Mechanical Properties of Pozzolan and Magnesium Phosphate-based Rapid Repair Materials

Main Users

DOT's

US Military
USMC, USAF, USN, USACE

Airports

Industrial

Tollway Authorities

Ports

Petro-Chemical

Challenges of Repair Materials

Needs of the users

- *Overnight repairs*
- *Limit traffic disruption*
- *Maintain safety of crews by minimizing time exposed to traffic*

Implications

- Difficult repair circumstances
- Traffic vibrations
- Varying skill levels of applicators

Challenges of Repair Materials

Typical DOT Requirements

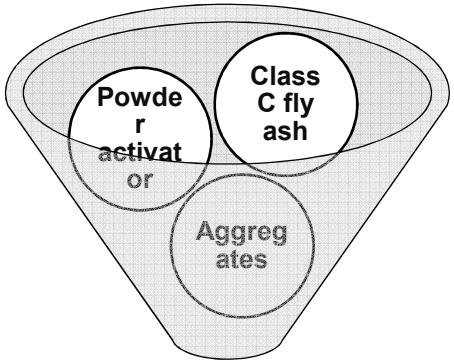
Return to Service

- High Early Strengths (typical DOT requirements demand >2000 psi in 2 hrs, or >3000 psi in 3 hrs)
- Fexural strength requirements >400 psi flex in 3 days
- Bond strength requirements >1000 psi in 24 hrs, >1500 psi in 7 days

Durability

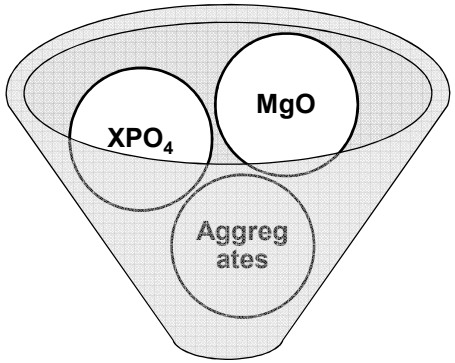
- Low Cl^- permeability (<0.15% Cl^- concentration at 0.5 or 1.0")
- Max. length change of $\pm$ 0.15%
- Freeze-Thaw resistance
- Scaling, less than 1 lb/ft^2

CTI's Rapid Repair Products



+
Water

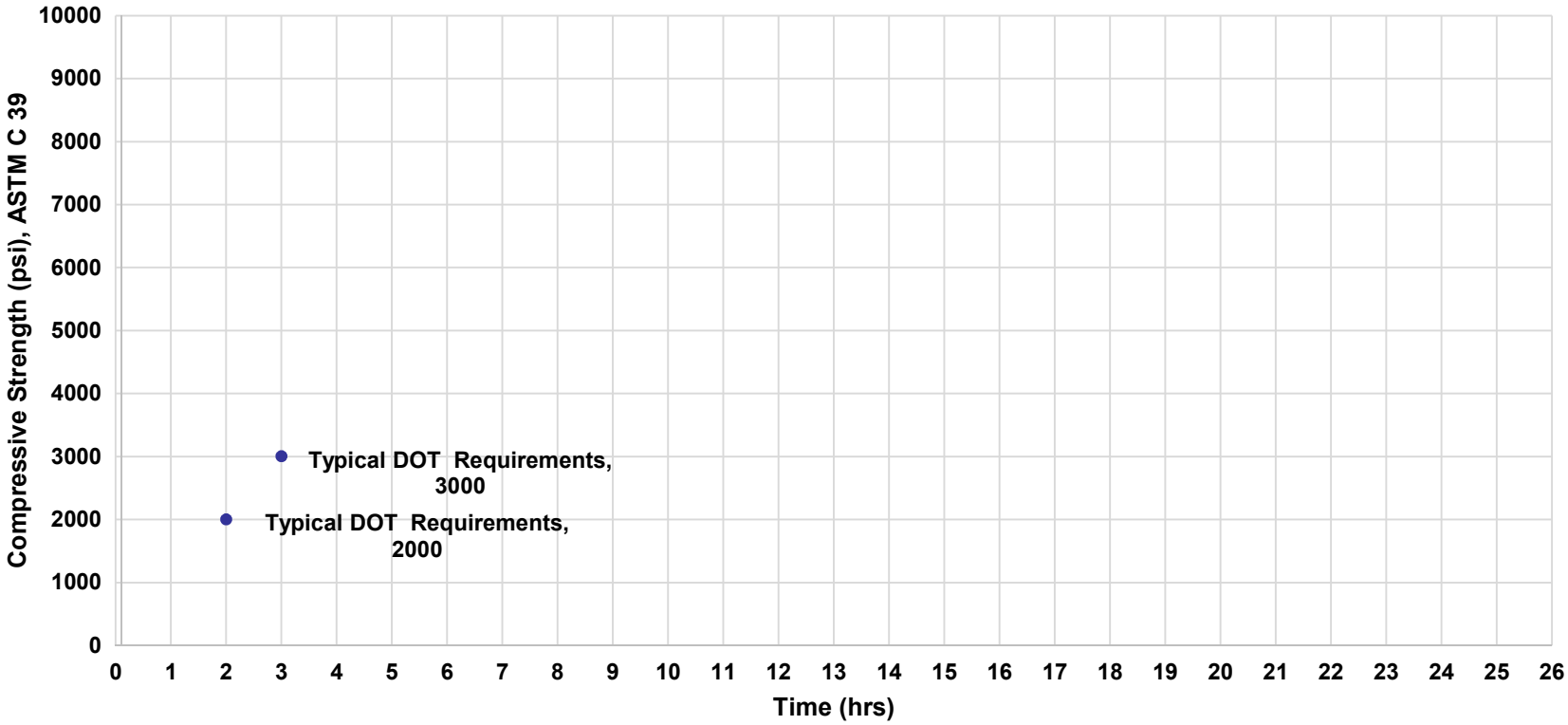
Main Reaction Products:
Calcium aluminosilicate Hydrates



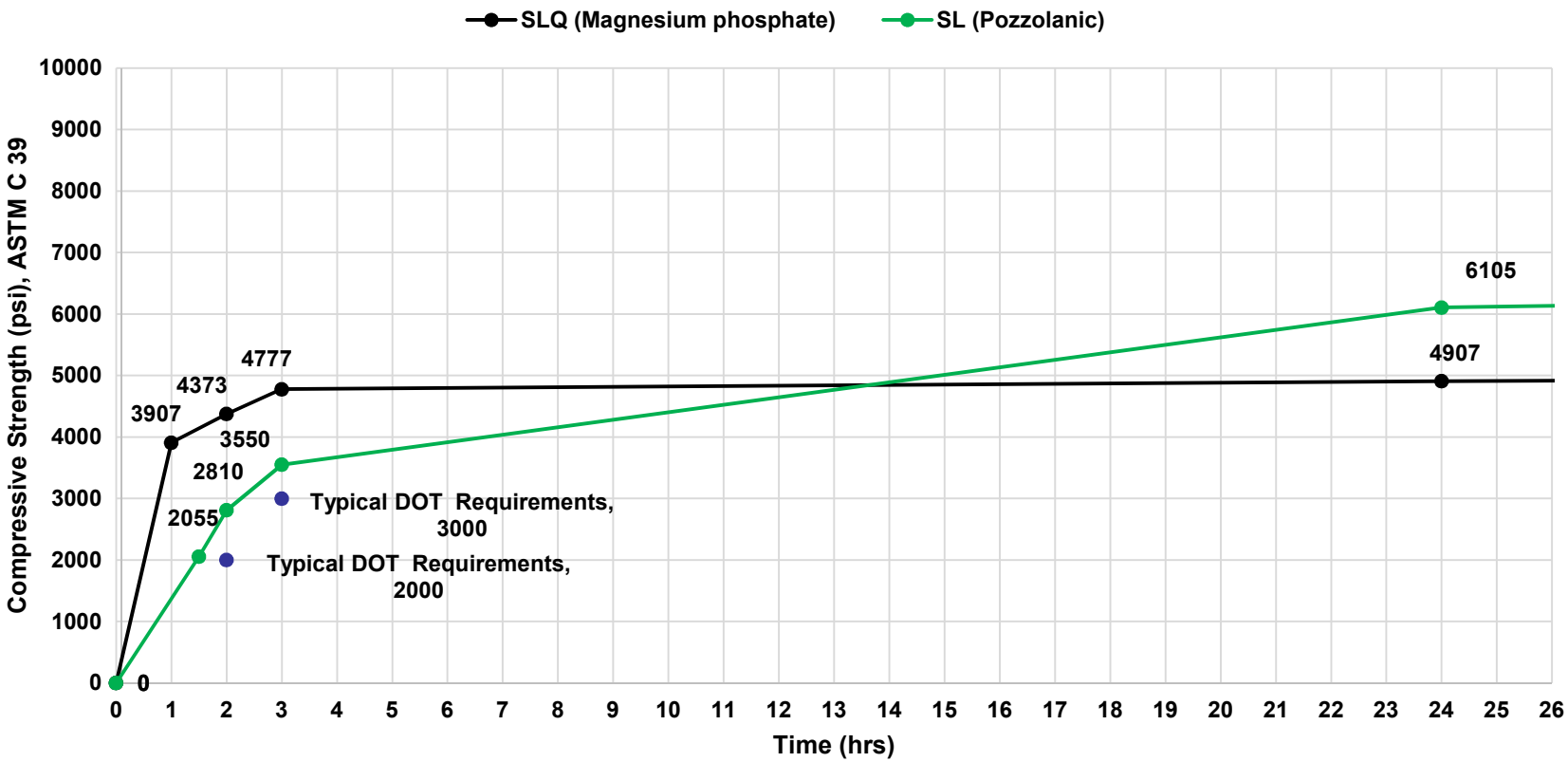
+
Water

Main Reaction Products:
Truvite

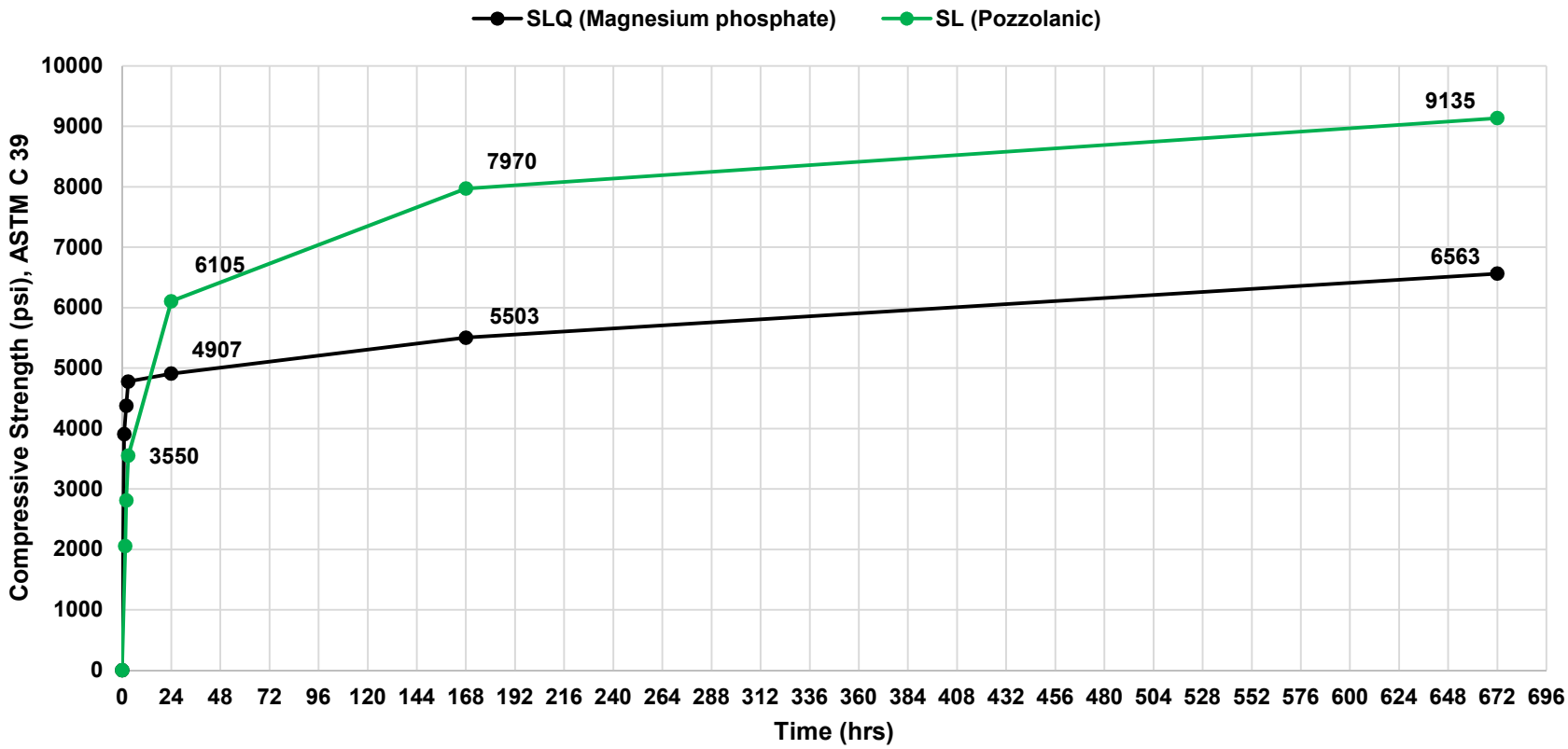
Compressive Strength 24 hrs



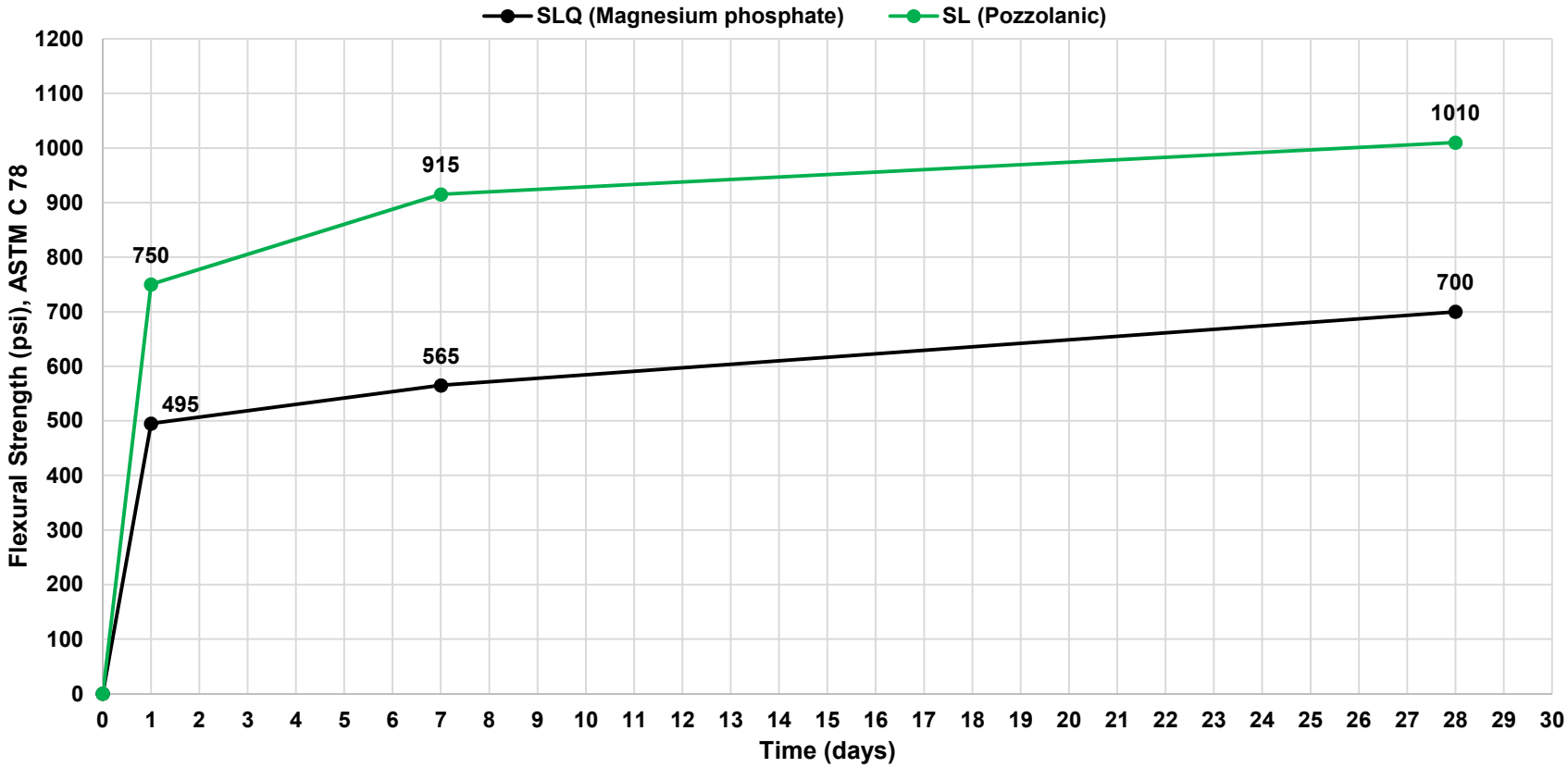
Compressive Strength 24 hrs



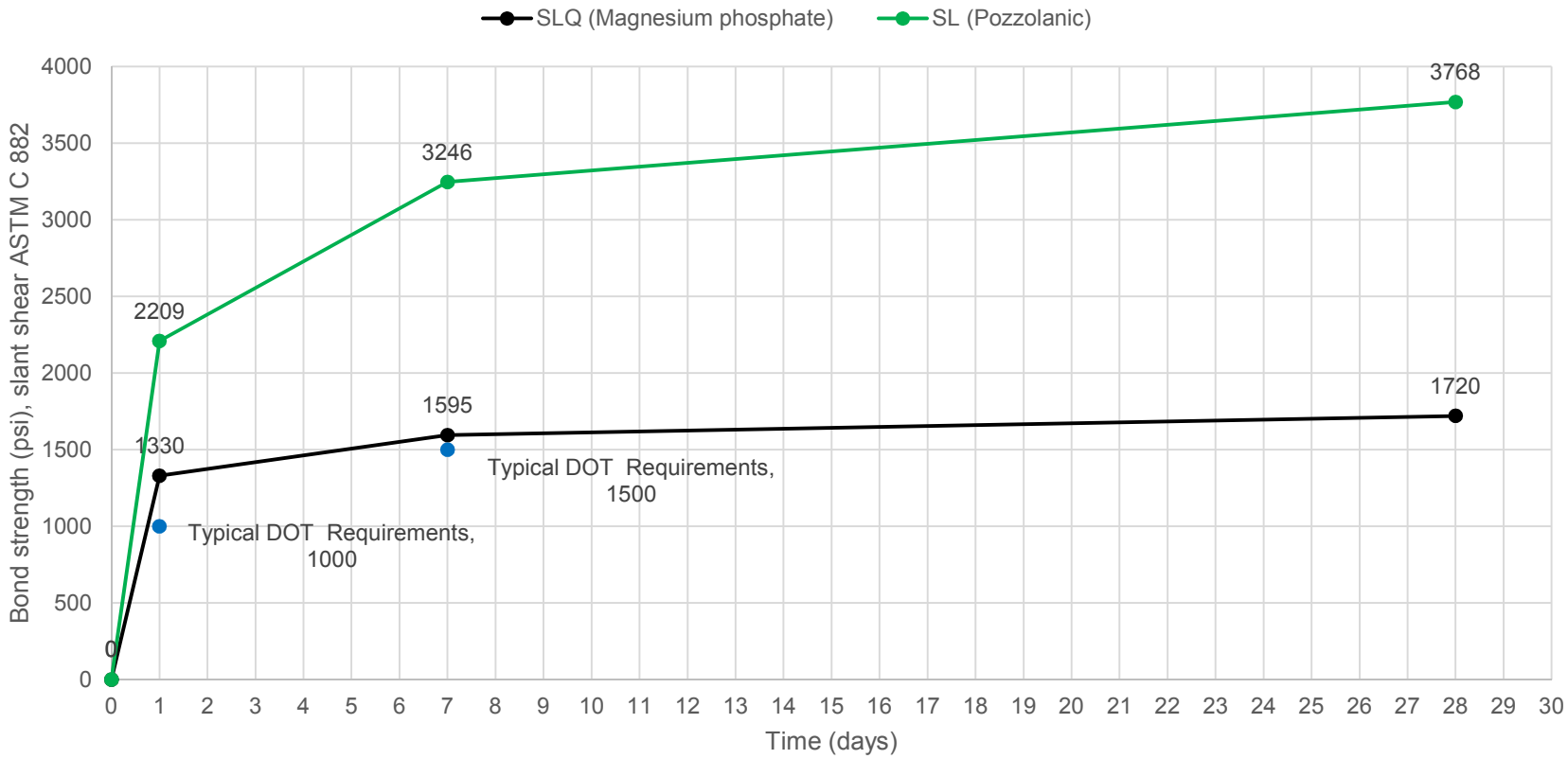
Compressive Strength 28 days



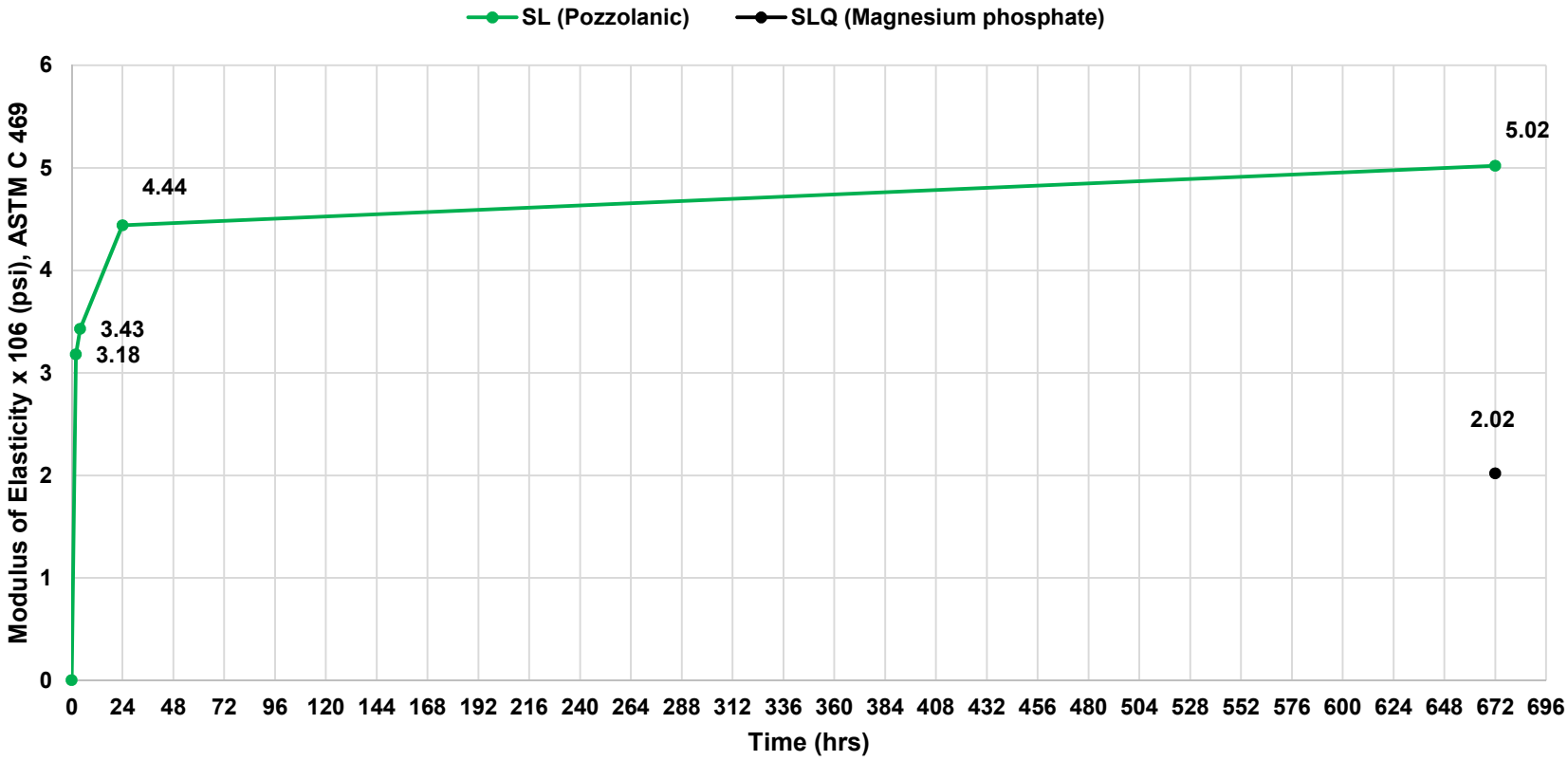
Flexural Strength



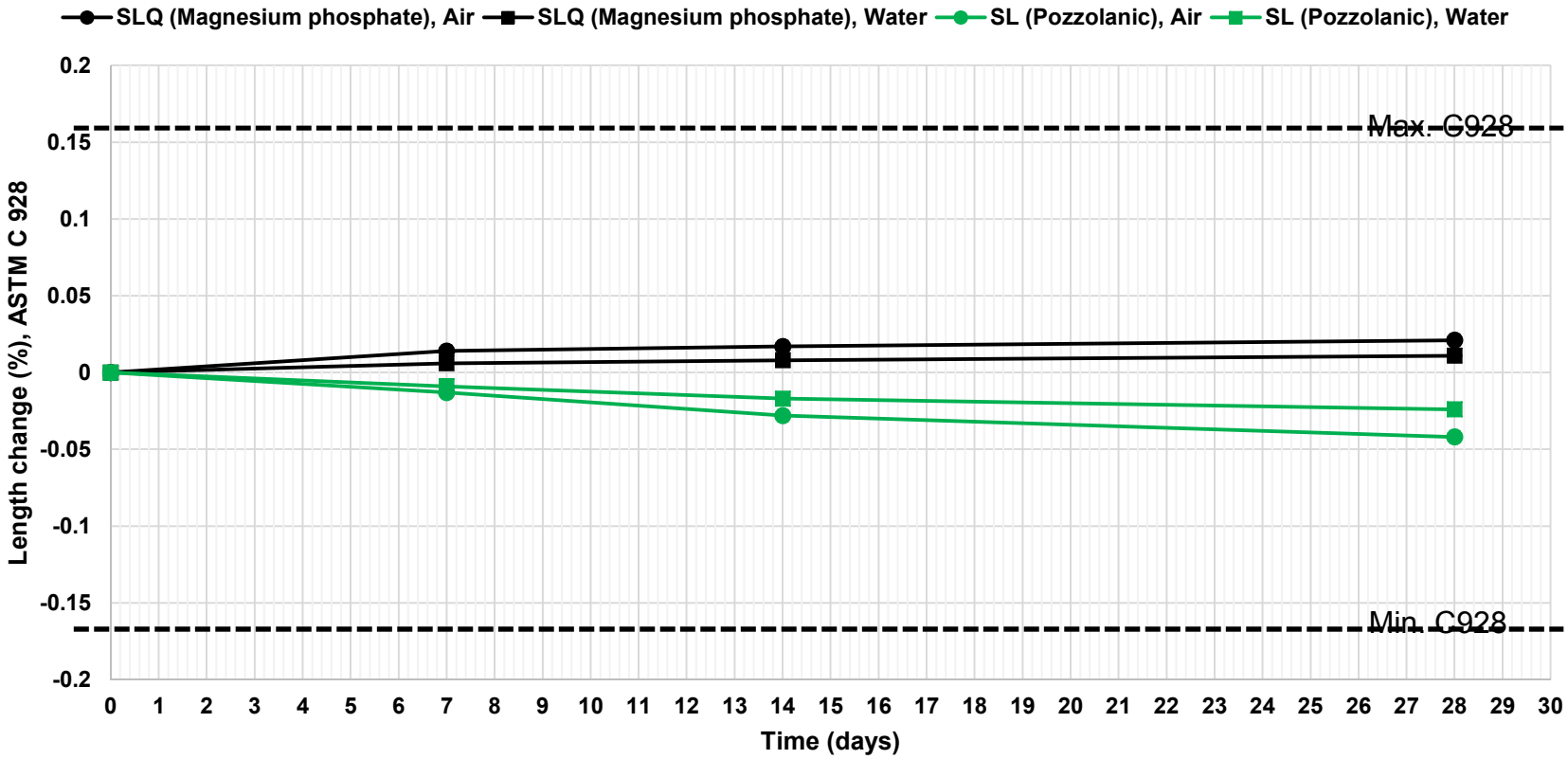
Bond Strength



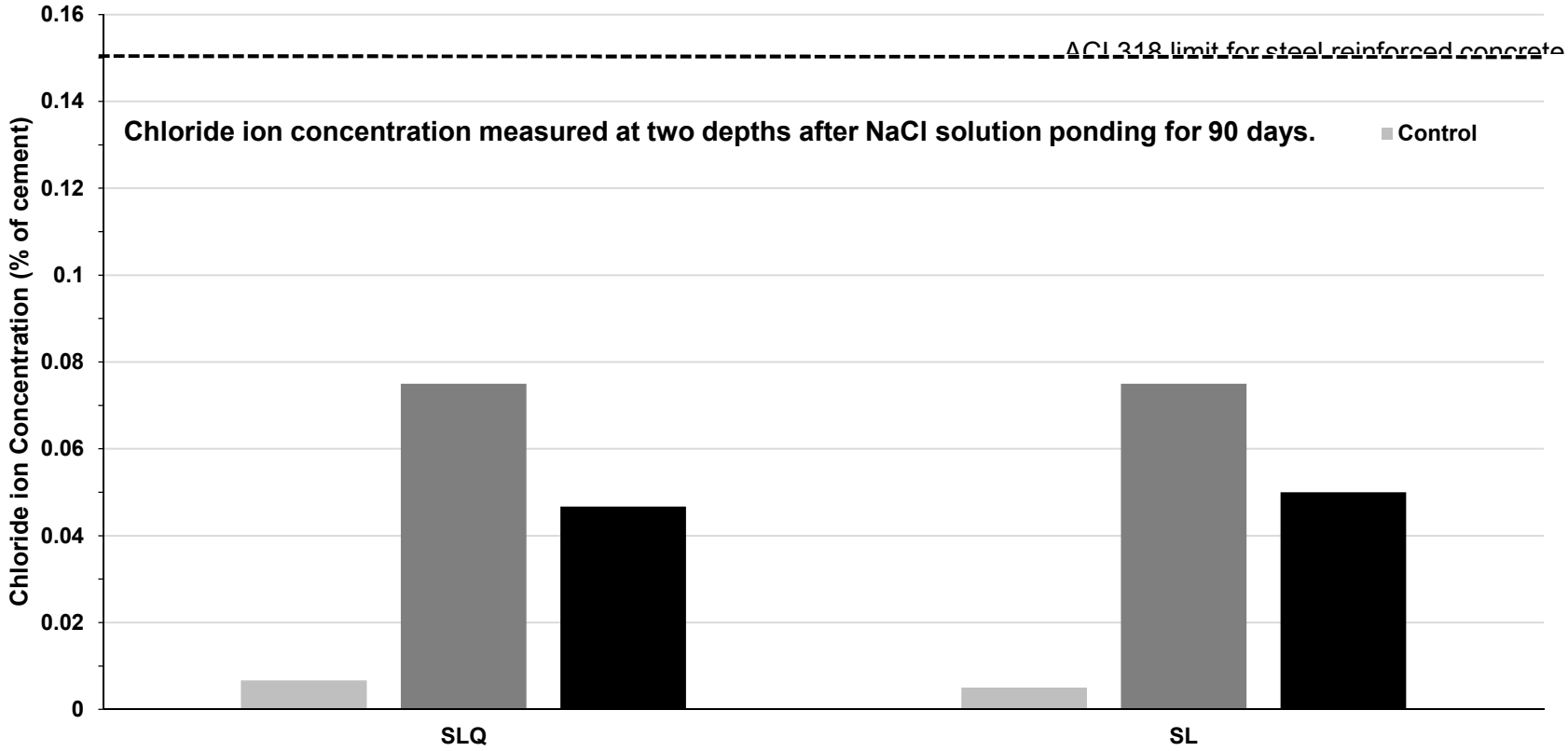
Elastic Modulus



Length Change



Chloride Ion Penetration



Summary – ***Both meet ASTM C 928 and most DoT requirements***

Magnesium Phosphate

- *Higher early compressive strength – faster return to service*
- *Lower MOE – Exceptional performance on thin section repairs*
- *Expansion <0.05%*

Pozzolanic

- *Higher compressive strength @ 28 days*
- *Higher flexural strength @ 28 days*
- Stronger bond
- Shrinkage <0.05%
- MOE matches existing concrete for full structural repairs required

- *Low Chloride ion permeability*
- *Resistance to salt scaling (<1lb/ft^2)*
- *Freeze thaw resistance (DF >95% after 300 cycles)*

CTI's Rapid Repair Products