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Mid term
meeting

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Paulo Candéias
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Istanbul
Sep./Oct. 2010

Project Technical Committee (PTC) Meeting

WP2 - Experimental activity on new and existing connections

Activity of the Portuguese group

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Summary:

- Task 3 - Tests on joints and subassemblies
- Task 4 - Shaking table tests

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Task 3

- Tests on 2D “T” frames
 - Full scale models
 - Monotonic test
 - Cyclic test
- Beam-column connections
 - Two dowels, grouted
 - Four dowels, grouted
 - Four dowels, grouted, prestressed

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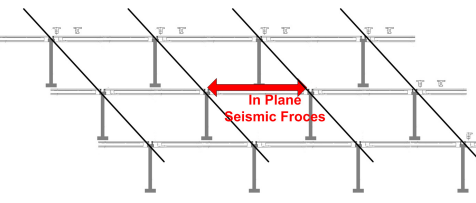
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Task 3

- Objective:** Testing of subassemblages of real scale industrial precast portal frame – T frames



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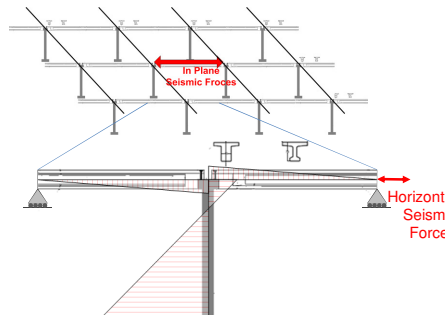
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Task 3

- Objective:** Testing of subassemblages of real scale industrial precast portal frame – T frames



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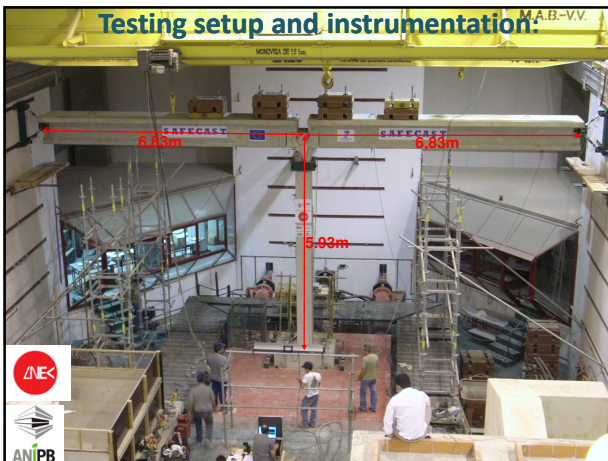
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Task 3

- Testing plan:** Traditional and improved beam-column connections.

	Connection type	Loading
Model #0		Grouted dowels Monotonic
Model #1	Two dowels	Grouted dowels Cyclic
Model #2		Grouted with pre-stress Cyclic
Model #3	Four dowels	Grouted dowels Monotonic
Model #4		Grouted dowels Cyclic
Model #5		Grouted with pre-stress Cyclic

- Total of 6 tests; 2 traditional and 6 improved solutions



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Task 3

- **Testing setup and instrumentation:**
 - Out-of-plane displacement constraint

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Task 3

- **Testing setup and instrumentation:**
 - Assessment of internal forces (4th degree hyperstatic str.)
 - Assessment Lateral displacements of the column along the height & column top rotation

Reaction wall

Beam-column connection

Reaction wall

Measured forces

Hinged connections

Fixed connection

Forces obtained through global equilibrium

Shaking table

Imposed displacements

East side

West side

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Task 3

- **Measurement of internal forces**
 - 2x2 orthogonal cell forces at each beam ends fixed on the reaction walls

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Task 3

- **Column rotation and rotation motions at the top**
 - 26x3 components infrared leds (Krypton equipment)

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Task 3

- **Column Lateral displacements**
 - 6x3 components optical infrared (Krypton equipment)
 - 5x2 components optical infrared (Hamamatsu equipment)

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Task 3

- Model 0 – Two dowels, grouted, monotonic

Reaction wall

East side

Shaking table

West side

Monotonic test

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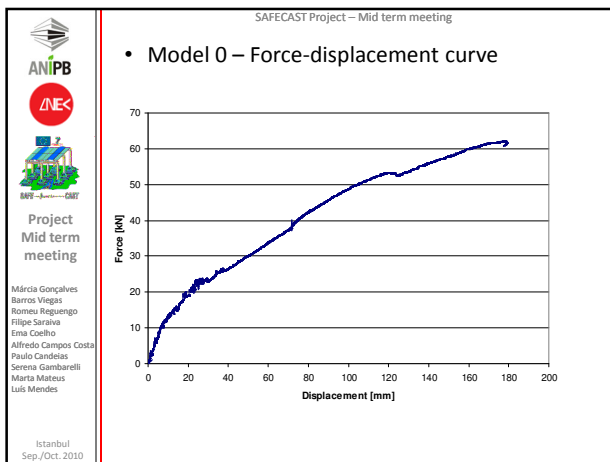
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MODEL 0

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MODEL 0

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Task 3

- Model 0

Crack in the beam

Dowel action

Concrete reaction

Crack in the cantilever

Monotonic test

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Task 3

- Model 0

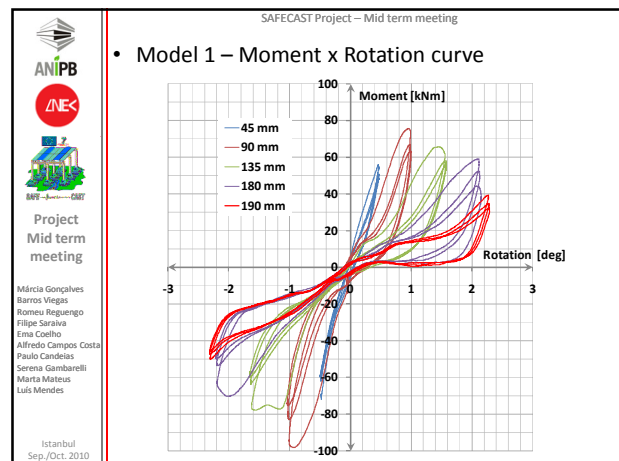
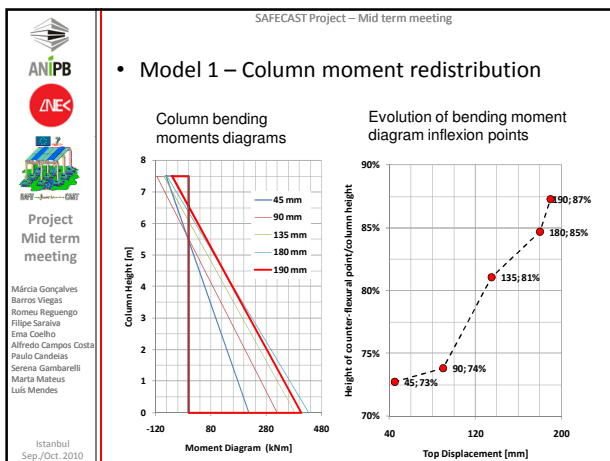
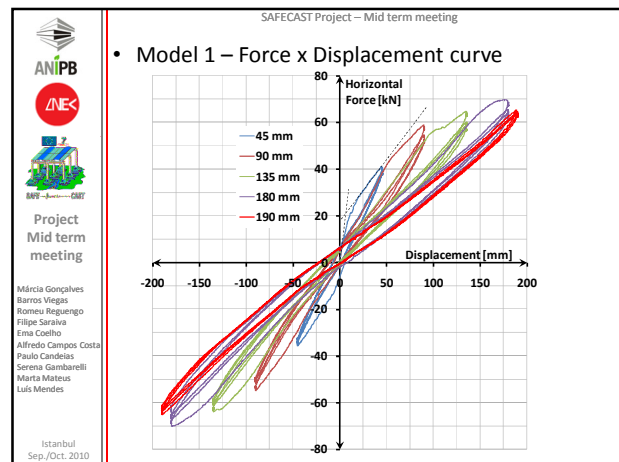
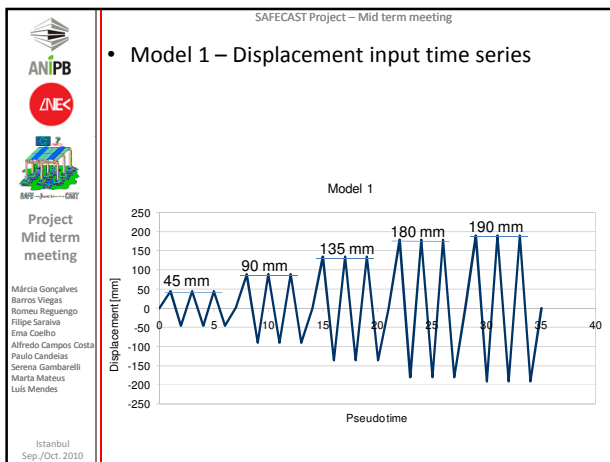
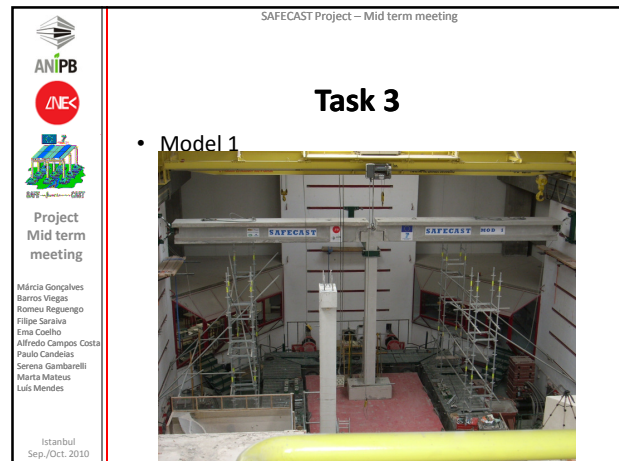
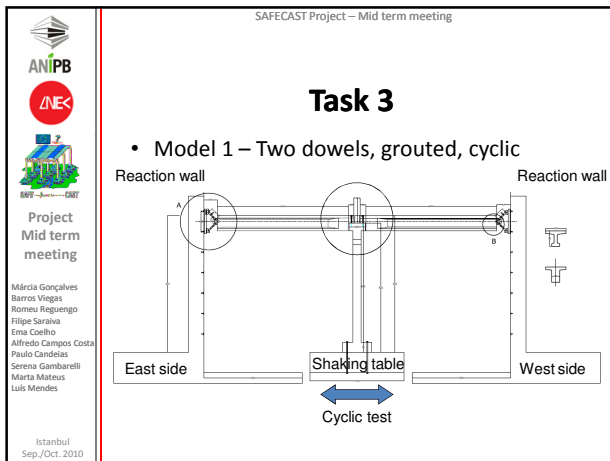
Cracking of the outer side of the cantilever

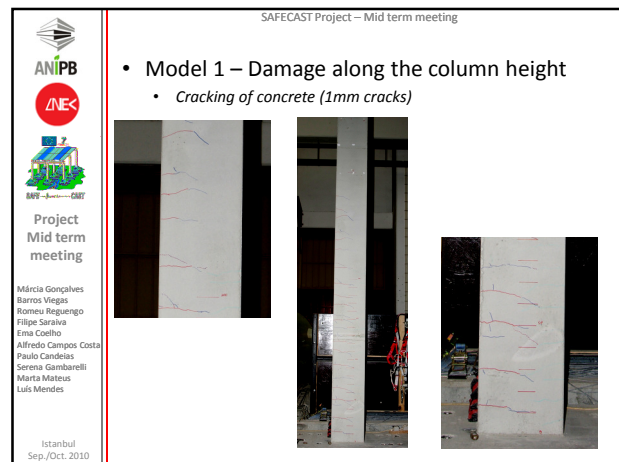
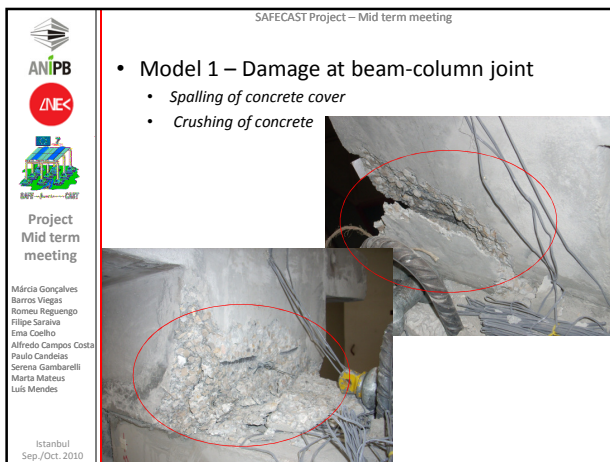
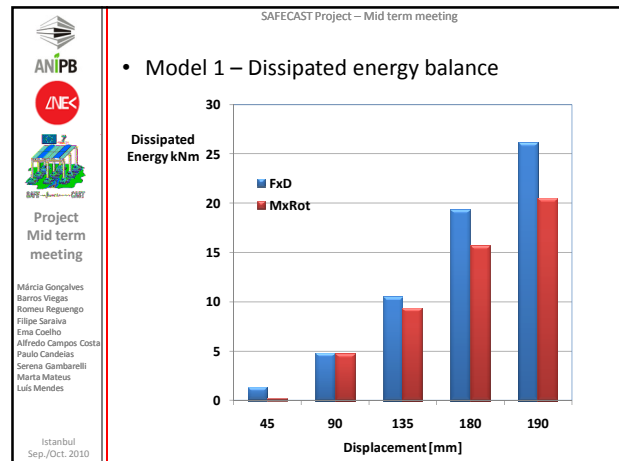
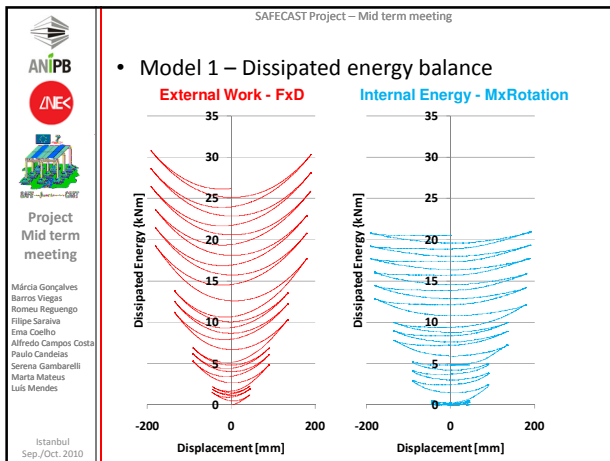
No apparent damage in the beams/dowels

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Preliminary Conclusions

- Even with a large displacement input collapse of the assemblage was not achieved either for monotonic and cycling loading.

- There is some initial beam-column joint moment-rotation stiffness that reduces along the test.
- Damage were concentrated mainly in the beam column connection.
- Moderate damage was also observed along the height of the column (lower 2m flexural cracks)
- Energy dissipation was mainly absorbed by a beam-column joint mechanism
- Spalling and crushing of concrete on pile corbels and beams at the joint reduces the moment resisting capacity of the joint

- Better balance design between moment bearing capacities of joint and column will be our goal (4 dowels?)

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Future work

- WP3 – Experimental activity
 - TASK 3 – Continue the assemblage T portal frame tests
 - TASK 3 – JRC tests on joints impossible until the end of November (other commitments)
 - TASK 4 – Different testing setup for dynamic tests of cladding panels (due to similitude constraints)
- WP6 – Derivation of design rules (Serena Gambarelli MSc thesis)



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Thank you