## AGENDA

**DC-80: Repair, Rehabilitation & Strengthening Committee**  
Wednesday, October 21, 2020  
4:00 p.m. - 6:00 p.m. Eastern

### Voting Members Present (x of 16)

<table>
<thead>
<tr>
<th>Name</th>
<th>Organization</th>
<th>Name</th>
<th>Organization</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amy Dowell</td>
<td>Post-Tensioning Institute Representative</td>
<td>Christopher Fulton</td>
<td>WSP Group</td>
</tr>
<tr>
<td>Hamid Ahmady</td>
<td>Suncoast Post-Tension Ltd</td>
<td>Scott Greenhaus</td>
<td>Structural Group Inc.</td>
</tr>
<tr>
<td>Cory Brett</td>
<td>Simpson Gumpertz and Heger</td>
<td>Liao Haixue</td>
<td>Vector Corrosion Technologies</td>
</tr>
<tr>
<td>Genmiao Chen</td>
<td>WSP</td>
<td>Gabriel A Jimenez</td>
<td>Walter P Moore</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Don Kline, TAB Contact, V Kline Engineering and Consulting, LLC</td>
<td></td>
</tr>
</tbody>
</table>

### Associate Members Present

<table>
<thead>
<tr>
<th>Name</th>
<th>Organization</th>
<th>Name</th>
<th>Organization</th>
</tr>
</thead>
<tbody>
<tr>
<td>Roger Frenn</td>
<td>Dywidag-Systems International Canada</td>
<td>Daniel Rosa</td>
<td>Vector Corrosion Technologies</td>
</tr>
<tr>
<td>Jason Haislip</td>
<td>CCL USA, Inc.</td>
<td>Otto Schwarz</td>
<td>Ryan Biggs Clark Davis Engineering and Surveying</td>
</tr>
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</table>
ACTION ITEMS FROM LAST / THIS MEETING

<table>
<thead>
<tr>
<th>Item #</th>
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</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Webinar Modules</td>
<td>Finalize slides and narrative</td>
<td>TG</td>
<td>October 2019</td>
</tr>
<tr>
<td>2</td>
<td>Update DC80.3-12</td>
<td>Review revisions</td>
<td></td>
<td>December 2019</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Agenda Item</th>
<th>Expected Outcome / Actions Taken</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. General</td>
<td></td>
</tr>
<tr>
<td>A.1 Call to Order</td>
<td></td>
</tr>
<tr>
<td>A.2 Introductions</td>
<td></td>
</tr>
<tr>
<td>A.3 Committee Roster / Changes</td>
<td>A.3 Jason Haislip has joined as an Associate Member</td>
</tr>
<tr>
<td>A.4 PTI Antitrust Policy</td>
<td></td>
</tr>
<tr>
<td>B. Agenda &amp; Minutes</td>
<td></td>
</tr>
<tr>
<td>B.1 Approval of Agenda</td>
<td></td>
</tr>
<tr>
<td>B.2 Approval of Minutes from 10-2-2019 (Meeting ballot required)</td>
<td>B.2 Vote on Minutes from 10-2-2019 approval Motion / Second: Name / Name Result: X-X-X (Y-N-A)</td>
</tr>
<tr>
<td>C. Actions Taken Between Meetings</td>
<td></td>
</tr>
<tr>
<td>C.1 Letter Ballots (none)</td>
<td>C.1 None</td>
</tr>
<tr>
<td>C.2 Web Meetings (TG-Webinar)</td>
<td>C.2 TG on webinar has progressed some on the repair webinar</td>
</tr>
<tr>
<td>1. Action Item 1: (Webinar Modules)</td>
<td></td>
</tr>
<tr>
<td>1.1. Review remaining updates needed</td>
<td>1.1 Review draft presentation, speaking notes outline, and plan for remaining updates.</td>
</tr>
<tr>
<td>2. Action Item 2: (Update to DC80.3-xx)</td>
<td></td>
</tr>
<tr>
<td>2.1. Review possible updates</td>
<td>2.1 Task Group: 80.3 Update - review and determine what needs to be improved or updated (Brett / Donnelly / Munuswamy / Greenhaus / Mark Watson / Moser)</td>
</tr>
<tr>
<td>2.2. Partnership with ICRI</td>
<td>2.2 Discuss partnership and develop roadmap for moving forward</td>
</tr>
<tr>
<td>Agenda Item</td>
<td>Expected Outcome / Actions Taken</td>
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<tr>
<td><strong>D. New Business</strong></td>
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<tr>
<td>D.1 None</td>
<td>D.1 On hold for now – complete current initiatives</td>
</tr>
<tr>
<td><strong>E. Next Meeting</strong></td>
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<tr>
<td>2021 PTI Convention, Weston Indianapolis, IN April 18-21, 2021 Web Meetings:</td>
<td></td>
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<tr>
<td><strong>F. Adjourn</strong></td>
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**AGENDA / MEETING EXHIBITS**

<table>
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<tr>
<td>Roster / A.4</td>
<td>Sign-In Sheet / PTI Anti-Trust Policy</td>
</tr>
<tr>
<td>B.2</td>
<td>Minutes from 10-2-2019</td>
</tr>
<tr>
<td>2</td>
<td>Draft of DC80.3 markup and Table of Modifications uploaded on the committee website</td>
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</table>
At a meeting on October 8, 1980, the Board of Directors first discussed the Institute's status and policies regarding compliance with antitrust laws. After review of both the internal and external compliance procedures, the following resolution was approved:

"The staff, officers, directors, and members of the Post-Tensioning Institute are reminded that they are required to comply with the spirit and specific requirements of the antitrust laws on all activities within the scope of, and related to, the official functions of PTI. Further, this restated position, along with appropriate explanatory material, should be placed in all meeting folders/books periodically, beginning with the 8th of October meeting of PTI."

On July 24, 2012 and again on October 7, 2015, the Executive Committee authorized Legal Counsel to review and update this Policy Statement in the perspective of the Department of Justice Business Review Letter of July 30, 1997 and current case law. As a continuing guide for your participation in PTI's meetings, please review and continue to adhere to the following "Legal Limitation on Discussions at PTI Meetings."

**LEGAL LIMITATION ON DISCUSSIONS AT PTI MEETINGS AND EVENTS**

A free exchange of ideas on matters of mutual interest to the members is necessary for the success of all meetings. Indeed, such an exchange of views is essential to the successful operation of every trade association and the law specifically allows legitimate exchange of views pertaining to, e.g., quality control, safety, building design and construction integrity, etc.

It is not the purpose of this memorandum to discourage the exploration in depth of any matters of legitimate concern to meeting participants. Nevertheless, to ignore certain antitrust ground rules, either through ignorance or otherwise, is to create a civil and criminal hazard businessmen simply cannot afford.

It is for these reasons that PTI provides you with a reminder that certain areas of formal and informal communication between competitors or between manufacturers and their suppliers and customers must be avoided, as posing potential antitrust problems.

The Sherman Antitrust Act, the Clayton Act, the Federal Trade Commission Act, and the Robinson-Patman Act comprise the basic federal antitrust laws, which set forth the broad areas of conduct considered illegal as restraints of trade. In general, agreements or understandings between competitors that operate as an impediment to free and open competition are forbidden. Federal antitrust prohibitions forbid any "agreement or understanding...to substantially lessen competition or tend to create a monopoly in any line of commerce." An important point to keep in mind is that communications and discussions between competitors or between sellers and customers, about matters which may be considered anti-competitive, often comprise the evidence from which courts infer antitrust violations. It is the policy of the Post-Tensioning Institute that such agreements, understandings or communications shall not be tolerated at any formal or informal meetings or social events of the Institute.

The general prohibitions contained in the federal antitrust laws, have been particularized in the form of a series of consent decrees, originally entered against a number of member companies of various trade associations and the associations themselves. It is important to note that these laws not only apply to PTI members, but also to PTI itself. Often trade associations have been and are presently co-defendants in cases brought by the Justice Department and the Federal Trade Commission ("FTC"). Recently, the FTC has stated: "Because trade associations are by their nature collaborations among competitors, the Commission and courts have long been concerned with anti-competitive restraints imposed by such organizations under the guise of codes of conduct. Competing for customers, cutting prices, and recruiting employees are hallmarks of vigorous competition. Agreements among competitors not to engage in these activities injure consumers by increasing prices and reducing quality and choice." Similar "codes" or policies and requirements that encourage directly or indirectly members’ unlawful activity are strictly forbidden by PTI in the course of its business with its members.
SPECIFIC EXAMPLES OF ACTIVITIES AND PRACTICES PROHIBITED
AT ALL PTI MEETINGS AND EVENTS:

Included in activities and practices which are forbidden, and are contrary to the policy of the Institute, both under the general antitrust laws and the consent decrees, subject to the said Business Review Letter, are the following:

- Agreeing to allocate markets, customers or suppliers among competitors, classify certain customers or suppliers being entitled to preferential treatment by manufacturers, and establish geographic trading areas.

- Participating in any plan designed to induce any manufacturer or distributor to sell or refrain from selling, or discriminate in favor of, or against any particular customer or class of customers.

- Agreeing in any manner to fix or otherwise establish bids, prices (including price increases, decreases, standardization or stabilization), profits, costs, contract terms affecting price (such as discounts and credit terms), etc. because, e.g. prices were too low, with the exception of certain resale pricing agreements between manufacturers and retailers or distributors.

- Agreeing in any manner to limit or restrict the quality of products to be produced (e.g., restrictions on selling coated strand to certain customers).

- Participating in any plan which has the effect of discriminating against, or excluding competitors, suppliers or customers.

These examples are provided to guide you in your discussions during formal and informal PTI meetings and social events. If the occasion arises, more specific advice will be provided by legal counsel, who is required by Article IV, Section 7 of the PTI By-Laws to be present at all meetings of the Board of Directors and the Executive Committee.
MINUTES
DC-80: Repair, Rehabilitation & Strengthening Committee
Wednesday, October 2, 2019
1:00 p.m. - 5:00 p.m.
Hilton Santa Fe Historic Plaza

Voting Members Present (8 of 16)

Tracy Naso
Wiss, Janney, Elstner Associates, Inc.

Amy Dowell
Post-Tensioning Institute Representative

Hamid Ahmady
Suncoast Post-Tension Ltd

Cory Brett
Simpson Gumpertz and Heger

Genmiao Chen
WSP

James Donnelly
Wiss Janney Elstner Associates, Inc.

Christopher Fulton
WSP Group

Scott Greenhaus
Structural Group Inc.

Liao Haixue
Vector Corrosion Technologies

Gabriel A Jimenez
Walter P Moore

Don Kline, TAB Contact, V Kline Engineering and Consulting, LLC

John R Mancuso
SKA Engineers

Daniel Moser
Walker Restoration Consultants

Siva Munuswamy
Thornton Tomasetti Inc

Douglas Sarkkinen
OTAK

Slava Tkachuk
Ready Cable Inc

Zuming Xia
Structural Technologies, Inc.

Associate Members Present

Noli Alarcon
Timothy Haahs & Associates, Inc.

Garth Fallis
Vector Corrosion Technologies

Roger Frenn
Dywidag-Systems International Canada

Hee-Taik Lee
Korea Institute of Nuclear Safety

Ralf Leistikow
Wiss, Janney, Elstner Associates, Inc.

Daniel Rosa
Vector Corrosion Technologies

Otto Schwarz
Ryan Biggs Clark Davis Engineering and Surveying

Hanif Shariff
Read Jones Christoffersen Ltd.

Rick Thompson
Post Tensioning Solutions

Edward Underhill
Freyssinet Inc
Visitors

Jim Beaudoin
Collier Engineering Company

Fabrice Brugere
CMC

Chris Copeland
Copeland Engineering

Monika Patel
DPIS Engineering

Jason Reigstad
Tech Development

Daniel Schuetz
SGH
## ACTION ITEMS FROM LAST / THIS MEETING

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<tbody>
<tr>
<td>1.1</td>
<td>Webinar Modules</td>
<td>Finalize slides and narrative</td>
<td>Munuswamy</td>
<td>~ 2 weeks from meeting Oct. 2019</td>
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<tr>
<td></td>
<td></td>
<td>Start ballot</td>
<td>Dowell</td>
<td></td>
</tr>
<tr>
<td>2.1</td>
<td>DC80.3-12 Update</td>
<td>Review for revisions</td>
<td>TG Dowell</td>
<td>Dec. 2019</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Schedule web meeting</td>
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<tr>
<td>3.1</td>
<td>Repair Tape</td>
<td>Review PDS</td>
<td>TG Dowell</td>
<td>Dec. 2019</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Schedule web meeting</td>
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### Agenda Item

#### A. General
- A.1 Call to Order
- A.2 Introductions
- A.3 Committee Roster / Changes
- A.4 PTI Antitrust Policy
- A.5 Annual Report

#### Expected Outcome / Actions Taken
- A.2 All present introduced themselves
- A.3 There have been no roster changes since the last meeting
- A.4 All present were reminded of the PTI Antitrust Policy as indicated on the attendance sheet
- A.5 Complete Annual Report

#### B. Agenda & Minutes
- B.1 Approval of Agenda
- B.2 Approval of Minutes from 5/8/19 (Meeting ballot required)

#### Expected Outcome
- B.1 There were no additions to the agenda
- B.2
  - Vote on Minutes from 5/8/19 approval
  - Motion / Second: Moser / Ahmady
  - Result: 7-0-0 (Y-N-A)

#### C. Actions Taken Between Meetings
- C.1 Letter Ballots (none)
- C.2 Web Meetings (none)

#### 1. Action Item 1: (Webinar Modules)
- 1.1. Review possible update

#### 1.1 Next Step:
- Distribute to committee for detailed comments. Do not comment on presentation format (e.g. photo and figure sizes, etc.) during this round of review.

#### Action Item:
- ballot on webinar to start ~ 2 weeks after Committee Days
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<tr>
<td><strong>2. Action Item 2: (Update to DC80.3-12)</strong>&lt;br&gt;2.1. Review possible updates</td>
<td>2.1 Various assignments recorded by Cory. December 31 check-in for status update. Amy will poll for availability. List of assignments (Excel) to be circulated to the TG shortly.</td>
</tr>
<tr>
<td><strong>3. Action Item 3: (Sheathing Repair Tape Survey/Test Procedures)</strong>&lt;br&gt;3.1 Review possible updates</td>
<td>3.1 <strong>Next steps (Brett):</strong> (1) list the performance criteria that are important to PTI (get list from ACI 423 - Donnelly), (2) identify PTSC tests that might be important to PTI, (3) contact manufacturers to see if they have data related to these tests or characteristics, (4) identify gaps in product/testing matrix and present status to committee during December 31 status update. Tracy and Jim can find a helper for Cory. Consider research partnership with ACI 423.</td>
</tr>
<tr>
<td><strong>E. Next Meeting</strong>&lt;br&gt;2020 PTI Convention – Miami, FL—May 3-6, 2020</td>
<td>Web meeting to review progress on revisions of DC80.3 and sheathing repair tape test procedures/ call TBD (end of December)</td>
</tr>
<tr>
<td><strong>F. Adjourn</strong></td>
<td>Meeting was adjourned at 4:40 p.m.</td>
</tr>
</tbody>
</table>

**AGENDA / MEETING EXHIBITS**

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<tr>
<td>A.5</td>
<td>Annual Report</td>
</tr>
<tr>
<td>1.1</td>
<td>Draft slides and narrative from TG</td>
</tr>
</tbody>
</table>
Committee Attendance Sheet

Committee: DC-80

Meeting Location: Santa Fe

Date: 10/12/2019

* I have read, understand, and agree to comply with PTI Anti-Trust Policy (attached).

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</thead>
<tbody>
<tr>
<td>1</td>
<td>Tracy Naco</td>
<td>USG</td>
<td>V</td>
<td><a href="mailto:maroc@use.com">maroc@use.com</a></td>
<td>TI</td>
</tr>
<tr>
<td>2</td>
<td>Amy Dowell</td>
<td>PTI</td>
<td>Staff</td>
<td><a href="mailto:amy.dowell@posttensioning.org">amy.dowell@posttensioning.org</a></td>
<td>AMO</td>
</tr>
<tr>
<td>3</td>
<td>Fabrice Brugere</td>
<td>CIC</td>
<td>G</td>
<td><a href="mailto:fabrice.brugere@cw.com">fabrice.brugere@cw.com</a></td>
<td>F3</td>
</tr>
<tr>
<td>4</td>
<td>Monika R. Patel</td>
<td>DPIS Engineering</td>
<td>Guest</td>
<td><a href="mailto:mong@dai.com">mong@dai.com</a></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Siva Munuswamy</td>
<td>Thornton Tomasetti</td>
<td>V</td>
<td><a href="mailto:smunaswamy@thornton-tomasetti.com">smunaswamy@thornton-tomasetti.com</a></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Zuming Xia</td>
<td>Structural Technologies</td>
<td>V</td>
<td>zxia@structural tec.com</td>
<td>ZX</td>
</tr>
<tr>
<td>7</td>
<td>Jason Reigstad</td>
<td>Tech Development</td>
<td>G</td>
<td><a href="mailto:jg-reigstad@reigstad.com">jg-reigstad@reigstad.com</a></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Harwood Amadu</td>
<td>Suncoast</td>
<td>V</td>
<td>@<a href="mailto:Suncoast@Suncoast.com">Suncoast@Suncoast.com</a></td>
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<tr>
<td>9</td>
<td>Cory Brett</td>
<td>SGH</td>
<td>V</td>
<td><a href="mailto:crbrett@sgh.com">crbrett@sgh.com</a></td>
<td></td>
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<tr>
<td>10</td>
<td>Daniel Schuetz</td>
<td>SGH</td>
<td>G</td>
<td><a href="mailto:DSchuetz@sgh.com">DSchuetz@sgh.com</a></td>
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<tr>
<td>11</td>
<td>Don Kline</td>
<td>Kline Engineering</td>
<td>V</td>
<td><a href="mailto:dkline@klineengineered.com">dkline@klineengineered.com</a></td>
<td></td>
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<tr>
<td>12</td>
<td>Dan Moser</td>
<td>Walker Consulting</td>
<td>V</td>
<td><a href="mailto:dmoser@walkerconsultants.com">dmoser@walkerconsultants.com</a></td>
<td>AM</td>
</tr>
<tr>
<td>13</td>
<td>Gearing Falls</td>
<td>VECTO</td>
<td>V</td>
<td><a href="mailto:spn@geering-falls-consulting.com">spn@geering-falls-consulting.com</a></td>
<td>Gf</td>
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<td>14</td>
<td>Jim Beaudoin</td>
<td>Collier Engineering</td>
<td>G</td>
<td><a href="mailto:Jim.beaudoin@collierengineering.com">Jim.beaudoin@collierengineering.com</a></td>
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<tr>
<td>15</td>
<td>Jim Cowan</td>
<td>WJE</td>
<td>V</td>
<td><a href="mailto:TCowance@wje.com">TCowance@wje.com</a></td>
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</tbody>
</table>
Committee Attendance Sheet

Committee: DC-80                                      Date: 10/2/19

Meeting Location: Santa Fe, NM

* I have read, understand, and agree to comply with PTI Anti-Trust Policy (attached).

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<tbody>
<tr>
<td>1</td>
<td>CHRIS COVELAND</td>
<td>COVELAND ENGINEERS</td>
<td>G</td>
<td><a href="mailto:ccsopedante@worldcomp.com">ccsopedante@worldcomp.com</a></td>
<td>/</td>
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PTI POLICY STATEMENT ON COMPLIANCE WITH ANTITRUST LAWS

At a meeting on October 8, 1980, the Board of Directors first discussed the Institute's status and policies regarding compliance with antitrust laws. After review of both the internal and external compliance procedures, the following resolution was approved:

"The staff, officers, directors and members of the Post-Tensioning Institute are reminded that they are required to comply with the spirit and specific requirements of the antitrust laws on all activities within the scope of, and related to, the official functions of PTI. Further, this restated position, along with appropriate explanatory material, should be placed in all meeting folders/books periodically, beginning with the 8th of October meeting of PTI."

On July 24, 2012 and again on October 7, 2015, the Executive Committee authorized Legal Counsel to review and update this Policy Statement in the perspective of the Department of Justice Business Review Letter of July 30, 1997 and current case law. As a continuing guide for your participation in PTI's meetings, please review and continue to adhere to the following "Legal Limitation on Discussions at PTI Meetings."

LEGAL LIMITATION ON DISCUSSIONS AT PTI MEETINGS AND EVENTS

A free exchange of ideas on matters of mutual interest to the members is necessary for the success of all meetings. Indeed, such an exchange of views is essential to the successful operation of every trade association and the law specifically allows legitimate exchange of views pertaining to, e.g., quality control, safety, building design and construction integrity, etc.

It is not the purpose of this memorandum to discourage the exploration in depth of any matters of legitimate concern to meeting participants. Nevertheless, to ignore certain antitrust ground rules, either through ignorance or otherwise, is to create a civil and criminal hazard businessmen simply cannot afford.

It is for these reasons that PTI provides you with a reminder that certain areas of formal and informal communication between competitors or between manufacturers and their suppliers and customers must be avoided, as posing potential antitrust problems.

The Sherman Antitrust Act, the Clayton Act, the Federal Trade Commission Act, and the Robinson-Patman Act comprise the basic federal antitrust laws, which set forth the broad areas of conduct considered illegal as restraints of trade. In general, agreements or understandings between competitors that operate as an impediment to free and open competition are forbidden. Federal antitrust prohibitions forbid any "agreement or understanding...to substantially lessen competition or tend to create a monopoly in any line of commerce." An important point to keep in mind is that communications and discussions between competitors or between sellers and customers, about matters which may be considered anti-competitive, often comprise the evidence from which courts infer antitrust violations. It is the policy of the Post-Tensioning Institute that such agreements, understandings or communications shall not be tolerated at any formal or informal meetings or social events of the Institute.

The general prohibitions contained in the federal antitrust laws, have been particularized in the form of a series of consent decrees, originally entered against a number of member companies of various trade associations and the associations themselves. It is important to note that these laws not only apply to PTI members, but also to PTI itself. Often trade associations have been and are presently co-defendants in cases brought by the Justice Department and the Federal Trade Commission ("FTC"). Recently, the FTC has stated: "Because trade associations are by their nature collaborations among competitors, the Commission and courts have long been concerned with anti-competitive restraints imposed by such organizations under the guise of codes of conduct. Competing for customers, cutting prices, and recruiting employees are hallmarks of vigorous competition. Agreements among competitors not to engage in these activities injure consumers by increasing prices and reducing quality and choice." Similar "codes" or policies and requirements that encourage directly or indirectly members' unlawful activity are strictly forbidden by PTI in the course of its business with its members.
SPECIFIC EXAMPLES OF ACTIVITIES AND PRACTICES PROHIBITED
AT ALL PTI MEETINGS AND EVENTS:

Included in activities and practices which are forbidden, and are contrary to the policy of the Institute, both under the general antitrust laws and the consent decrees, subject to the said Business Review Letter, are the following:

- Agreeing to allocate markets, customers or suppliers among competitors, classify certain customers or suppliers being entitled to preferential treatment by manufacturers, and establish geographic trading areas.

- Participating in any plan designed to induce any manufacturer or distributor to sell or refrain from selling, or discriminate in favor of, or against any particular customer or class of customers.

- Agreeing in any manner to fix or otherwise establish bids, prices (including price increases, decreases, standardization or stabilization), profits, costs, contract terms affecting price (such as discounts and credit terms), etc. because, e.g. prices were too low, with the exception of certain resale pricing agreements between manufacturers and retailers or distributors.

- Agreeing in any manner to limit or restrict the quality of products to be produced (e.g., restrictions on selling coated strand to certain customers).

- Participating in any plan which has the effect of discriminating against, or excluding competitors, suppliers or customers.

These examples are provided to guide you in your discussions during formal and informal PTI meetings and social events. If the occasion arises, more specific advice will be provided by legal counsel, who is required by Article IV, Section 7 of the PTI By-Laws to be present at all meetings of the Board of Directors and the Executive Committee.
Annual Report of PTI Committee Activities
(To be placed on the committee’s agenda for the fall meeting)

Committee DC-80

Chair Tracy Naso

Date 10/2/2019

1. List the progress on goals of your committee during last year:

<table>
<thead>
<tr>
<th>2018-2019 Goal</th>
<th>Progress</th>
</tr>
</thead>
<tbody>
<tr>
<td>Develop repair webinar module</td>
<td>Established TG, collected slides and content</td>
</tr>
<tr>
<td>Draft sheathing repair tech note</td>
<td>Established TG, reviewed current PTI requirements and recommendations, completed poll to identify materials currently being used for repair, developed list of desirable characteristics and related test values</td>
</tr>
<tr>
<td>Update DC80.3-12</td>
<td>Distributed clean PDF of current document for committee to review, established working group to focus efforts</td>
</tr>
</tbody>
</table>

2. List at least three goals for the upcoming year. Note – all goals are subject to TAB/CAB Approval:

<table>
<thead>
<tr>
<th>2019-2020 Goals (New documents, revisions of documents, convention presentations or sessions, PTI Journal case studies, research proposals, PT Treasures or Technical Papers, etc.)</th>
<th>Tasks Champion / Expected Completion Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Complete webinar module and ballot</td>
<td>Siva Munuswamy/May 2020</td>
</tr>
<tr>
<td>2 Draft sheathing repair tech note and ballot</td>
<td>Cory Brett/May 2020</td>
</tr>
<tr>
<td>3 Update DC80.3</td>
<td>Naso/October 2020</td>
</tr>
<tr>
<td>4 Draft guide specification for external post-tensioning</td>
<td>Kline/October 2020</td>
</tr>
<tr>
<td>5 Repair-themed tech. session (compile papers in committee and submit)</td>
<td>[open]/May 2020</td>
</tr>
<tr>
<td>6</td>
<td></td>
</tr>
</tbody>
</table>
3. Report detailed progress on already approved document revisions / new documents / technical sessions / PTI Journal Contributions / certification program development, etc.:

<table>
<thead>
<tr>
<th>Title</th>
<th>Progress in Last 12 Months</th>
<th>Task Champion / Expected Completion Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>See #1</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

4. List new and updated documents you expect to submit to TAB/CAB for review in the next 12 months:

<table>
<thead>
<tr>
<th>Document Title</th>
<th>Expected Completion Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sheathing repair tech note</td>
<td>October 2020</td>
</tr>
<tr>
<td>Webinar module</td>
<td>October 2020</td>
</tr>
</tbody>
</table>

5. List old documents needing revision.

<table>
<thead>
<tr>
<th>Document Number / Title</th>
<th>Notes</th>
<th>Task Champion / Expected Completion Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC-80.3-12/Guide for Evaluation and Repair of Unbonded Post-tensioned Concrete Structures</td>
<td>Update for content and consistency with recently released FAQs, tech notes, CRT-60 certification course, and updated Post-Tensioning Design Manual</td>
<td>October 2020</td>
</tr>
</tbody>
</table>

6. List subjects for FAQs and / or TNs that would reflect “PTI Position” on issues

<table>
<thead>
<tr>
<th>Subject</th>
<th>Notes</th>
<th>Task Champion / Expected Completion Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evaluating and repairing damaged caused by fire</td>
<td>TN? (address residential slab-on-ground too)</td>
<td>Siva</td>
</tr>
<tr>
<td>Evaluating deteriorated end anchorages</td>
<td>FAQ (address residential slab-on-ground too)</td>
<td>Naso</td>
</tr>
</tbody>
</table>

7. List Technical Session ideas

<table>
<thead>
<tr>
<th>Topic / Brief Synopsis</th>
<th>Presenter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evaluating deteriorated end anchorages</td>
<td>Naso</td>
</tr>
<tr>
<td>Evaluating and repairing damaged caused by fire</td>
<td>Siva</td>
</tr>
</tbody>
</table>

8. List any liaisons or scope conflicts with other committees in PTI or other organizations:

Coordination with PTI CRT-60 for update for DC-80.3; coordination with DC-20 for external post-tensioning design and to prevent conflict with new repair webinar module; coordination with M-10, DC-20, and ACI 423 for sheathing repair tech note to prevent conflicts and duplication of work; coordinate with DC-10 with regard to items listed under Section 6 above; ACI 562

9. List anything you need from PTI Staff:

Access to photos and figures published in other PTI documents (DC-80.3 update).

Please return to: Miroslav Vejvoda
E-mail: miroslav.vejvoda@post-tensioning.org
AN INTRODUCTION TO THE EVALUATION AND REPAIR OF EXISTING POST-TENSIONED (PT) CONCRETE STRUCTURES

Presenter: xx
This presentation covers two major topics. **1: Evaluation and Report** and **2: Repair and Strengthening** of an existing post-tensioned (PT) concrete structures.

The first topic for discussion is on **Evaluation and Report**

In this first topic, a brief **Introduction** to prestressed concrete, various methods of prestressing will be discussed. This may be considered as Phase I of the project.

The **PT systems** discussed in this presentation include both unbonded single-strand tendons and button wire systems.

**Discuss Evaluation process.**

Various methods available for **Field investigation/nondestructive evaluation.**

Where and what to look for in the **Field investigation and exploratory evaluation**

**Discuss Different Laboratory testing and analysis** available for various aspects and conditions of the structural materials

Discuss the need to perform **Structural analysis** and its advantage in the earlier stages.

Once the Evaluation is done, discuss on preparation of **Evaluation Report** highlighting the scope and limitations.

The second topic covered is the **Repair and Strengthening**
After the evaluation in Phase I is completed and the report presented and discussed with the Ownership, the Phase II of the project is on dealing with the findings of the Phase I. A brief Introduction and preparation of the Repair and Strengthening options available will be discussed, followed by discussion on preparation of Plans and specifications for the proposed repair Safety for workers and occupants during the repair work Various caution to be taken during Concrete removal Repair of tendons Concrete placement Concrete protection Maintenance and Monitoring Strengthening with post-tensioning Finally, after Phase II scope are completed, a Record documents should be prepared for closeout

The presentation concludes with a Summary followed by a Q&A session
Flow chart on evaluation and report process
Typically the necessity for an evaluation of an existing PT building arises with some sort of distress within the building or it could be the local city requirements on periodical inspection and report.

One such common example is shown here. You may get a call from a building owner or facilities manager about a condition in the building that warrants an immediate visit to the property to assess and provided recommendation on life safety.

The photos show that the slab is evidently a post-tensioned slab from the tendon pop out, exposed sheathing. There could be many reasons for this “tendon showing up” out of the slab/corrosion and exposure of the tendons/rebar and deterioration and delamination of concrete.

You may not have all the documents such as structural drawings, shop drawings and any construction documents readily available to you at the first visit itself.
A quick walkthrough of the floor and the building envelop provides a fair idea of the intensity of the issue. Sometimes you may find a binocular survey or drone survey very helpful.

The photos show building envelop to verify if there are any visible distress, such as popped out PT anchor pockets or tendon shoot-outs. In this particular case, no visible distress were noticed.

You may need follow-up evaluations to develop the specifications to fix the conditions. But first establish the purpose and scope of the investigation to avoid a complete, exhaustive inspection of the entire structure. Emphasis on performing a visual and nondestructive examination of representative typical conditions and specific conditions identified as critical. Explain limitations and risk associated with the evaluation to educate the owner for better understanding and acceptance to limit the liability.

**Evaluation scope**

- expectations of the owner are clearly understood and that the owner understands the limitations of the evaluation.
- It may be unnecessary to perform a complete, exhaustive inspection of the entire
structure.
• perform a visual and nondestructive examination of representative typical conditions and specific conditions identified as critical.
• there is some risk that it may not detect hidden or latent defects that show no visible indications of distress. That risk should be understood and accepted by the owner.
• consideration should be given to visible concrete deterioration, repairs, and exposed structural elements.
  • PT coating stains
  • Concrete penetrations and
  • Modifications
  • Previous repair
  • Overlays
  • freezing-and-thawing damage
  • Curing compounds, coatings, and waterproofing
  • Cracking
  • Defections
  • Tendon eruption at slab edge
  • Anchorage zones
  • Delamination and spalling
  • Exposed tendon sheathing
  • Construction and expansion joints
  • Efflorescence and leakage
  • Rust stains
History of the Structure
An experienced investigator should consider the type and age of the structure and the standards and practices used at the time of construction. Original construction code requirements and design of post-tensioned systems may vary from current code requirements and design. The evaluation should consider these differences in assessing the integrity of the existing post-tensioned system. The investigator should clearly identify the type of post-tensioning sheathing used on the project. Examples of post-tensioning sheathing include paper-wrapped, push-through, heat-sealed, or extruded.

It is recommended that all firms and on-site supervisory personnel have a minimum of 5 years of experience working with post-tensioned structures, including certification in PTI training programs (such as the PTI Level 1 Unbonded PT – Field Installation program).
Unbonded single strand PT system anchors and accessories

Stressing-end,
Fixed-end Anchorages,
Wedges,
Extruded Tendons,
Trumpets,
Pocket formers,
Grease cap
Gather and review documents such as
1. Structural drawings and specifications
2. Architectural drawings
3. Post-tensioning shop drawings
4. Stressing records
5. As-built drawings
6. Investigation reports and plans and specifications for previous repairs
7. Loading and use history
8. Construction documentation
9. Operational and maintenance review
Gather and review documents such as
1. Structural drawings and specifications
2. Architectural drawings
3. Post-tensioning shop drawings
4. Stressing records
5. As-built drawings
6. Investigation reports and plans and specifications for previous repairs
7. Loading and use history
8. Construction documentation
9. Operational and maintenance review
1. **Environment**: Structural deterioration is much more likely in an aggressive environment.

2. **External and internal exposures**: Examine and evaluate surrounding environmental conditions. Exposure to moisture, like freezing-and-thawing, coastal regions,

3. **exposure to chemicals**, chlorides from pool or deicing chemicals and

4. **moisture** from planters for example, moisture accumulation between the tendon and the sheathing,

5. **Historical exposure**: Industrial or use-specific environments, Aggressive chemicals, high humidity, and high carbon dioxide levels can initiate disintegration of the concrete.

6. **Original construction deficiency** may also result in Premature deterioration. Marine structures in the splash zone, chemical contamination in Industrial buildings,

7. **Service conditions**: loading and performance history should be investigated. An increase in loading may lead to deflections and cracking, which could subsequently allow moisture to reach and deteriorate the post-tensioning system.
conduct a survey of the post-tensioning tendons in all areas of a structure, especially those exposed to moisture, visible concrete deterioration, repairs, and exposed structural elements. Visual survey of concrete conditions at specific locations along the tendon length that merit close scrutiny: high and low points of the tendon profile; construction joints; intermediate stressing locations; and end anchorages, particularly at the stressing end.

A small percentage of the total number of tendons in a structure are usually inspected over a short portion of their length, thus understand the limitations of the investigation and prepare report as such. Discuss the limitations of the investigation with the owner or facilities manager, before performing additional investigations.

Tendon eruption at slab edge
1. presence of leakage and corrosion.
2. Excessive deflections may also indicate construction problems, materials problems, overloading, or other issues. The presence and cause(s) of excessive deflections should, therefore, be identified and investigated.
3. Anchorage zones:
1. Exposed tendon sheathing and leaking grease
2. Issues at construction and expansion joints
3. Anchorage zones:
1. Presence of leakage and corrosion.
2. Excessive deflections may also indicate construction problems, materials problems, overloading, or other issues. The presence and cause(s) of excessive deflections should, therefore, be identified and investigated.
3. Anchorage zones:
1. check for evidence of previous coring, drilling, and cutting; the existence of post-installed fasteners; or other concrete removal activities.
2. Check and compare with original drawings for any new overlays
3. freezing-and-thawing damage
4. Curing compounds, coatings, and waterproofing
Complement the results of the visual examination
Selection of the appropriate test method to determine a particular characteristic depends on several factors, including the amount of testing required to provide meaningful information and cost.
1. Acoustic testing/hammer sounding- chain-drag and hammer-sounding techniques
2. Impact echo stress (sound) waves generated by mechanical impact to detect cracks, voids, honeycombing, and debonding in concrete structures as well as locate delamination
3. Impulse response stress-wave method for the evaluation of structures using a greater force input at a lower frequency than IE. locate delamination caused by steel reinforcement corrosion, debonding, poor concrete consolidation and honeycombing in concrete structures.
4. Ground-penetrating radar (GPR) can be used to locate tendons and reinforcing bars in slabs, joists, beams, and walls
5. An X-ray can be used to precisely locate tendons in a structural member. X-rays may detect breaks or fractures in individual wires.
6. Rebound hammer/Windsor probe/ pulse velocity/pullout to find in the field the relative compressive strength of the concrete
7. Corrosion potential testing to identify active areas of nonprestressed reinforcement corrosion.
8. Acoustic monitoring continuous monitoring of post-tensioned structures with series of accelerometers (or sensors)
9. Magnetism based Strand-break detection identifies the location of breaks in post-tensioned and pretensioned tendons in a structure.
tendons can corrode or fail without showing any external evidence. After performing noninvasive testing, the next step is to physically inspect the post-tensioning hardware. A detailed plan of action should be formulated to prevent damage to the post-tensioning system.

1. **Anchorage inspection** when observed, should be dry, free of rust, and the wedges should appear free of corrosion and securely seated on the strand in the anchorage wedge cavity.
Anchorage inspection when observed, should be dry, free of rust, and the wedges should appear free of corrosion and securely seated on the strand in the anchorage wedge cavity.
Lift-off test to determine the force in a tendon. A lift-off reading provides information about the force in the tendon at the time of the test and does not preclude the possibility that there is corrosion on the strand, as it is possible to have a reading with corroded strands, but with an increased risk of strand rupture.

**Strand/tendon testing:**
1. Screwdriver penetration test: If the strand is fully tensioned, it is unlikely that the wires of the strand will separate.
2. In-place strand tension test: expose a length of strand by concrete removal. Attach test frame to the strand and in two increments hydraulically apply a lateral force. Measure The resulting deflections for both applied lateral forces. Estimate tensile force in the strand.
High- and low-point inspection: Excavate the high points, which are generally over supports, and low points, which are generally near the centers of spans. Next, remove the sheathing to observe the condition of the PT coating, prestressing steel, sheathing, and possible presence of moisture.
High- and low-point inspection: including construction joints, expansion joint condition assessment
High- and low-point inspection:
High- and low-point inspection:
Other methods are
1. Bore scope, fibre scope, and video scope
2. Corrosion evaluation: corrosion potential evaluation (CPE) technique identifies wet and dry tendons in a structure and determines the probable state of corrosion of a tendon based on the moisture content of the air inside the plastic tendon sheath.
3. Strand extraction
4. PT coating inspection and testing: Cut tendon sheathing to verify if PT coating is present completely cover the prestressing steel and be clean and free of debris, rust, and liquid.
Concrete/structural member evaluation

1. Core samples may be extracted from the concrete member to provide concrete samples for further analysis.
2. Load test: Load-bearing capacity analysis derived from the evaluation results is considered inadequate, a full-scale load test could be used to determine the load capacity of the structure in test areas.
Laboratory testing and analysis:

**concrete testing:**

1. Compressive strength: Cores taken in the field can be tested in the laboratory to determine the compressive strength of the concrete.


3. Chloride content: drawing pulverized concrete using a rotary-percussion hammer or by taking cores and then pulverizing the concrete in the laboratory. Chloride contamination can promote corrosion of the nonprestressed reinforcement and accelerate corrosion of the prestressing steel.

4. Carbonation: The carbonation of concrete is a result of the reaction of calcium hydroxide in cement paste with atmospheric carbon dioxide to form calcium carbonates, which causes a reduction in the pH of the concrete. This condition makes the concrete more conducive to corrosion of the mild steel reinforcement and exposed post-tensioning hardware in the area of carbonated concrete.
**Prestressing Steel Testing:**
1. Visual inspection: observe the surface condition of the steel along its entire length,
2. Tensile strength test: assess the residual strength of corrosion-damaged strands, tensile testing of removed samples
3. Chemical analysis and metallurgical testing: verify that the manufacturer of the prestressing wire produced material that is not sensitive and susceptible to embrittlement failures
4. Metallography: examine and document fracture characteristics and micro-structural features of the prestressing steel
5. Hydrogen embrittlement testing: Sensitivity to hydrogen embrittlement is generally verified by stressing a strand that is then subjected to an ammonium thiocyanate solution. Poor-quality, severely strain-aged prestressing steel wire typically fails in 4 to 10 hours.
6. Scanning electron microscopy (SEM) can also be used for microscopic evaluation of prestressing steel wire. This examination is generally conducted in tandem with energy dispersive X-ray analysis (EDS) of corrosion products or the PT coating in the case of unbonded post-tensioned tendons.

**Protective PT Coating Testing:** The corrosion-inhibiting attributes are of particular importance for contamination by water-soluble ions, water-absorption potential, and the melting point
to determine the effect that existing conditions have on structural integrity and load capacity
• aimed at determining whether a deteriorated structure requires repairs
• Appropriate code requirements and standards should be considered
• Where damage or deterioration has occurred, the calculated load-carrying capacity should account for known and projected tendon failures.
• Engineering judgment should be employed when a limited sample size
• Analysis results that indicate structural overstress conditions and reduced load-carrying capacity should be clearly noted in the final report.

Please note that analysis may be required to establish the adequacy of the structure for service and strength concerns. If any of the broken tendons cannot be repaired due to field constraints this analysis is useful to verify if those tendons can be abandoned without compromising structural integrity.

If needed, then, run analysis of the structure to an appropriate level, either partially to the extent to capture the localized field condition or entire floor system for global issues. A simple hand calculation or an equivalent frame method, a 2D or 3D finite element modeling depending on the scope of work and the extent of damage shall be carried-out using any readily available computer software programs that are used for new PT design.
- performed to determine the effect that existing conditions have on structural integrity and load capacity and whether a deteriorated structure requires repairs. Analysis results that indicate structural overstress conditions and reduced load-carrying capacity should be clearly noted in the final report.
The report should summarize the results of the entire investigation indicating the:
1. type of investigations performed and
2. the locations and
3. types of testing completed
4. indicate the scope and limitations
5. include recommendations for further evaluation and testing if required
6. results of the structural analysis
7. include current and future strength and serviceability concerns
8. recommendations on potential repair procedures,
9. costs, and
10. the effects of the repair procedures and construction operations on the structure and its occupants.

The results of the structural analysis should also be included. Include current and future strength and serviceability concerns. Recommendations on potential repair procedures, costs, and the effects of the repair procedures and construction operations on the structure and its occupants.
Conclusions
1. High stored energy is released when unbonded tendons fail in a PT floor systems.
2. Many PT accessories and systems evolved over a period.
3. Gather and review all the available construction documents to avoid surprises.
4. Perform evaluation of PT buildings employing appropriate evaluation techniques.
5. Structural analysis for evaluation should consider all the field condition.
6. Understand the scope of work and clearly state the limitations of the evaluation report.
THIS CONCLUDES PART 1 OF THE PRESENTATION ON

AN INTRODUCTION TO THE EVALUATION AND REPAIR OF EXISTING POST-TENSIONED (PT) CONCRETE STRUCTURES

PART 2 WILL BE ON

Introduction and preparation FOR REPAIRS

ANY QUESTIONS?

THANK YOU!