
SIMPLE INNOVATIVE SOLUTIONS
TO COMPLEX CHALLENGES
IN UNBONDED POST-TENSIONING

PTI Convention
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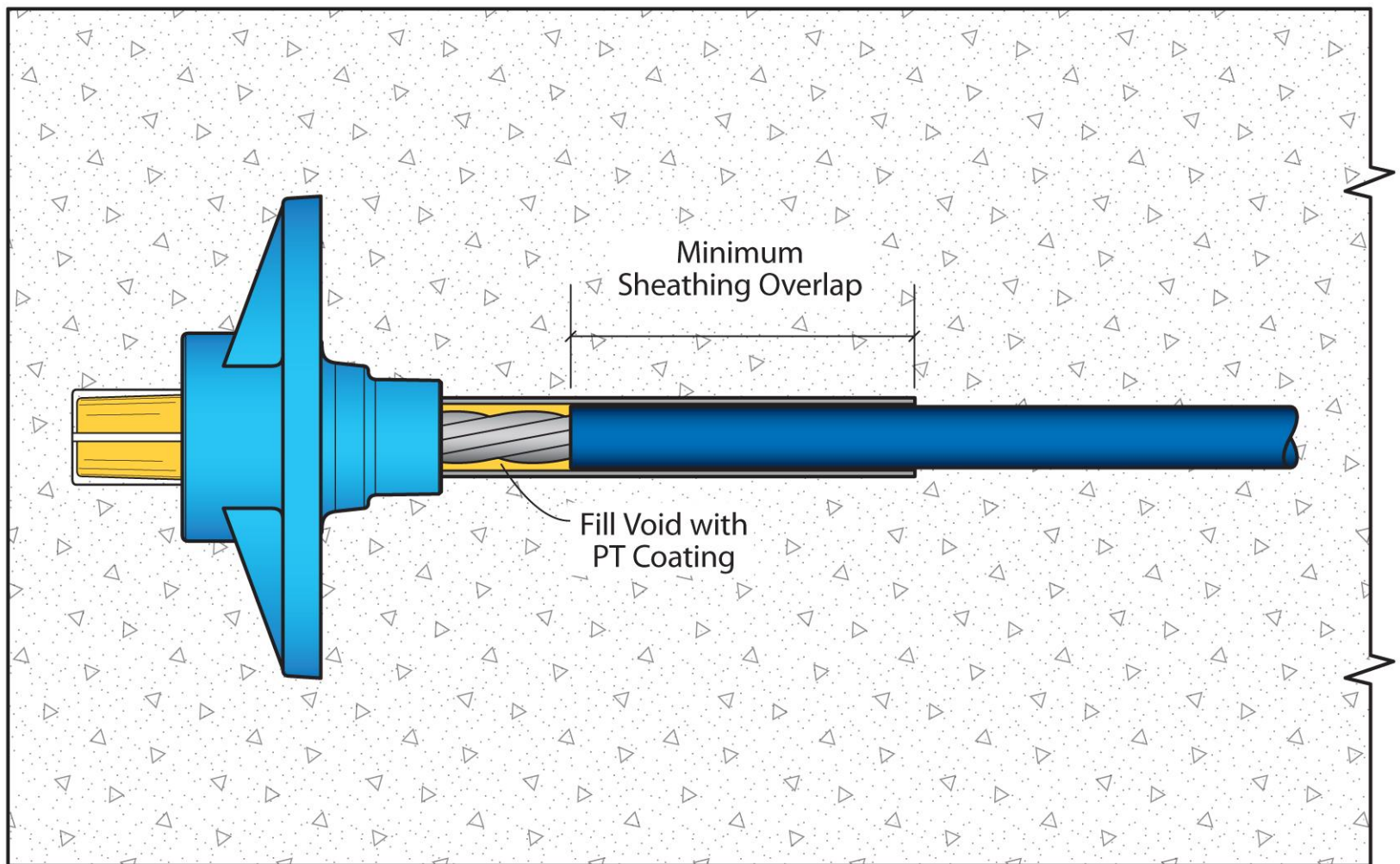
- As all industries progress, challenges arise – the unbonded post-tensioning industry is no different.
- Specifications and codes continue to evolve based upon lessons learned.
- Owner's and designer's stipulations adjust as their requirements change.
- Advancements in materials require modifications to processes.
- These changes create challenges that any industry must address.

Challenge: Sheathing Shrinkage

The sheathing shrinkage challenge is to prevent sheathing from slipping out of encapsulation sleeves or moving within the sleeves so there is not proper overlap per specifications.

- PTI M10.2-00 required that sleeves “should be designed to be as void-free as possible”.
- ACI 423.6-01 and ACI 423.7-07 required that sleeves be “designed to be void-free”.
- All three state “requirement that prohibits voids may be satisfied by filling the sleeves with PT Coating”.
- ACI 423.7-14, states “Within the connecting component or enclosure, either the prestressing steel shall be covered by sheathing for its full length, or the annular space between the sleeve and the strand shall be filled with PT coating.”

- Why does the sheathing move?
- There are two primary reasons: thermal movement and release of internal plastic stresses after unbonded tendons have been placed.
- The thermal movement of plastic and prestressing steel is different – the plastic sheathing will move more.
- The sheathing contains residual internal plastic stresses from manufacture which, when the tendon is laid flat, causes sheathing to shrink.



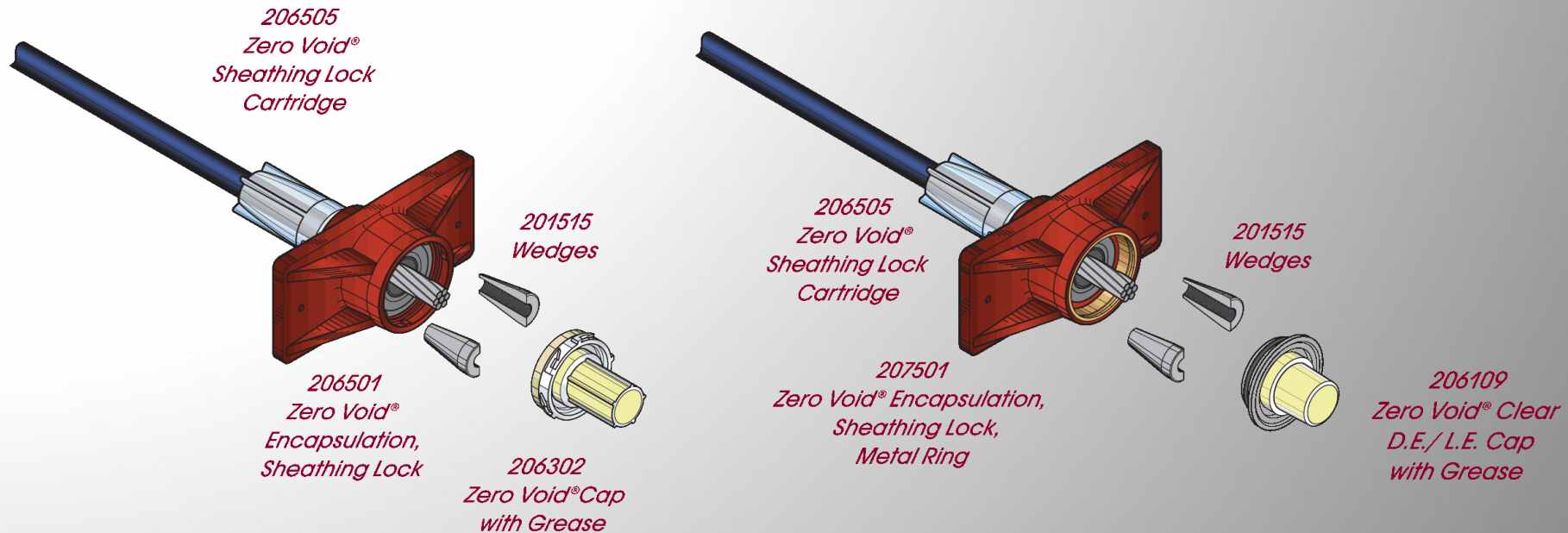
ACI 423.7-14, 6.5.2c) – Within the connecting component or enclosure, either the prestressing steel shall be covered by sheathing for its full length, or the annular space between the sleeve and the strand shall be filled with PT coating.

SOLUTION: GTI ZERO VOID[®] SHEATHING LOCK SYSTEM

- An encapsulation system without sleeves – there is no annular space (void) to fill with PT Coating between the sleeve and the strand.
- The sheathing will not move after the Sheathing Lock is affixed.
- Sheathing movement due to thermal difference is not a factor any longer.
- Can be used at all fixed-ends, intermediates, and stressing-ends.

SOLUTION:

GTI ZERO VOID[®] SHEATHING LOCK SYSTEM



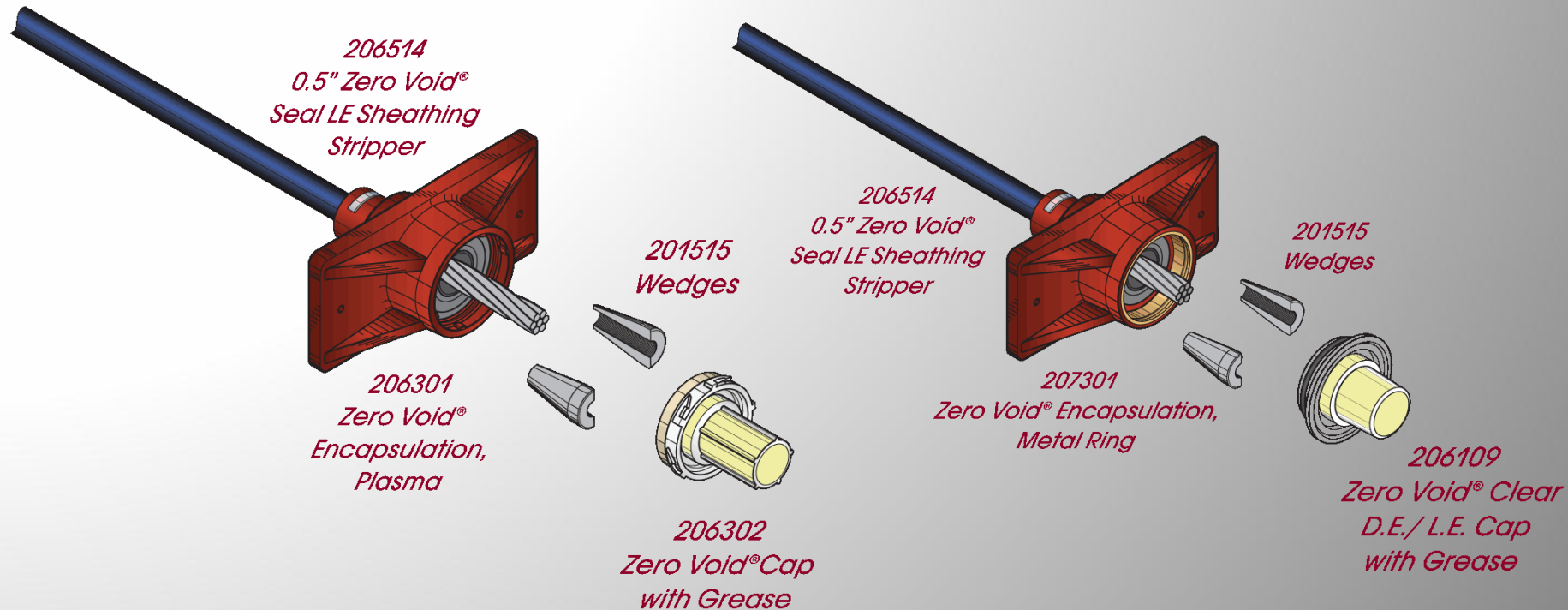
SOLUTION:

GTI ZERO VOID[®] SEAL LE SHEATHING STRIPPER

- The sheathing protects the strand until right before stressing of the tendon when the GTI Sheathing Stripper removes the sheathing.
- An encapsulation system without sleeves – there is no annular space (void) to fill with pt coating between the sleeve and the strand.
- Sheathing movement due to thermal difference is not a factor any longer.
- Can be used at all stressing-ends.

SOLUTION:

GTI ZERO VOID® SEAL LE SHEATHING STRIPPER



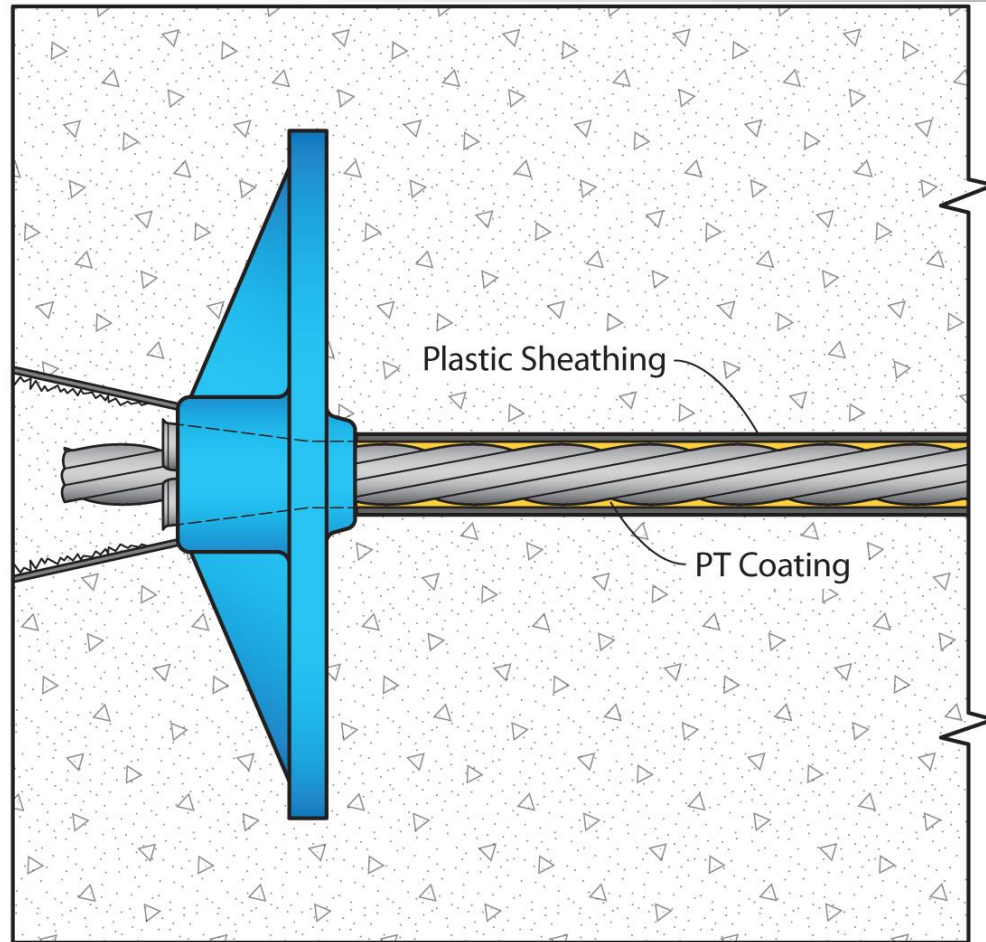
CHALLENGE: STRESSING POCKETS

The stressing pocket challenge is to maintain a grout plug that will stay in place and retain its position thus protecting the stressing-end anchorage from water possibly contaminated with chlorides and from fire exposure.

- Schupak in 1991 said that “corrosion found in unbonded tendons can be related to inadequate protection of end-anchors”.
- ACI 423.4-14 reiterated that defects in the anchorage region can be caused when “anchorage pocket plug shrinks and becomes loose” due to poor bond which permits “aggressive materials access to anchorage and prestressing steel”.
- This can become an issue for all types of applications.

- The patch shrinking away allows water possibly contaminated with chlorides to penetrate into the anchorage or the patch can completely fall out leaving the anchorage exposed to the elements.
- Stressing pocket patches were identified as one of the reasons for the recent demolition of McGuire Apartments in Seattle. The Nadine Post article in ENR states that “McGuire’s problems center around corrosion of steel tendons at stressing-end anchors due to a lack of corrosion-resistant paint and non-shrink grout”.

Cementitious grout plug at anchorage pocket shrinks and becomes loose. Poor bond and/or poor quality mortar permits aggressive materials access to anchorage and prestressing steel.



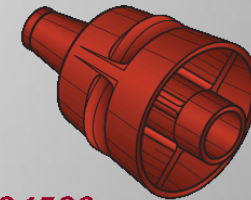
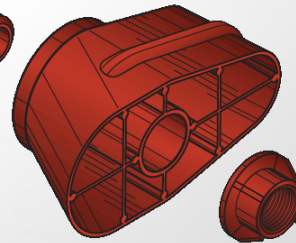
Recently, stressing pocket patches have come to the forefront of challenges in unbonded post-tensioning. This was identified as one of the reasons for the recent demolition of McGuire Apartments in Seattle. The Nadine Post article in ENR states that “McGuire’s problems center around corrosion of steel tendons at stressing-end anchors due to a lack of corrosion-resistant paint and non-shrink grout”.

SOLUTION: ZERO VOID[®] GROUT LOCK POCKET FORMER

- Provides a physical locking mechanism within the concrete of the pocket former.
- The keyway retains the pocket former grout plug from dislodging from the concrete.

SOLUTION:

ZERO VOID® GROUT LOCK POCKET FORMER



CHALLENGE:

WATER INTRUSION DURING CONSTRUCTION

The water intrusion during installation challenge is to protect the unbonded tendon anchorages from water getting into them during installation at the jobsite.

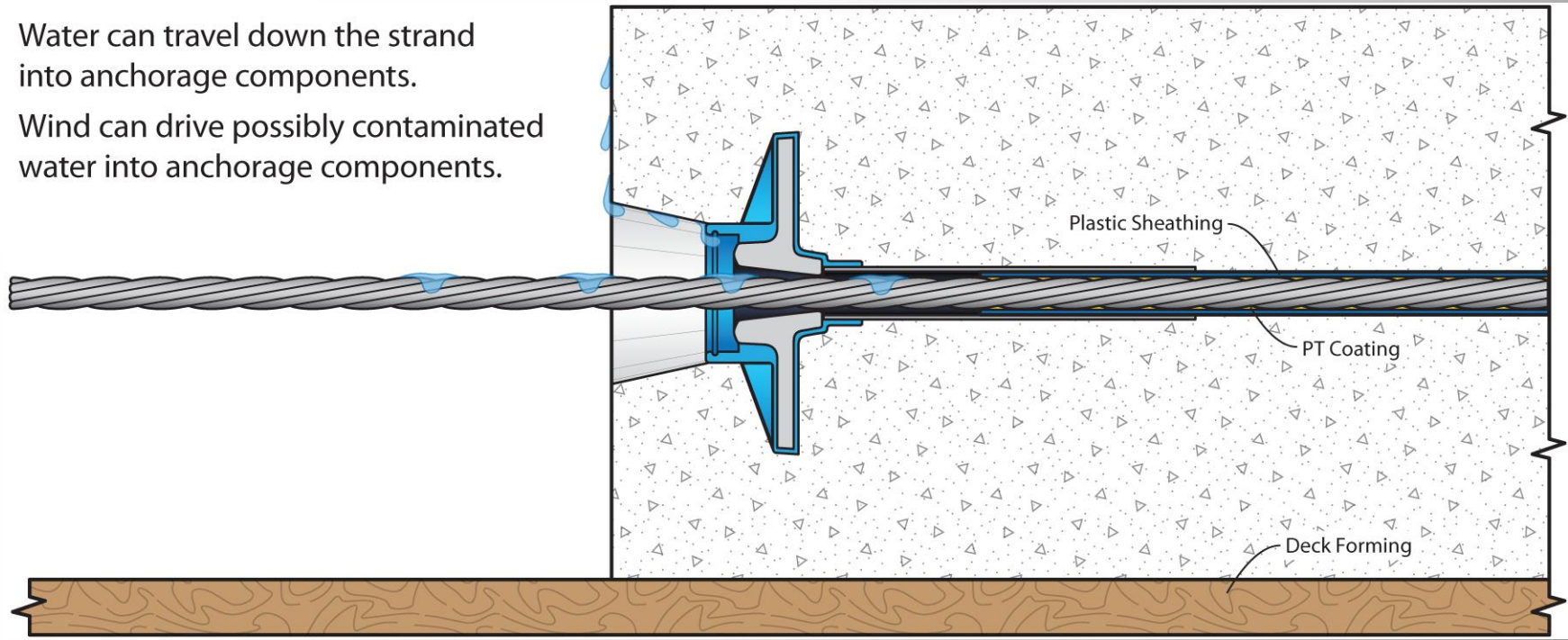
- Project jobsites are not protected from the elements – wind, rain, snow, and airborne contaminants.
- Many jobsites continue to work regardless of weather conditions.
- Projects near seacoasts are exposed to airborne salts.

- PTI M10.2-00, ACI 423.6-01, and ACI 301-10 all say encapsulated “components shall be protected within one working day after their exposure during installation” and specifically, without any time limitations, “water shall be prevented from entering tendons during installation”.

CHALLENGE: WATER INTRUSION DURING INSTALLATION

Water can travel down the strand into anchorage components.

Wind can drive possibly contaminated water into anchorage components.



PTI M10.2-00, ACI 423.6-01, and ACI 301-10 all say encapsulated “components shall be protected within one working day after their exposure during installation” and specifically, without any time limitations, “water shall be prevented from entering tendons during installation”.

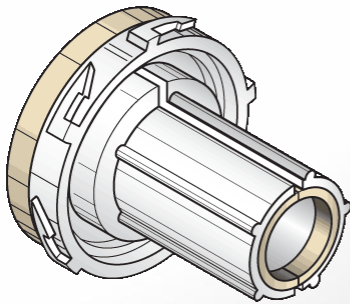
SOLUTION:

ZERO VOID[®] TEMPORARY FIELD PROTECTION CAP

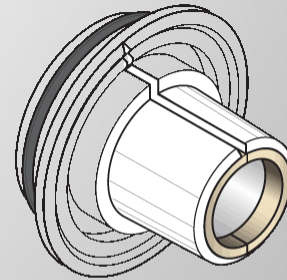
- Designed to protect the anchorage from water during construction.
- Feature is a development to ensure compliance with the code requirement which states “water shall be prevented from entering tendons during installation.”

SOLUTION:

ZERO VOID[®] TEMPORARY FIELD PROTECTION CAP



*206502
Zero Void[®]
Temporary Field
Protection Cap*



*206509
Zero Void[®]
Temporary Field
Protection Cap,
Torch*

THANK YOU FOR YOUR ATTENTION!

QUESTIONS?