



***fib* Symposium2025**

Antibes - France

Concrete Structures :
extend lifespan, limit impacts

16-18 June, 2025



On-going durability and corrosion studies on the metric specimens cast as part of the National Project PerfDuB and exposed to natural ageing sites

François CUSSIGH (VINCI Construction, France)

and

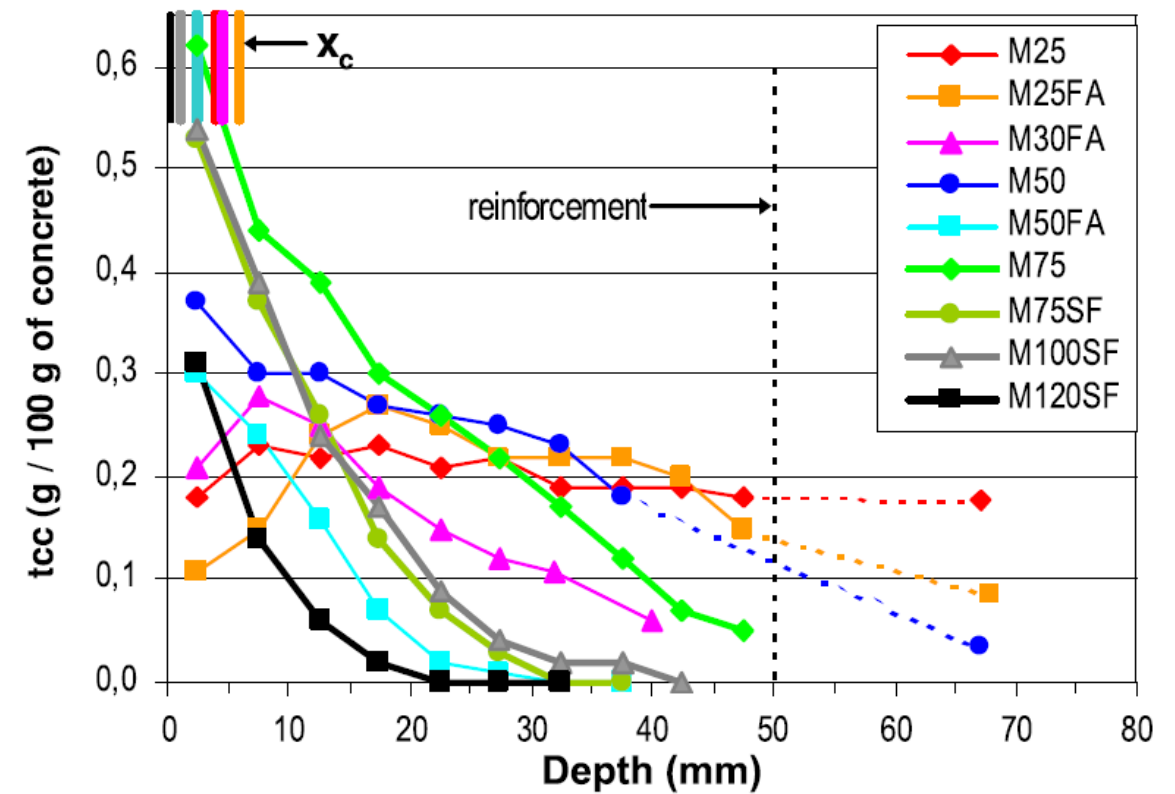
Véronique BOUTEILLER (Université Gustave Eiffel), Jonathan MAI-NHU (CERIB),

Philippe TURCRY (LASIE) and Elisabeth MARIE-VICTOIRE (LRMH)

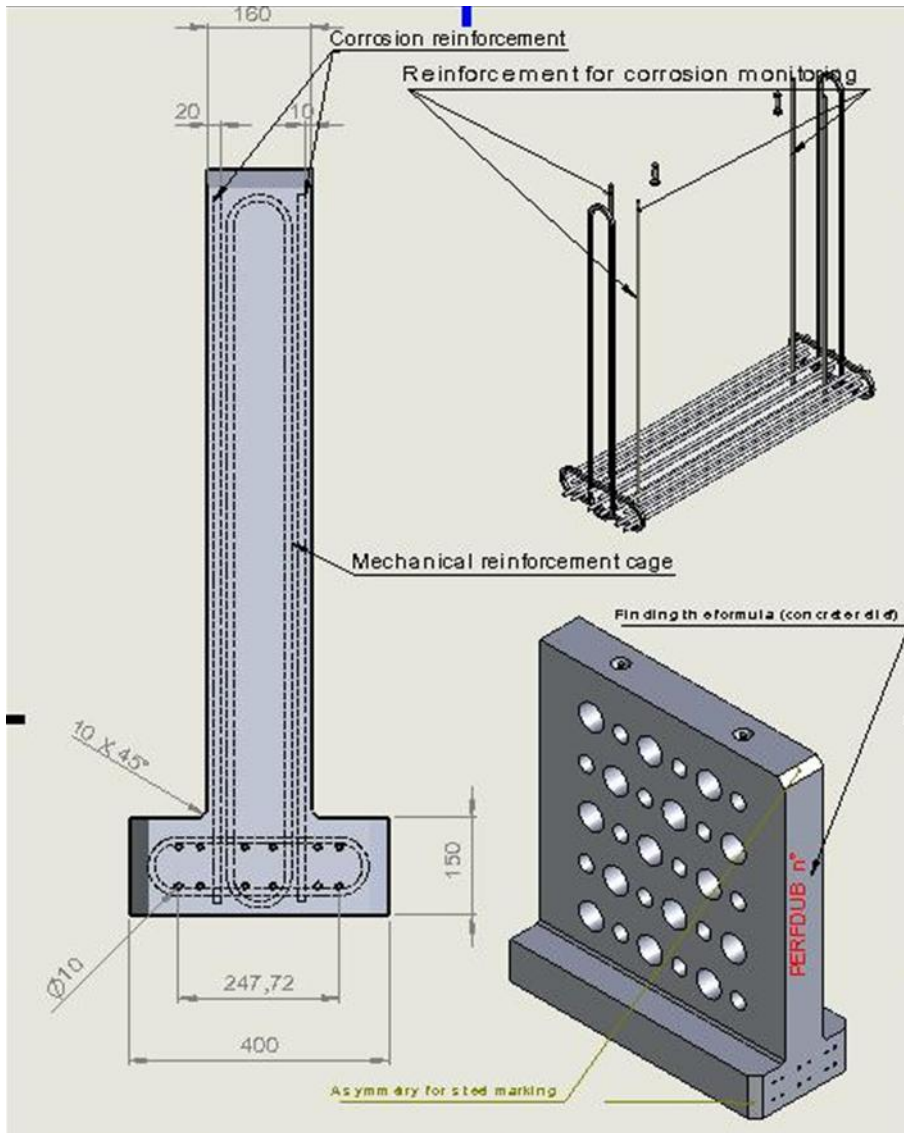
Interest of dedicated ageing specimens



BHP 2000 concrete blocks in La Rochelle



Objective of PerfDuB T-shaped specimens



- Follow-up on long term scale (20 years) :
 - carbonation and chloride ingress
 - corrosion activity
- Exposure conditions :
 - XS3m (tidal and splash zone)
 - XS3e (spray zone)
 - XC4
- Rebars type : “smooth round” (RL) or “ribbed” (HA)
- Cover values : 10 or 20 mm

Concrete mix design and hardened properties

Mix Design	B01	B02	B04	B05	B07	B31	B36	B37	B38	B40	B41
Binder	CEM I	CEM I _V30	CEM III/A	CEM I _S60	CEM I _L41	CEM III/A	CEM V/A (S-V)	CEM V/A (S-V)	CEM I _D8	CEM I _Qz30	CEM I _M20
Binder content (kg/m ³)	280	330	290	310	455	385	365	375	385	370	375
W/B	0.62	0.52	0.61	0.57	0.42	0.40	0.45	0.45	0.35	0.47	0.35
Aggregate type	G2	G2	G2	G2	G2	G1	G4	G3	G1	G2	G1
fc28d(1) (MPa)	26.7	42.5	53.6	49.9	40.8	78.9	61.8	78.5	101.3	44	87.7
fc28d(2) (MPa)	28.8	31.9	49.9	44.5	42.6	61.6	49.9	74.4	103.5	39.9	88.5
Porosity ϕ (3) (%)	16.9	17.4	16.7	18.6	16.8	12.1	19.6	12.8	10.3	16.6	10.8

- (1): measured on set of concrete batches for XC4 exposure conditions
 (2): measured on set of concrete batches for XS3m exposure conditions
 (3): measured on similar concrete mixes studied during PerfDuB project

Aggregate characteristics

	G1	G2	G3	G4
Mineralogy	Siliceous-limestone alluvial	Siliceous-limestone alluvial	Hard limestone	Limestone
Shape	Semi-crushed	Sand: rounded	Crushed	Crushed
		Gravel: mix of rounded and crushed		
Water Absorption (%)	0/4: 0.7	2.70	0.60	0/4: 4.0
	4/11: 1.0			4/10: 4.4
	11/22: 1.3			10/20: 4.0
Dmax (mm)	22	20	20	20

11 concrete mixes in XS3m and XC4



XS3m exposure : La Rochelle



XC4 exposure : Epernon

Rebar corrosion study

- Annual non-destructive testing (NDT) using portable laboratory potentiostats and field equipment (11 concrete mixes)
- Continuous monitoring using sensors embedded in instrumented specimens (3 concrete mixes: B01, B04 and B31) :
 - resistivity measurements
 - potential measurements
 - current measurements

3 concrete mixes with monitoring



4 ERE electrodes (Force Technology)

2 MRE sensors (Sensortec) with 8 rings in a range of 5 to 40 mm depth

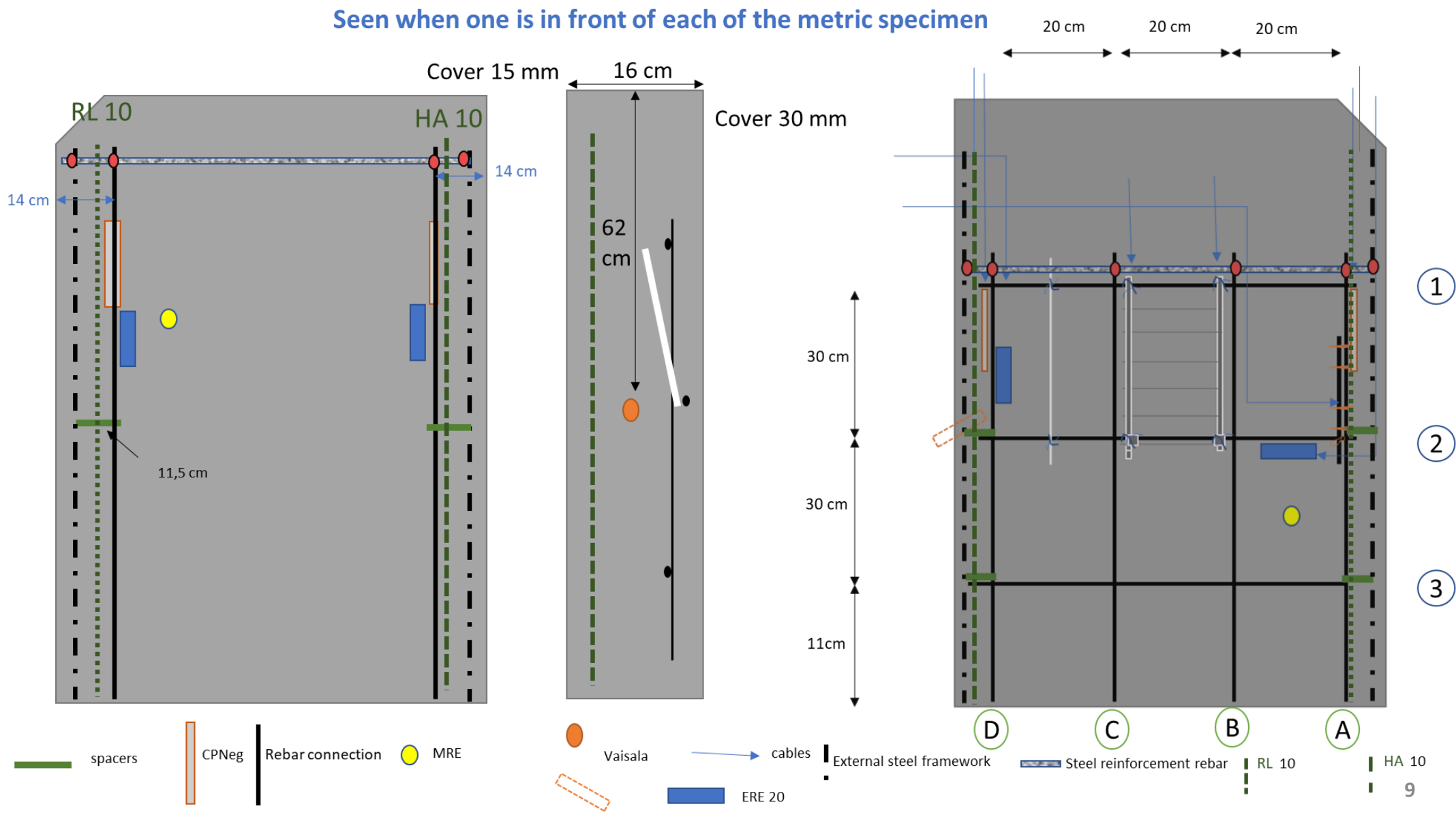
1 anode ladder sensor (Sensortec)

1 HMP110 sensor (Vaisala)

Weather station

Acquisition system (Ibac – Aachen University)

3 concrete mixes with monitoring



3 concrete mixes with monitoring



XS3e exposure in La Pallice



XC4 exposure in Champs sur Marne

Thanks for your kind attention