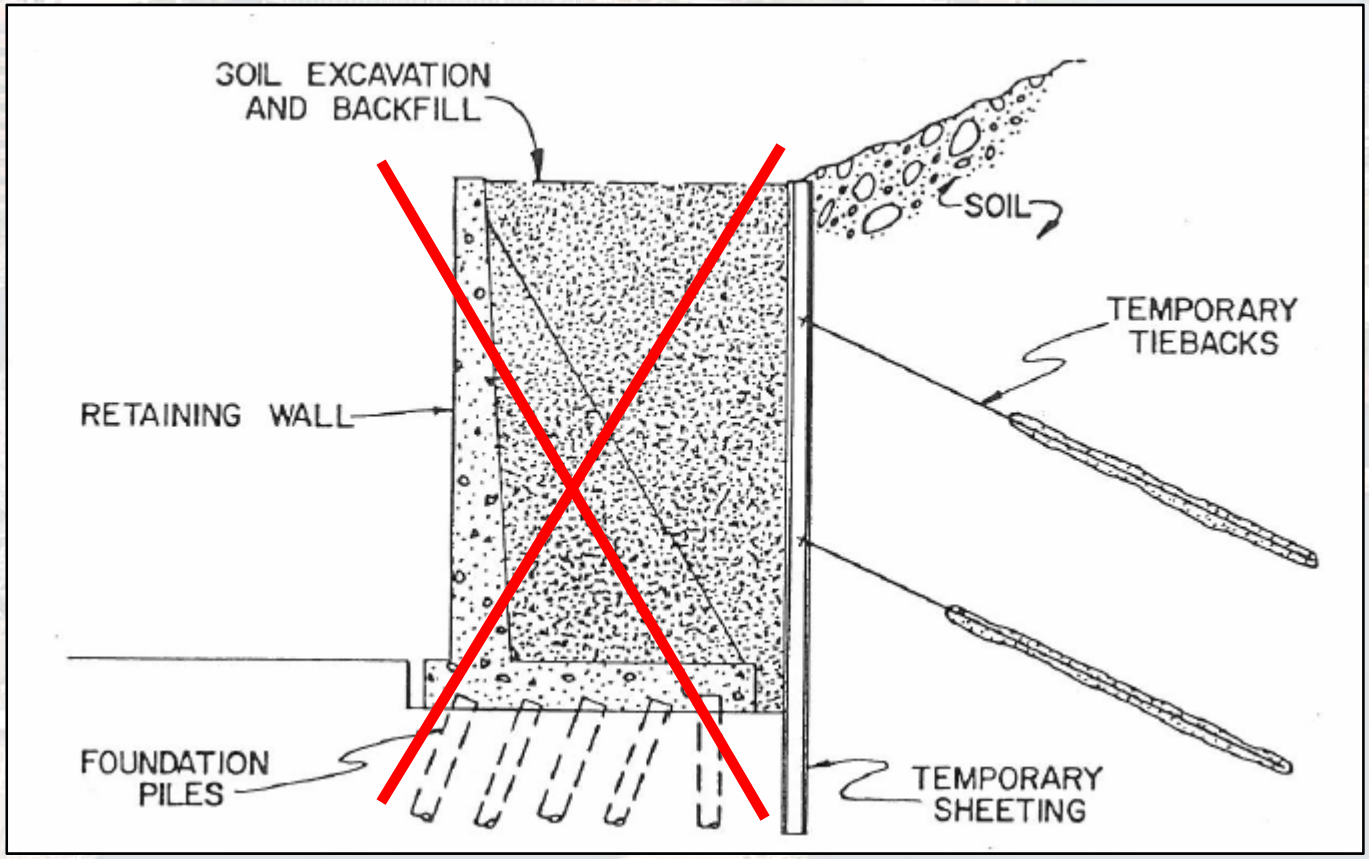
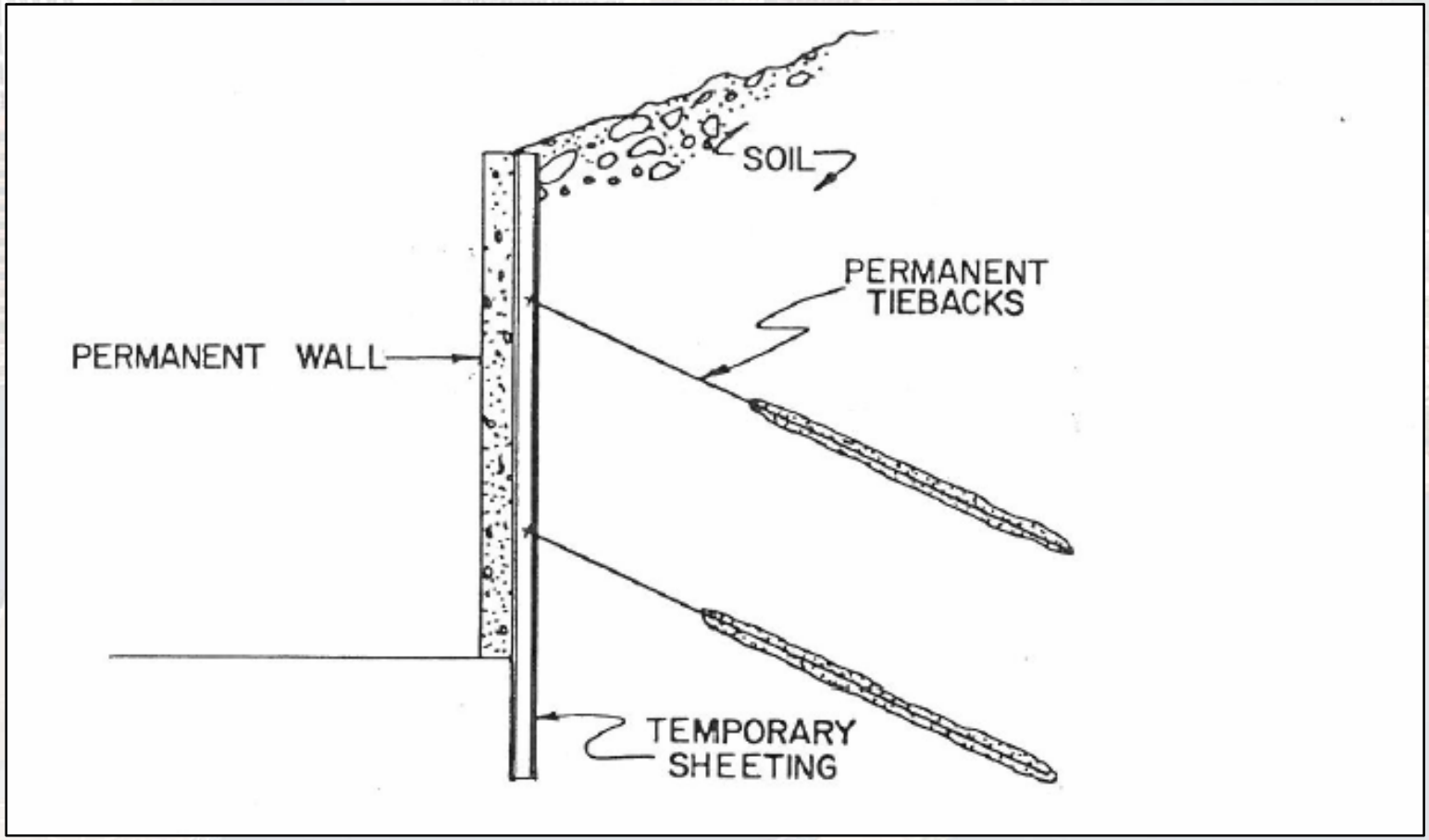


# Application – Perm. Excavation Support



# Application – Perm. Excavation Support



# Application – Perm. Excavation Support

# Application – Temp. Excavation Support

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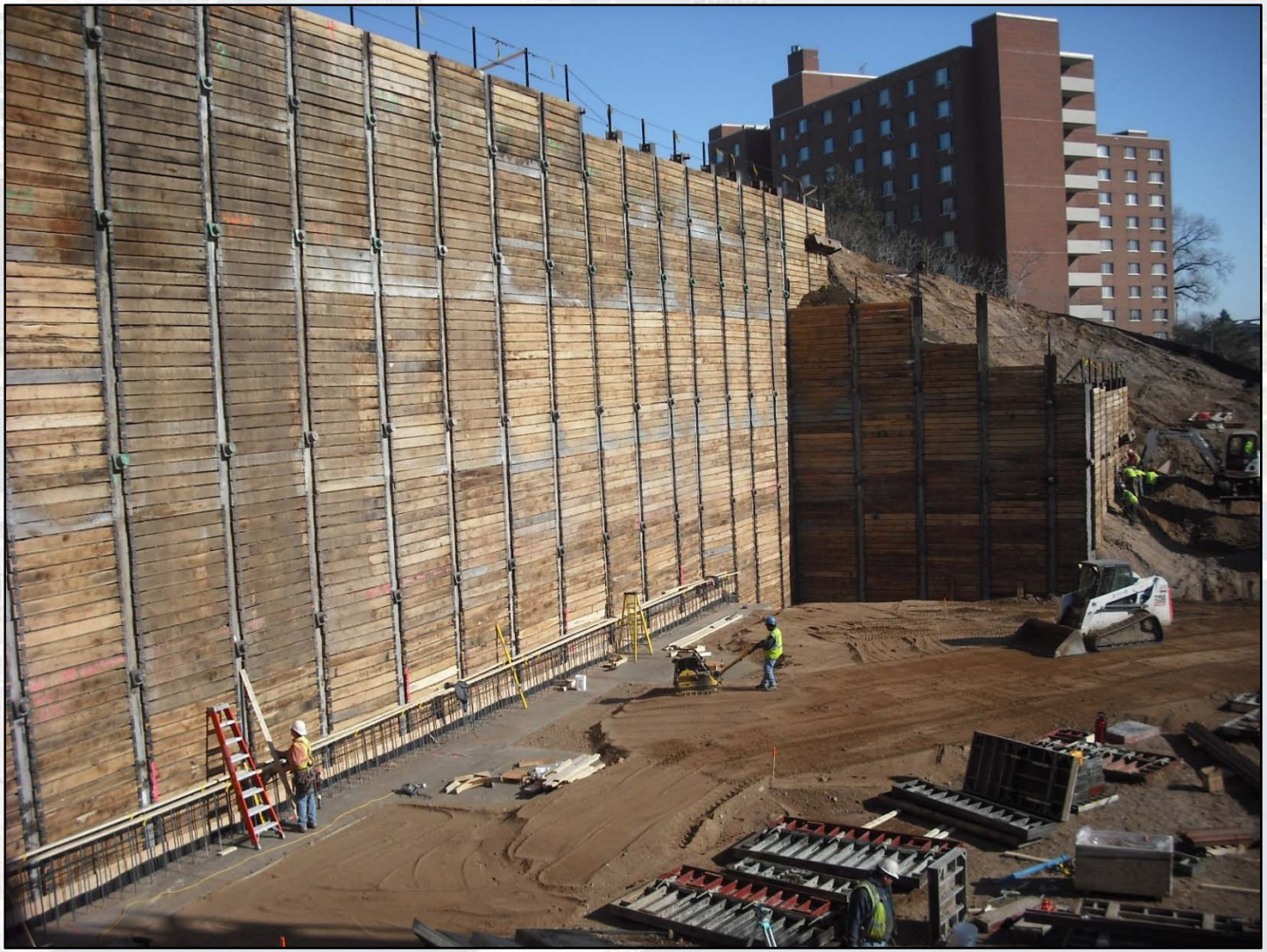

# Preliminary Design Considerations

- Load Capacity
- Free Stressing Length
- Corrosion Protection

# Preliminary Design Considerations

- Load Capacity
  - What force do we need to apply to structure?
  - Inclination of anchor
  - Tendon size and type (bar or strand)
- Free Stressing Length
  - How far back do we need to put the bond length?
- Corrosion Protection
  - Temporary or permanent?

# Design AND Construction Considerations

- Drilling method
- Grouting method
- Hole size
- Tendon installation
- Testing schedule
- Corrosion protection
- Equipment selection

# Typical Anchor Drill

# History of the Document

- Tentative Recommendations (PCI) – 1974
- First Edition – 1980
- Second Edition – 1986
- Third Edition – 1996
- Fourth Edition – 2004
- Fifth Edition – 2014

# History of the Document - 1974

## Tentative Recommendations for Prestressed Rock and Soil Anchors

PREPARED BY AN AD HOC COMMITTEE
of the
PCI POST-TENSIONING COMMITTEE

(After this report was published the Post-Tensioning Division of the Prestressed Concrete Institute left PCI in 1976 to establish the Post-Tensioning Institute. Accordingly, information regarding new and future developments on prestressed anchors may be obtained from either the Prestressed Concrete Institute or the Post-Tensioning Institute.)

PRICE: $2.00
FIRST PRINTING – SEPTEMBER, 1974
SECOND PRINTING – MAY, 1975

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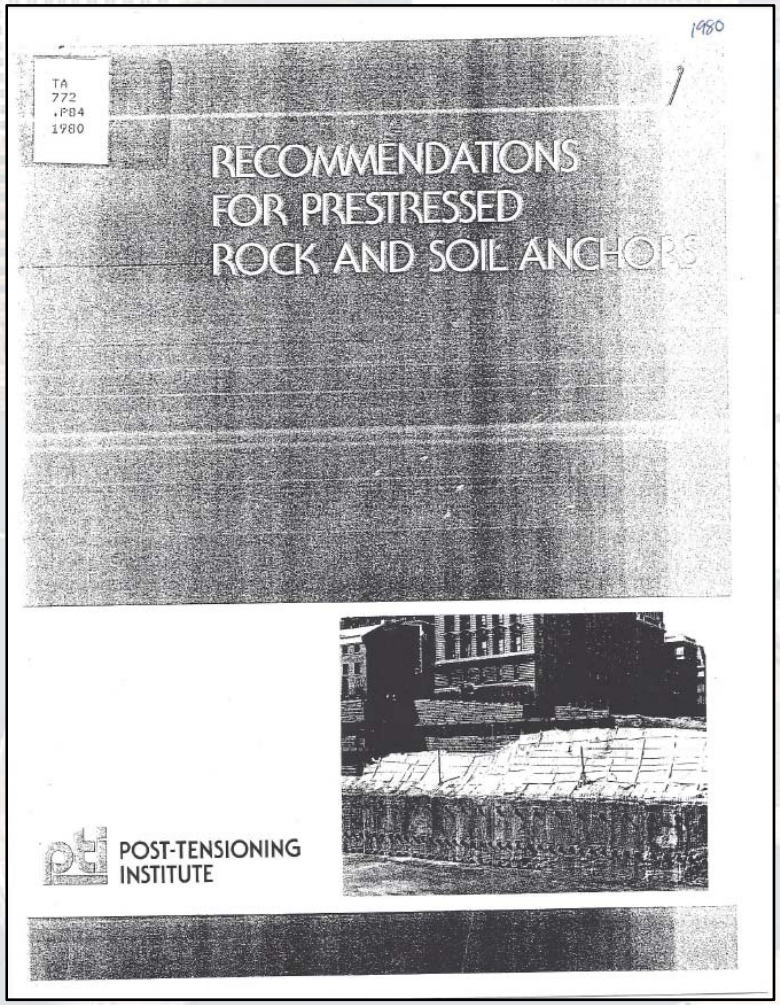


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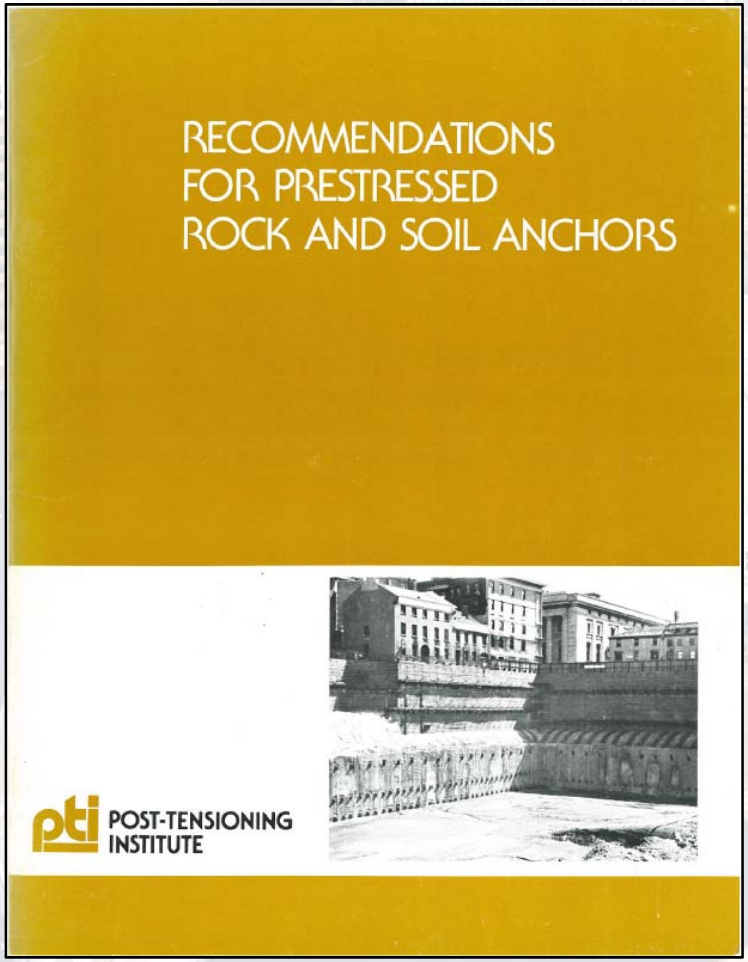


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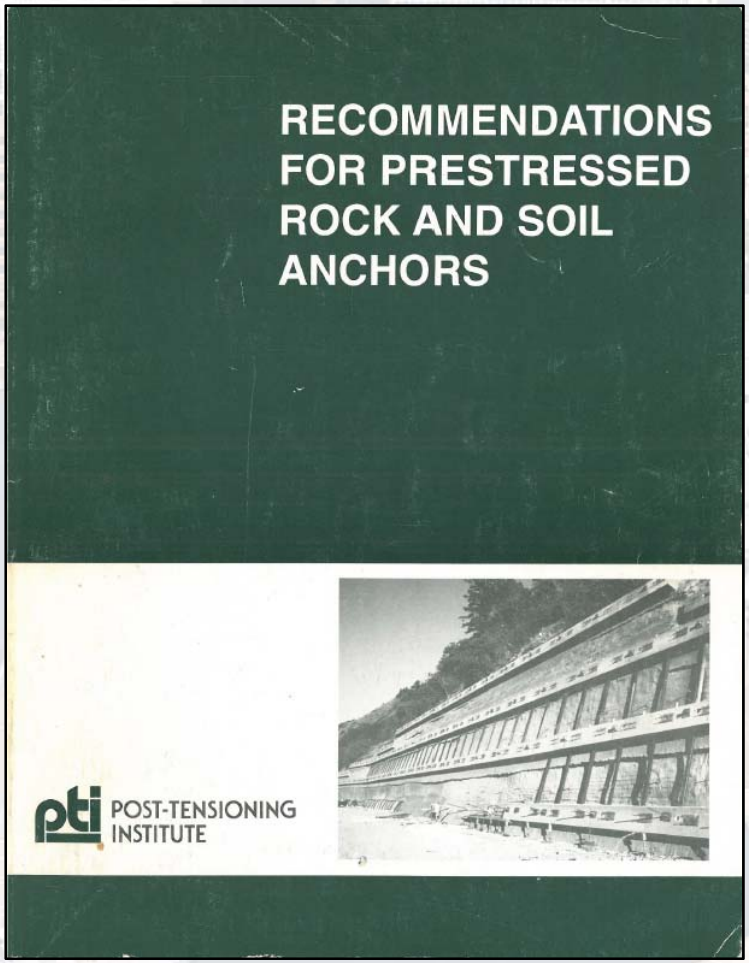
# History of the Document - 1996

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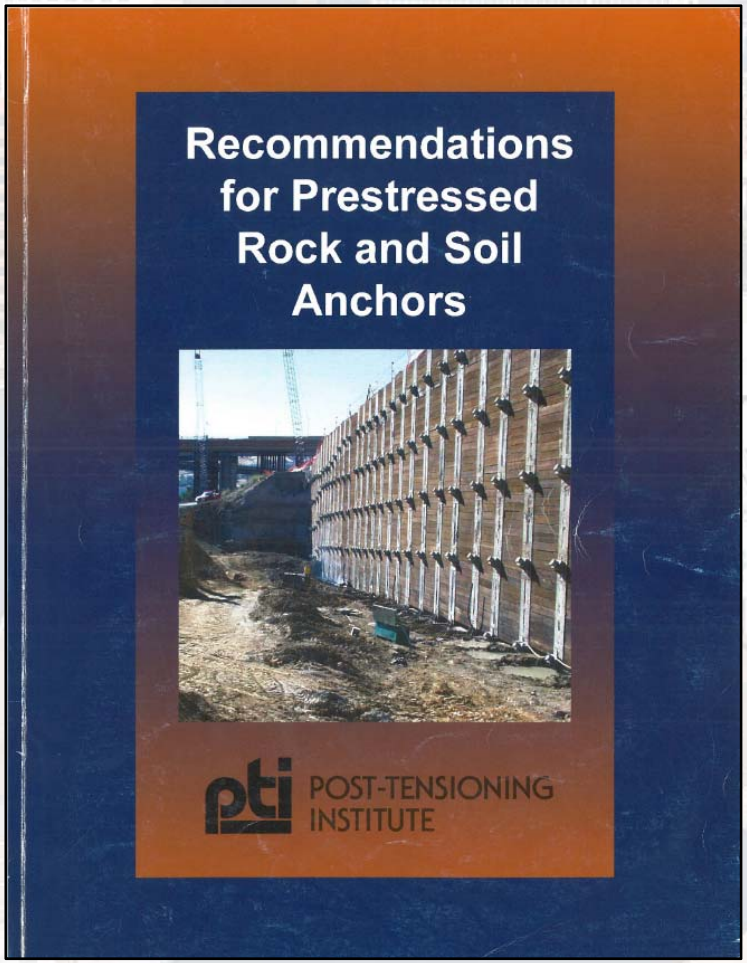


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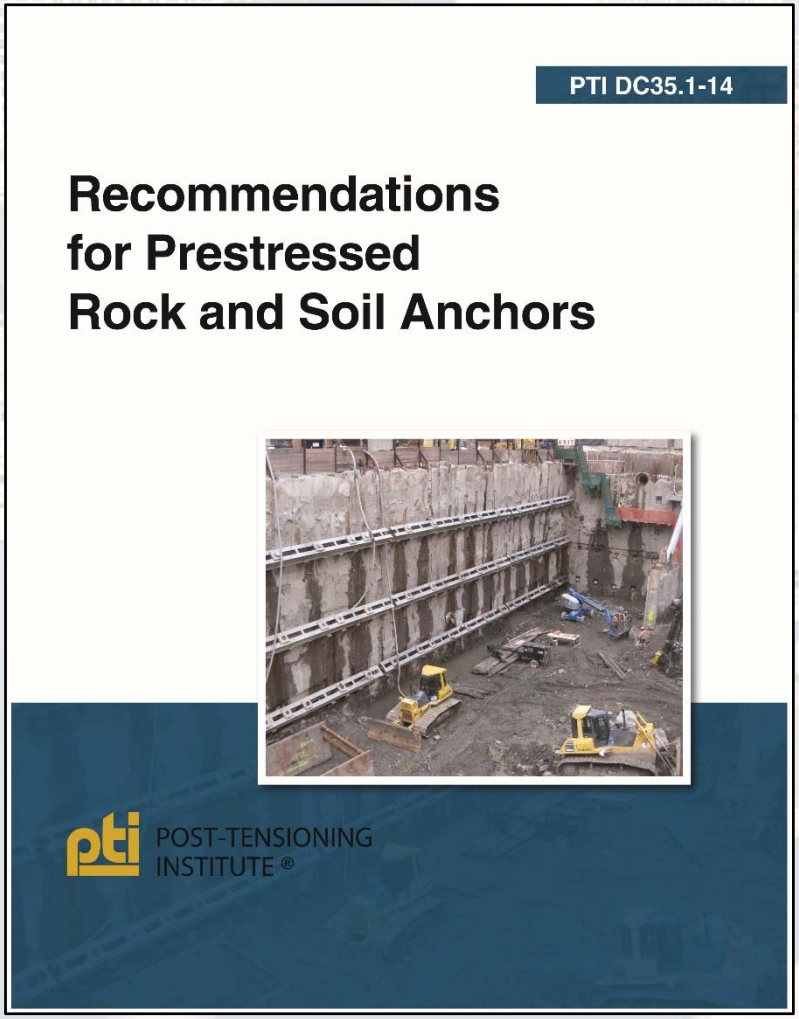
# What's Different?

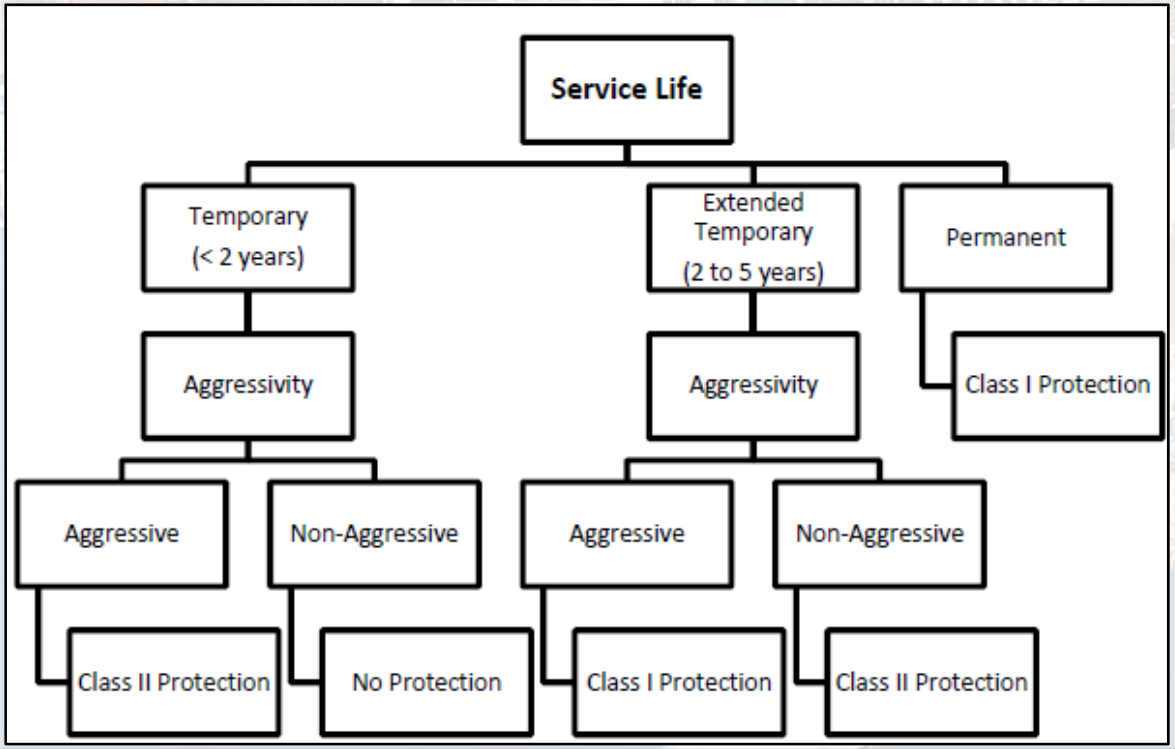


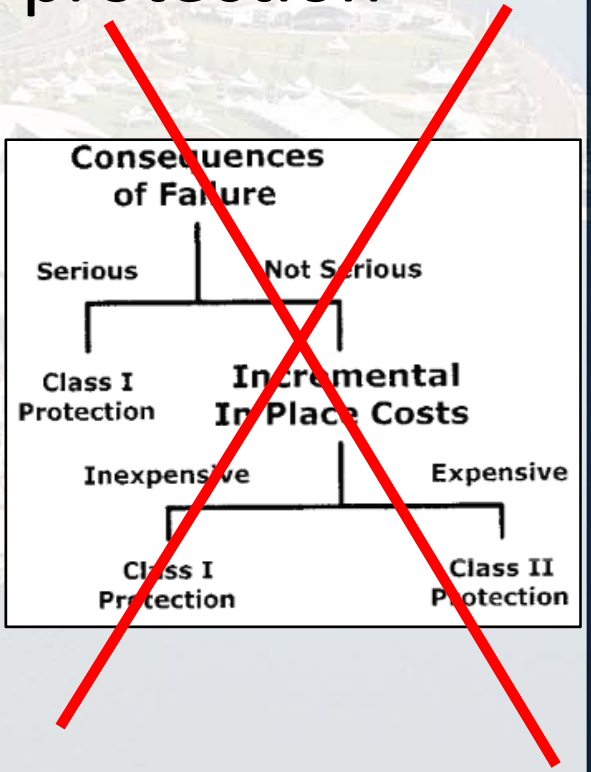

- Focus on <u>Consistency</u>

  - conformity in the application of something, typically that which is necessary for the sake of logic, accuracy, or fairness (Oxford)

# What's Different?

- Added "Extended Temporary Anchor"
- All permanent anchors = Class I protection



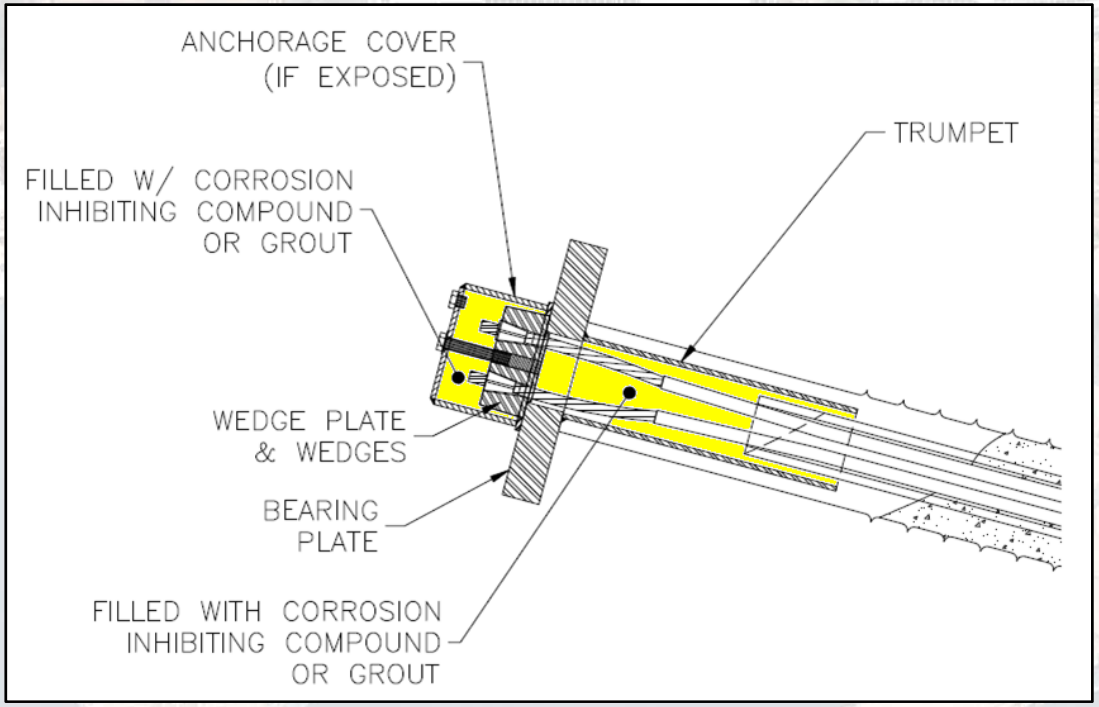



# What's Different?

- Large Gr. 150 bars
  - Added "Special Prestressing Materials" section
  - Minimum tendon bond length requirements

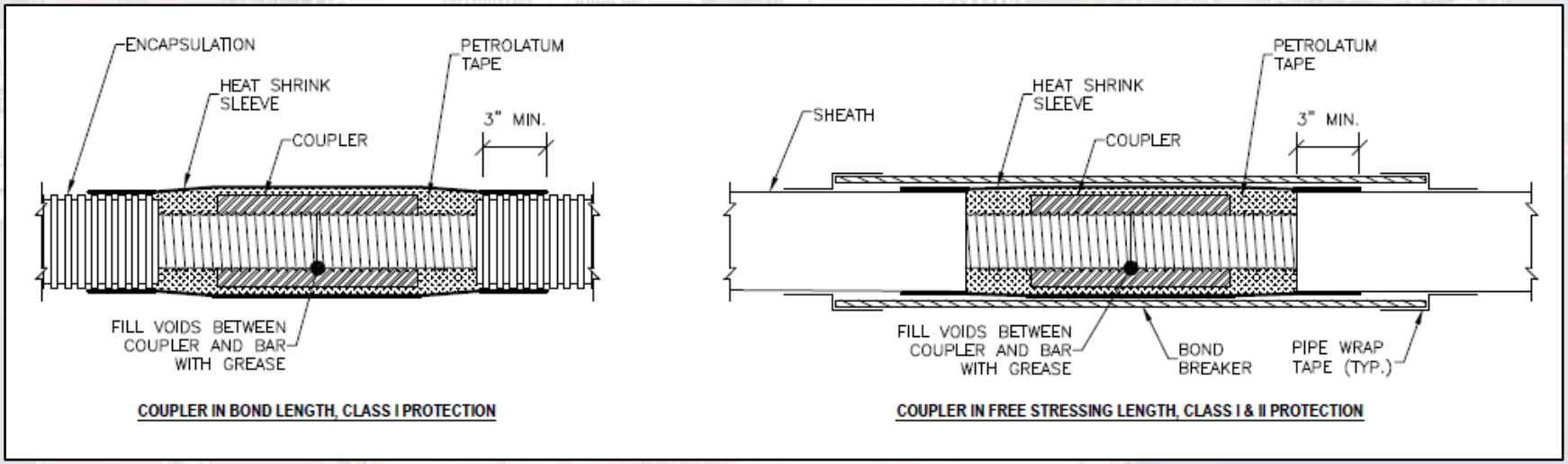
# What's Different?

- Improved guidance for anchorage protection




# What's Different?

- Improved guidance for coupler protection



# What's Different?

- New reference to ADSC grouted wedge testing


# What's Different?

- Clarification and guidance for water pressure testing of permanent rock anchors (in dams)

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# What's Different?

- Improved guidance for repair of corrosion protection

# What's Different?

- Additional guidance for evaluating creep movement

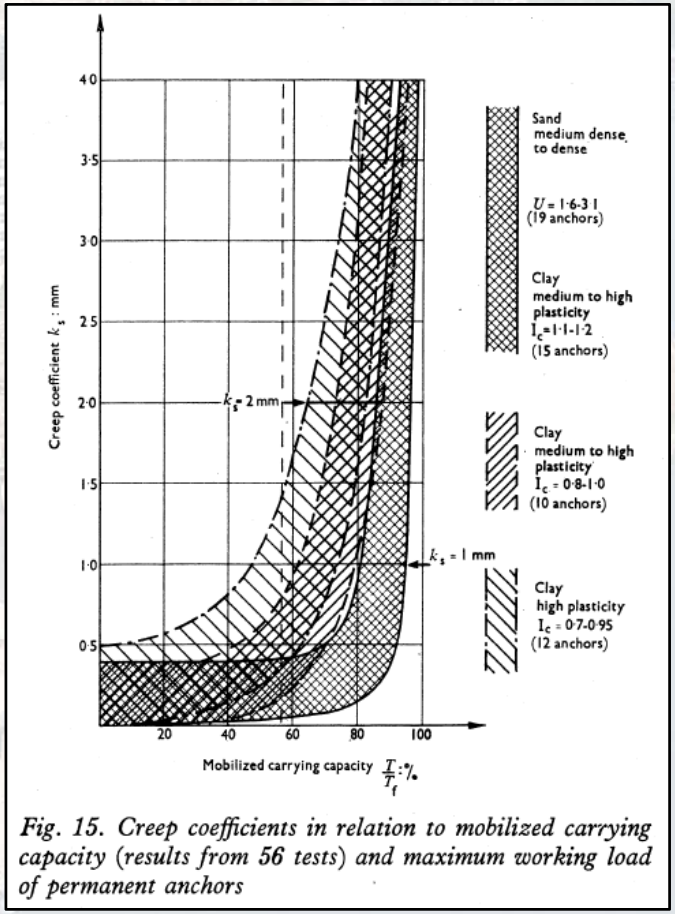
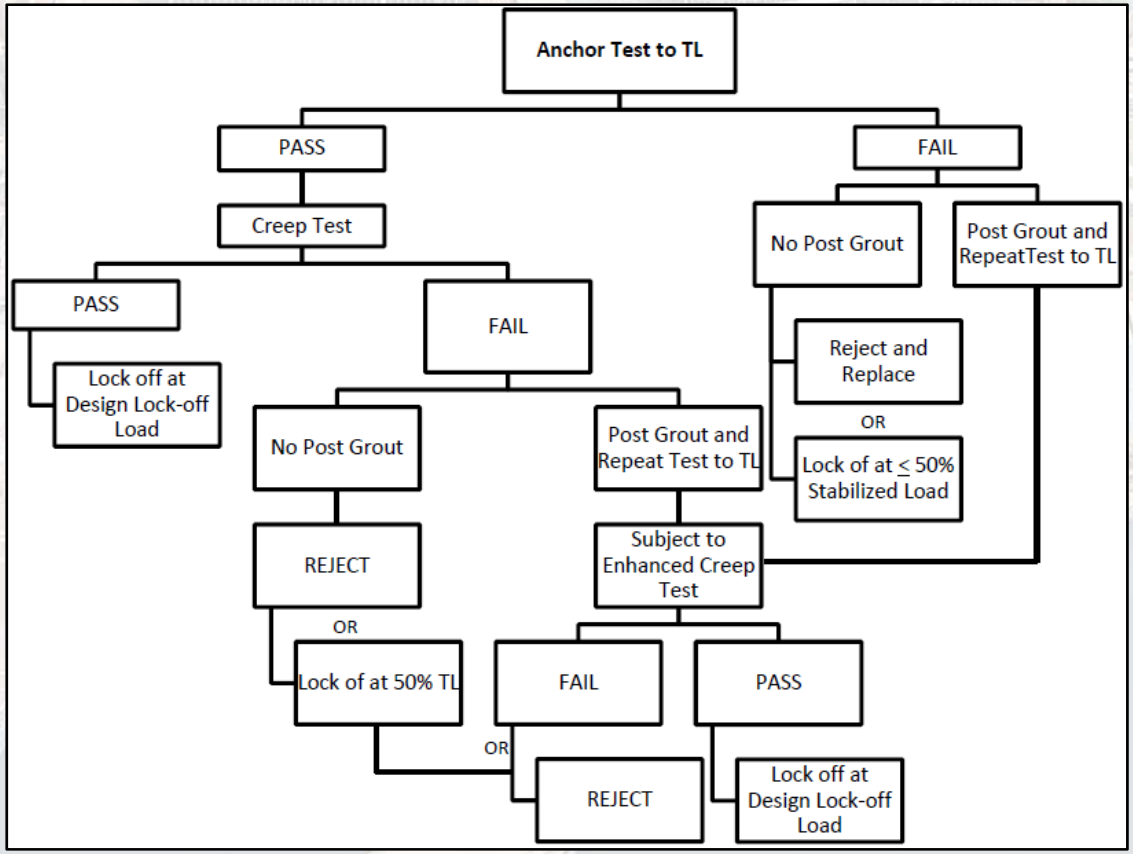



*Fig. 15. Creep coefficients in relation to mobilized carrying capacity (results from 56 tests) and maximum working load of permanent anchors*

Ostermayer, 1974

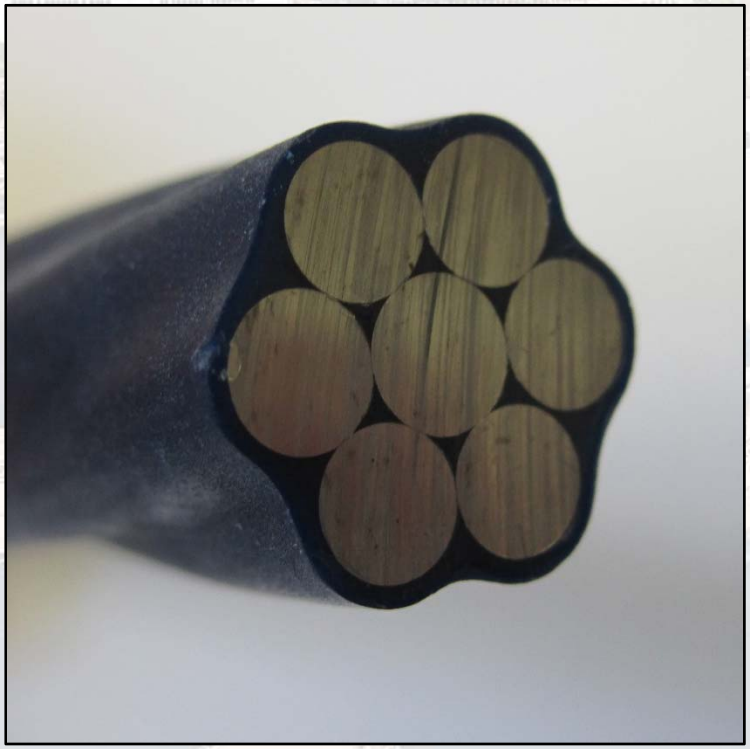
# What's Different?

- Improved decision tree for anchors that fail



# What's Different?

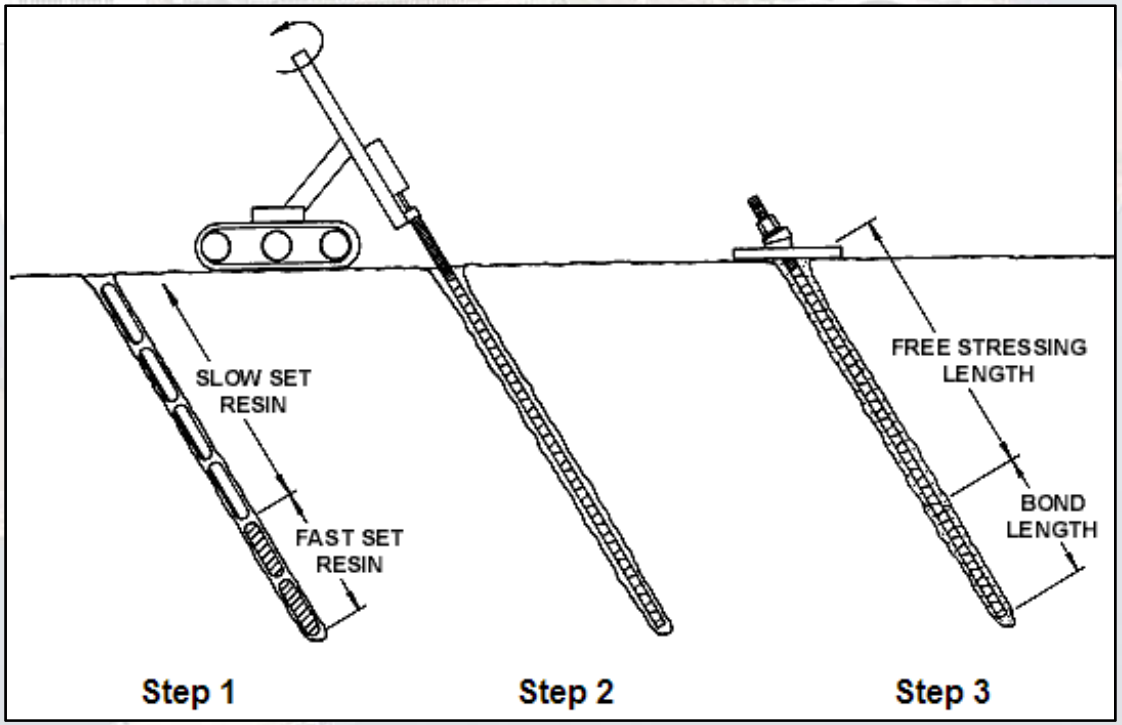
- Guidance for epoxy coated strand has been updated, remains in supplement section



# What's Different?

- Guidance for resin-grouted anchors moved to supplement

Photo and drawing courtesy of Williams Form Engineering Corp.



# Thank You!

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