# Systems and methodologies for corrosion prediction and collapse time estimation of post tensioned cables in ducts with grout defects

Cycle 39° - PhD Giglio Martina

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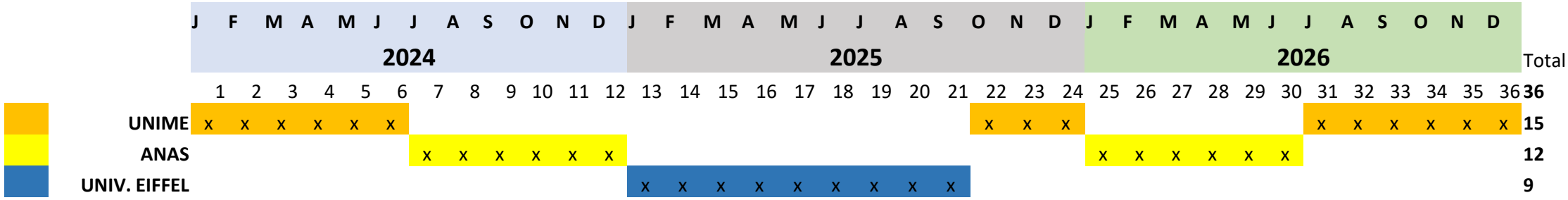
# Introduction

The research focuses on defining techniques for damage evaluation, residual strength and service life assessment of post-tensioned cables in ducts on prestressed bridges.

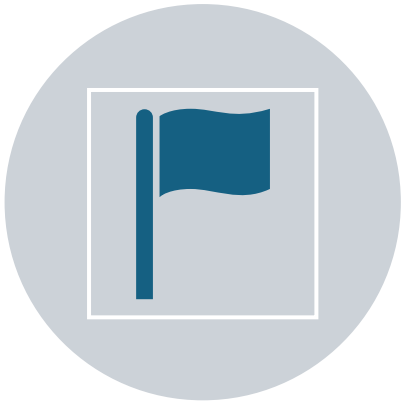
The work involves the estimation of the steel corrosion rate based on on-site evaluation and corrosion models.

# Scholarship fundings and timeline

My PhD position was co-financed thanks to the **DM 117 M4C2** grant, which falls within the scope of the initiatives envisaged by the PNRR. The funding is divided 50% between the **PNRR** and 50% by **ANAS**, which supports projects related to innovation in infrastructure and mobility.



# Research objectives



Implement **non-destructive testing methods** to assess the degradation of post-tensioned reinforcements without compromising the integrity of the structure.

Monitoring and quantifying the **corrosion levels** in reinforcements, ensuring rapid and reliable detection.

Quantify the rate of corrosion to estimate the **remaining service life** of the structure, with implications for maintenance planning and **safety assessments**.

# Company placement

- Safety course
- Course on work carried out in confined spaces

anas

**Attestato di formazione**

Si attesta che

*Martina Giglio*

Nata a Messina il 01/03/2000

ha partecipato con esito positivo alla verifica di apprendimento alla sessione formativa tirocinante (SO. Diagnostica Strutturale)

**Ai sensi "dell'art. 37 del D.Lgs. 81/08 e l'Accordo Stato Regioni del 21/12/2011"**

**Corso di formazione per lavoratori**

Modulo generale e specifico-ATECO 2007 -F costruzioni e ingegneria civile.

che si è tenuto al Centro di Ricerca e Sperimentazione Stradale di *Cesano* nei giorni 4-11 *Luglio 2024.*

Il corso, della durata di *16* ore ha avuto contenuti coerenti con l'Accordo Stato Regioni del 21/12/2011

Il RSPP
*Paolo Cuius*

Il Datore di Lavoro
*Marcello De Marco*

# Company placement

- Detensioning measurements



# Company placement

- Prestress loss estimation

**D.M.96**

$$\Delta\sigma_{tot} = \Delta\sigma_a + \Delta\sigma_r + \Delta\sigma_v + \Delta\sigma'_{ril}$$

Simple Addition

**Eurocode 2**

$$\Delta P_{c+s+r} = A_p \frac{\epsilon_{cs} E_p + 0.8\Delta\sigma_{pr} + \frac{E_p}{E_{cm}}\phi(t,t_0)\sigma_v}{1 + \frac{E_p}{E_{cm}}\frac{A_p}{A_c}(1 + \frac{A_c}{I_c}z_{cp}^2)[1 + 0.8\phi(t,t_0)]}$$

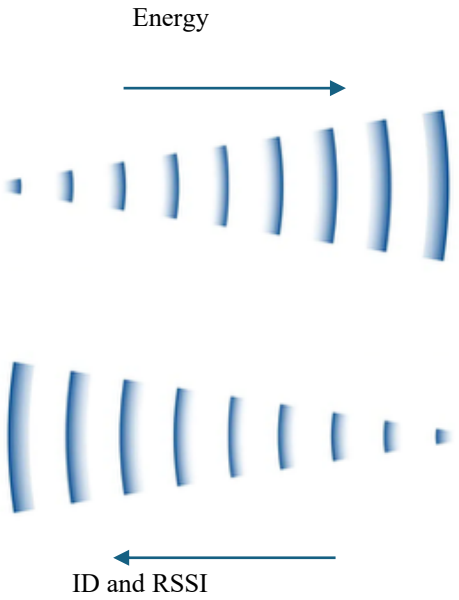
Interdipendence

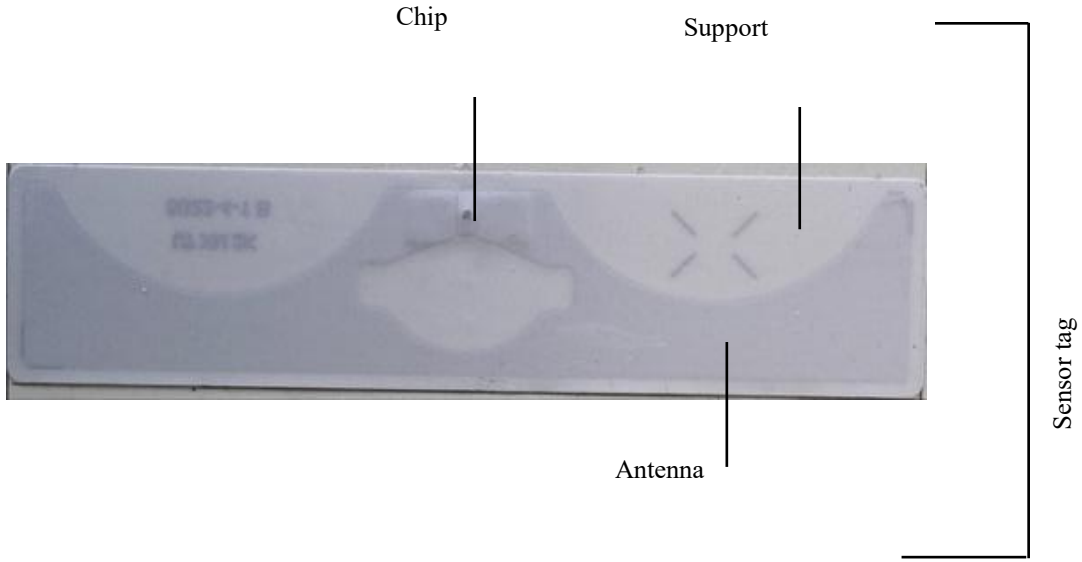
The calculation process involves:

- Determination of **real initial prestress forces**
- Consideration of short-term and **long-term losses**
- **Comparison** between measured and theoretical values
- Identification of discrepancies and **influencing factors**

# Period abroad

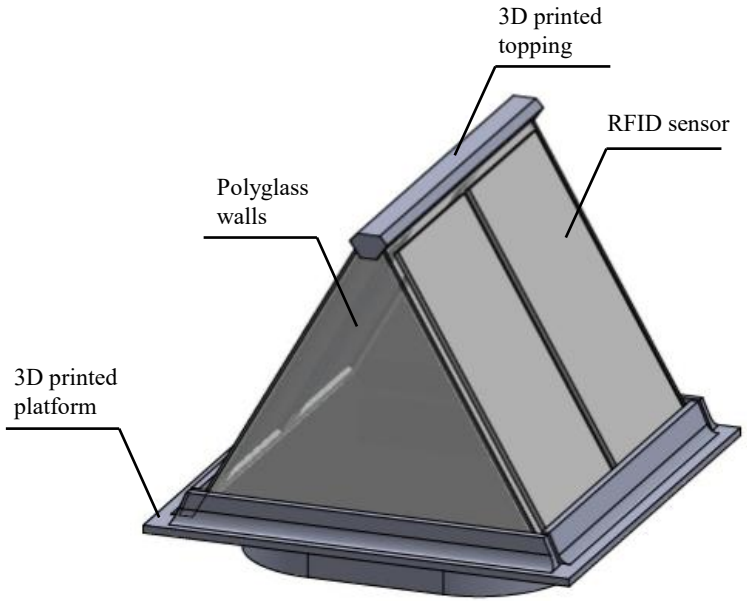
- RFID sensor technology

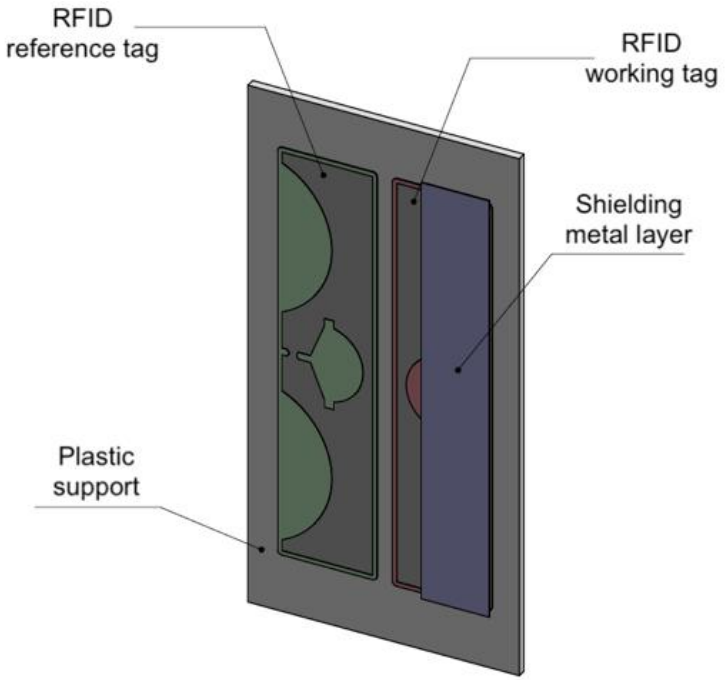


# Period abroad

- Accelerated corrosion tests – small samples



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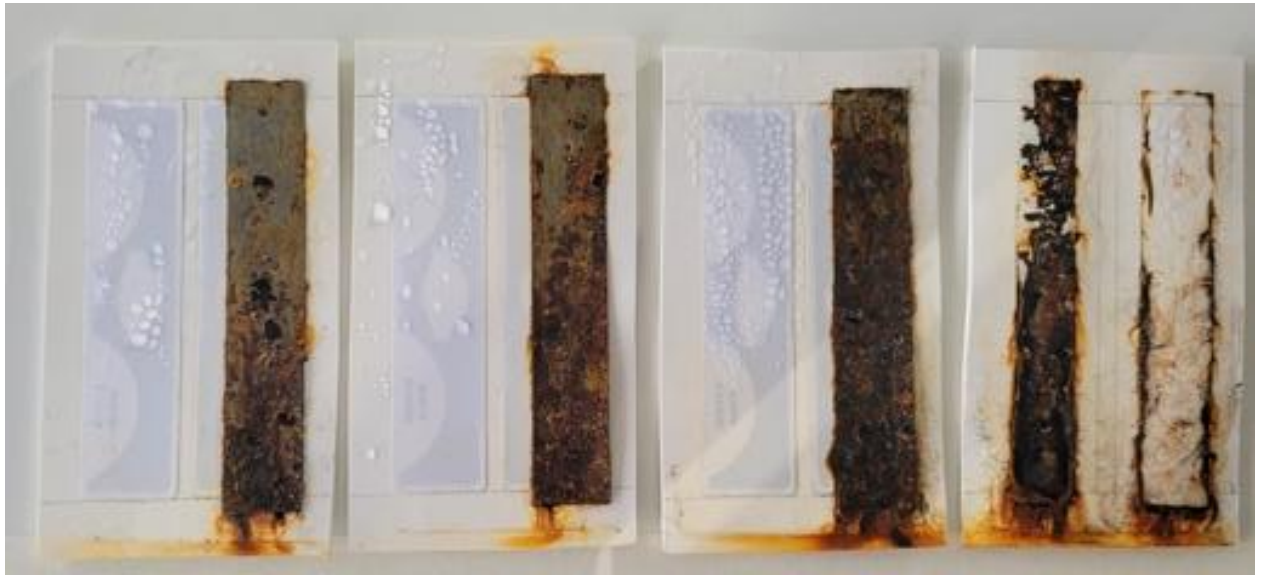
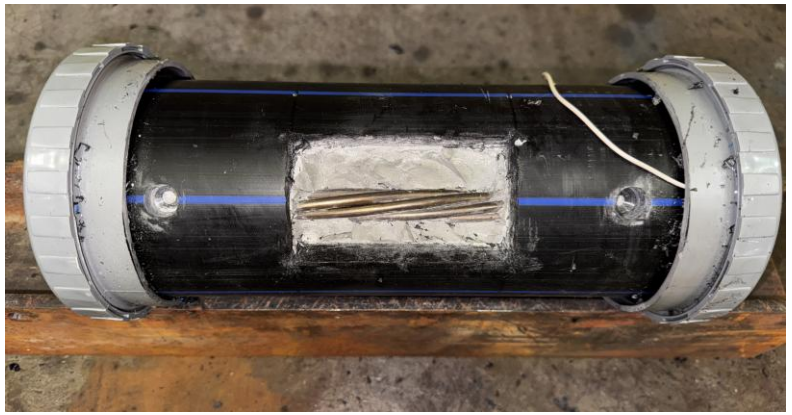
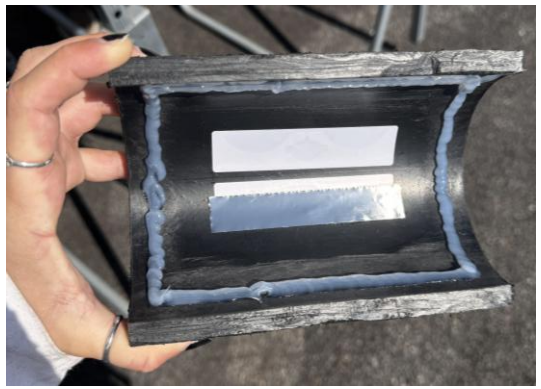
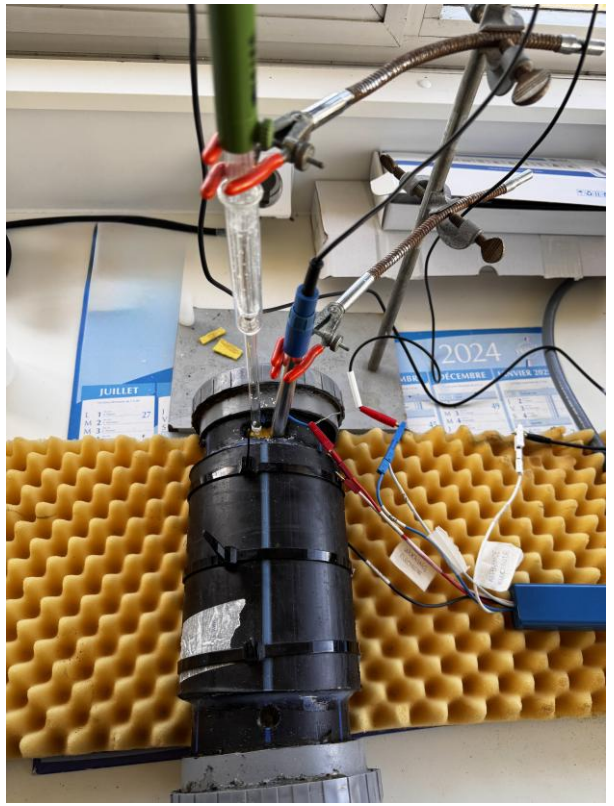


# Period abroad

- Accelerated corrosion tests- big samples







# Conclusions

- The research focuses on understanding and predicting the **degradation of post-tensioned concrete structures**, particularly due to grout defects.
- The goal is to develop predictive models that assess the **evolution of structural degradation over time**.

# THANK YOU FOR YOUR ATTENTION!