



## Protection Levels of a PT Tendon

### Question:

How shall I identify the degree to which a PT tendon is protected from corrosion and deterioration over time?

### Answer:

Selection the tendon's Protection Level (PL) for a specific project requires that the aggressivity of the environment attacking the prestressing construction element as well as the protection provided by the structure for the element with the greater exposure are both identified.

Environment				
Very dry with no risk of corrosion	Very dry with no risk of corrosion	In Northern climates with freeze/thaw mechanisms (moderate saturations & deicing agents)	In tempered climates (10Km from shore) exposed to airborne salt but not in direct contact with seawater	In areas with cyclic wet-dry exposure being also exposed to chlorides
Coding				
X0=Low	X0=Low	XF2=High	XS1=Medium	XD3=High
Protection by the structure				
Medium-High	Low	High	Medium-High	Medium-Low
Tendon's PL				
1	2	2	2	3
Structure's Protection High Medium Low Aggressivity/Exposure High Medium Low <b>PL1</b>	Structure's Protection High Medium Low Aggressivity/Exposure High Medium Low <b>PL2</b>	Structure's Protection High Medium Low Aggressivity/Exposure High Medium Low <b>PL2</b>	Structure's Protection High Medium Low Aggressivity/Exposure High Medium Low <b>PL2</b>	Structure's Protection High Medium Low Aggressivity/Exposure High Medium Low <b>PL3</b>



Protection Level 1 (PL1)	Protection Level 2 (PL2)	Protection Level 3 (PL3)
Fib Bulletin 33-PL1 is defined as a duct with filling material (grout) providing durable corrosion protection	Fib Bulletin 33-PL2 is defined as a PL1 plus a watertight, impermeable envelope providing a leak tight barrier	Fib Bulletin 33-PL3 is defined as a PL2 plus integrity of tendon or encapsulation to be inspectable or monitorable
<ul style="list-style-type: none"> <li>o Duct sufficient strong and durable for fabrication, transportation, installation, concrete placement and tendon stressing</li> <li>o Duct sufficiently leak tight for concrete placing and grout injection</li> <li>o Duct material non-reactive with concrete, prestressing and reinforcing steel, and tendon grout materials</li> </ul>	<ul style="list-style-type: none"> <li>o In addition to PL1</li> <li>o Corrugated plastic duct to be watertight and impermeable to water vapor over entire length including connections (segmental duct couplers)</li> <li>o Corrugated plastic duct to be chemically stable without embrittlement or softening during anticipated exposure temperature range and service life (no free chloride ions extractable from material)</li> <li>o Anchorage components to have an enclosure that is watertight and impermeable to water vapor (encapsulated)</li> </ul>	<ul style="list-style-type: none"> <li>o In addition to PL2</li> <li>o Demonstrated means to inspect or monitor tendons for integrity and/or corrosion</li> </ul>
PTI/ASBI-PL1A is defined as a duct with grout providing durable corrosion protection	PTI/ASBI-PL2 is defined as PL1B plus an envelope, enclosing the tensile element bundle over its full length and providing a permanent leak tight barrier	PTI/ASBI-PL3 is defined as PL2 plus electrical isolation of tendon or encapsulation to be monitorable or inspectable at any time
<ul style="list-style-type: none"> <li>o Bare strand or bar</li> <li>o Galvanized or plastic duct</li> <li>o Basic or engineered grout</li> <li>o Grouting that leaves no voids in duct</li> </ul>	<ul style="list-style-type: none"> <li>o PL1B plus</li> <li>o System pressure tests</li> <li>o Embedded anchorage components-epoxy or galvanized</li> <li>o Thixotropic engineered grout</li> <li>o Only plastic duct</li> <li>o Segmental couplers</li> </ul>	<ul style="list-style-type: none"> <li>o PL2 plus</li> <li>o Electrical isolation of tensile element</li> <li>o Ability to be monitorable or inspectable at any time</li> </ul>
PTI/ASBI-PL1B is defined as PL1A plus engineered grout and permanent grouting caps		
<ul style="list-style-type: none"> <li>o PL1A plus</li> <li>o Only engineered grout</li> <li>o Permanent grouting caps</li> </ul>		

Fib Bulletin 33 “Durability of Post-tensioning tendons”

Fib Bulletin 75 “Polymer-duct Systems for Internal Bonded Post-tensioning”

PTI-ASBI M50.3-12 “Guide Specification for Grouted Post-Tensioning”