

EARTHQUAKE EXPERIENCE OF TURKISH PRECAST INDUSTRY

TURKISH PRECAST BUILDINGS COMMITTEE

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Istanbul Technical University

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Bologna-ITALY

BRIEF HISTORY OF TURKISH PRECAST INDUSTRY

- FIRST EXPERIENCES IN RC PRECAST CONSTRUCTION GOES BACK 1960s.
- 90% OF THE INDUSTRIAL BUILDINGS WERE CONSTRUCTED BY USING RC PRECAST TECHNOLOGY IN 1990s.
- WESTERN EUROPEAN TYPE FRAME STRUCTURES (GRAVITY FRAMES) WERE CONSTRUCTED COMMONLY.
- DURING THE LAST TWO DECADES, AWARENESS ABOUT EQ BEHAVIOR ARE INCREASED.
- MOMENT RESISTING CONNECTIONS, DIAPHRAM ACTION, DRIFT RESTRICTION ETC.

Earthquake Damages Recorded in Last 30 Years (Members of TPA)

TURKISH EQs	Year	M _w	PGA	Total Building	Collapsed and Heavy Damaged	Minor/Moderate Damages
Adana / Ceyhan ⁽¹⁾	1998	5.9	0.22 g	114	-	4
Körfez / Kocaeli ⁽²⁾	1999	7.4	0.32 g	481	17	14
Bingol ⁽³⁾	2003	6.1	0.55 g	39	-	-
Van ⁽⁴⁾	2011	7.2	0.25 g	66	-	3
			Total	700	17	21

App. 3%

Single Story Frame Structures – Industrial Buildings



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1999 Kocaeli EQ.

Fotoğraf: Hakan ATAKÖY



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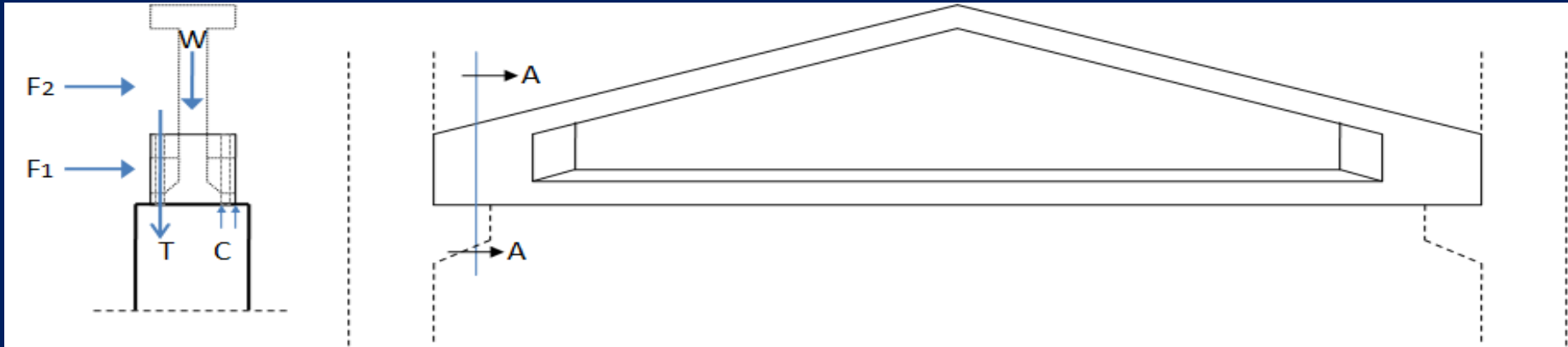
Single Story Frame Structures – Industrial Bldgs.

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1999 Kocaeli EQ.



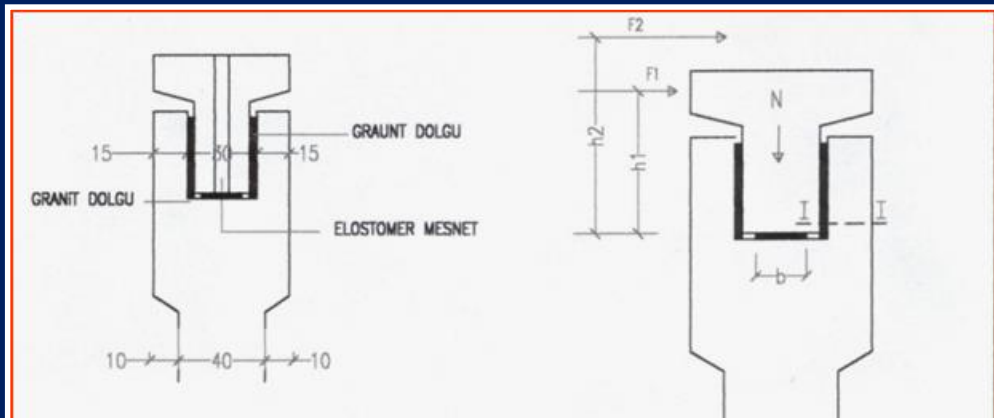
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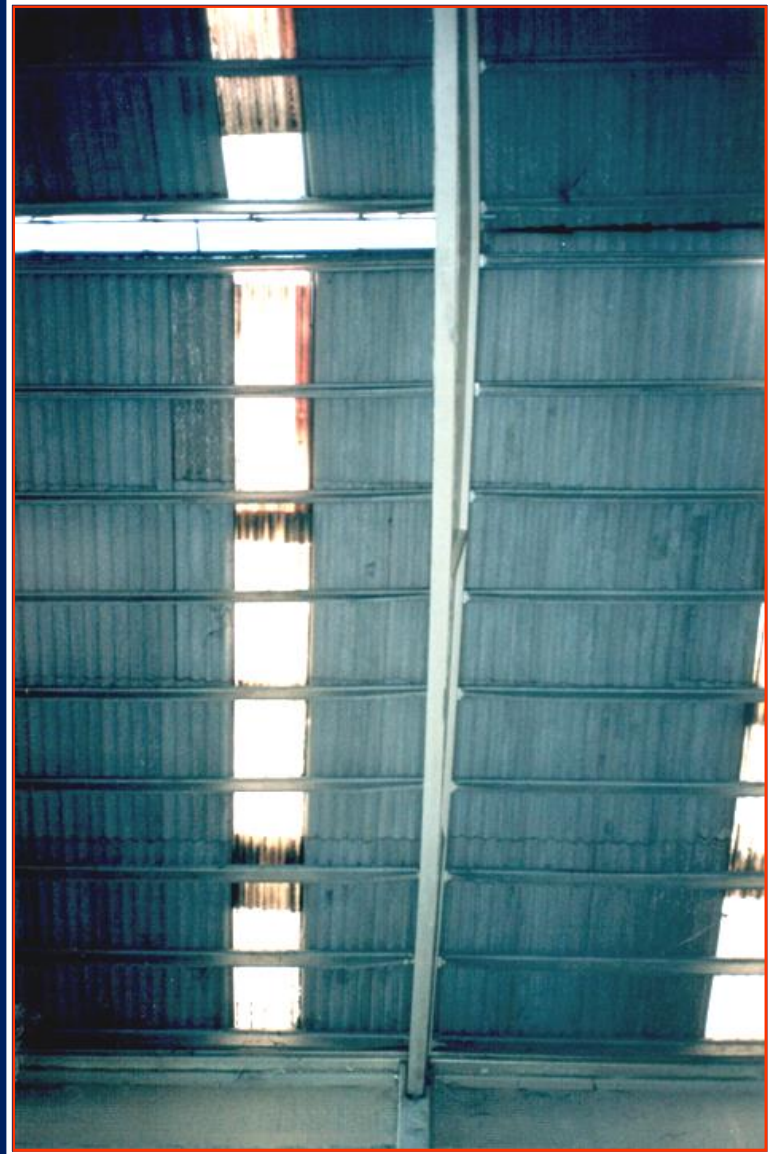


**Single Story
Frame
Structures –
Industrial Bldgs.**



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Out-of-plane deformation



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1999 Kocaeli EQ.



Kocaeli University Gymnasium



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2011 Van EQ.



Single Story Frame Structures – Industrial Bldgs.

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2011 Van EQ.



Single Story Frame Structures – Industrial Bldgs.

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*Hammering Effect Flexible
vs. Rigid Adjacent
Buildings*



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2011 Van EQ.



27.10.2016

Single Story Frame Structures – Industrial Bldgs.

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1984 – Right After Construction



Photo: Hakan Atakoy

Multi-Story Frame Structures – Residential Bldgs.

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2004 Bingol EQ.



EARTHQUAKE EXPERIENCE OF TURKISH PRECAST INDUSTRY

1999 Kocaeli EQ.



*Student Hostel
Avcılar-Istanbul*

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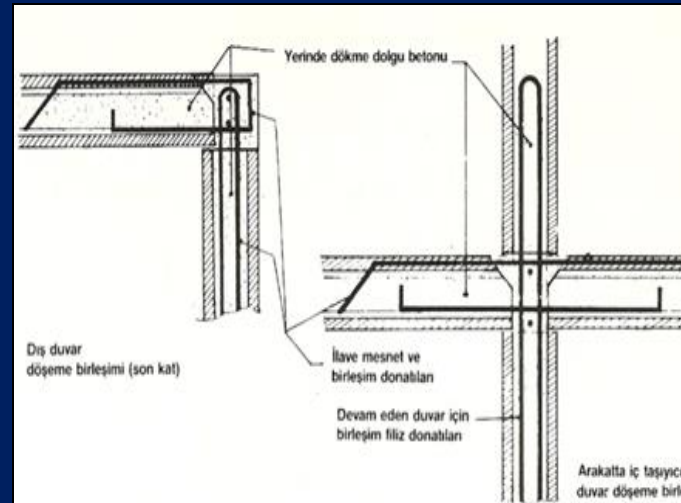
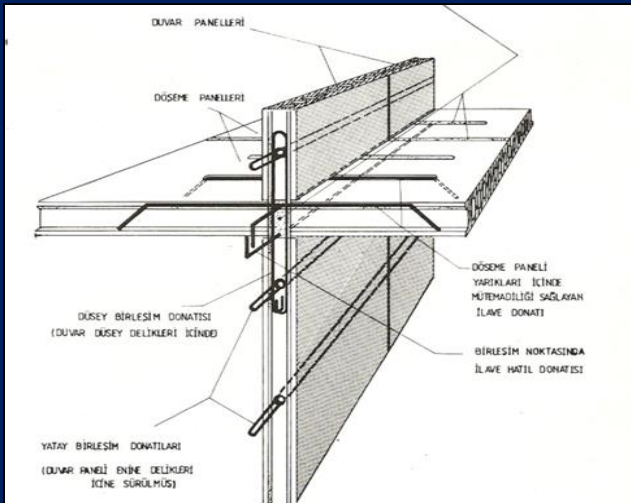
2011 Van EQ.



Multi-Story Frame Structures – Gymnasiums

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Residential Houses For Immigrants – Kocaeli - 1990



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1999 Kocaeli EQ.



Conventional RC vs. Precast RC Buildings

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Construction of Post-tensioning Precast RC Building



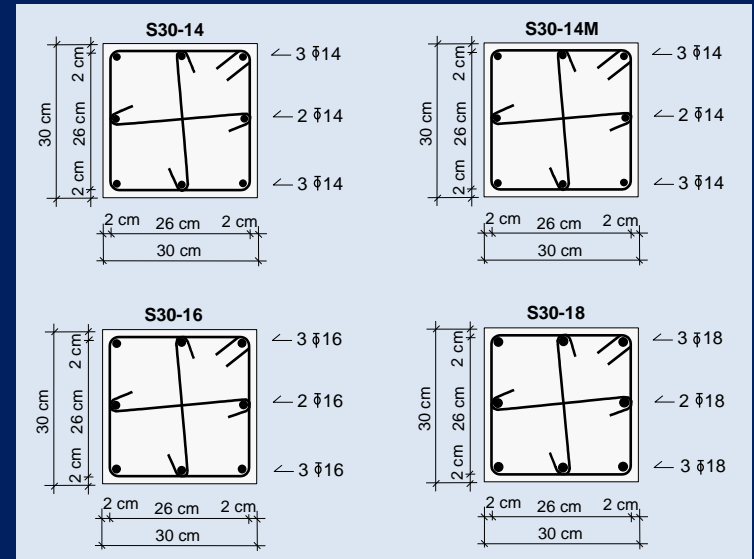
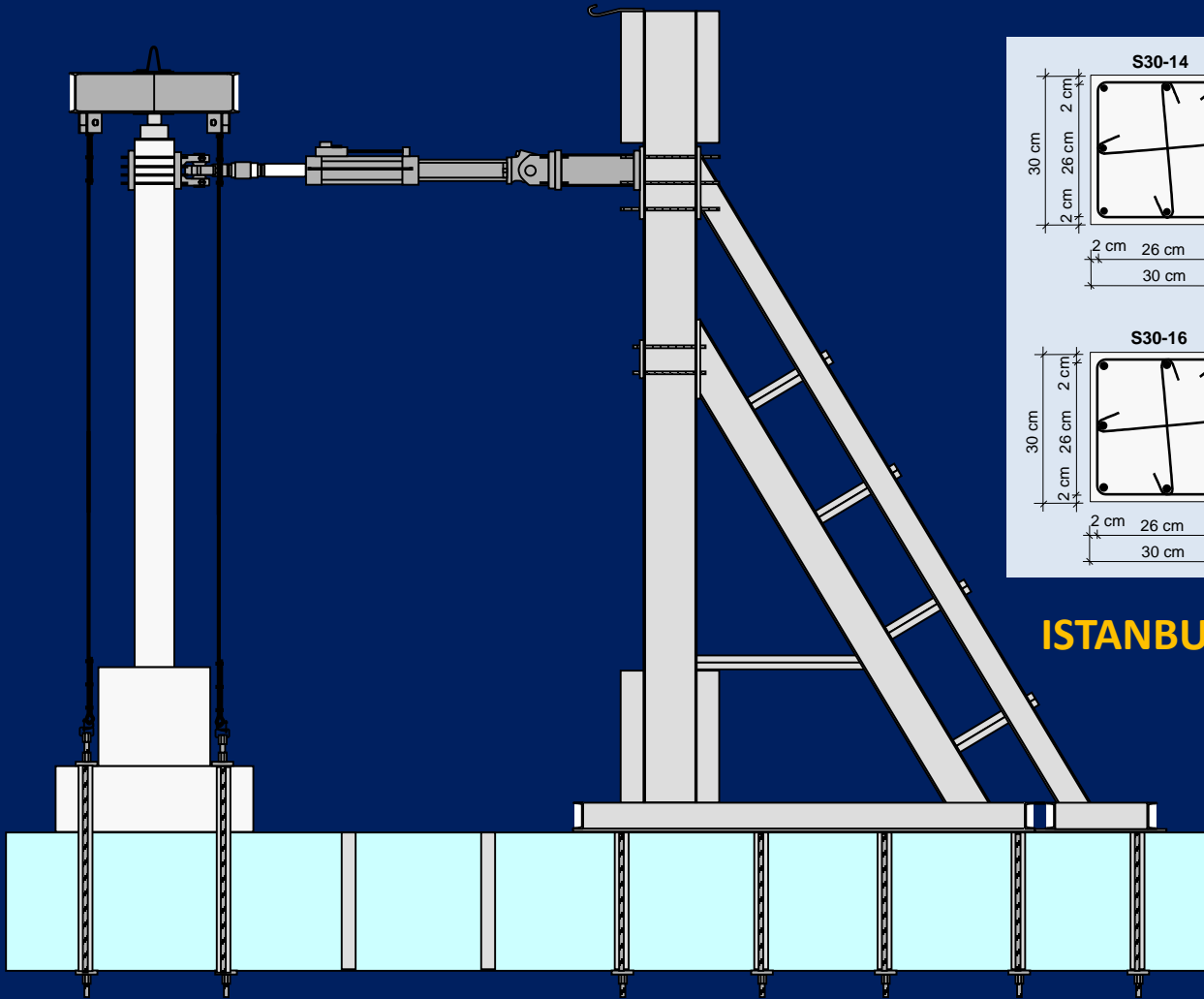
EARTHQUAKE EXPERIENCE OF TURKISH PRECAST INDUSTRY

2011 Van



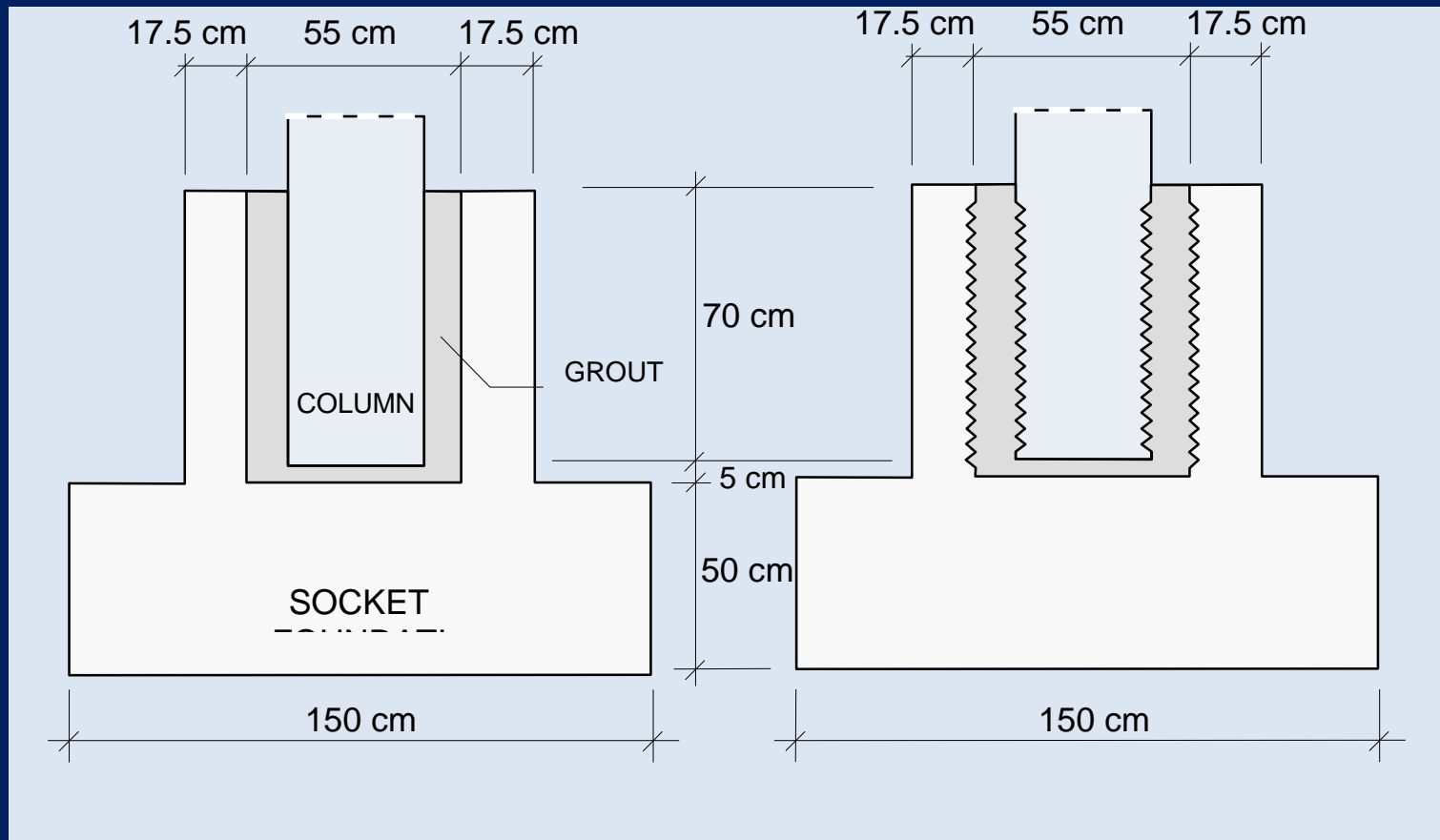
RESEARCH ACTIVITIES

FULL SCALE COLUMN TESTS

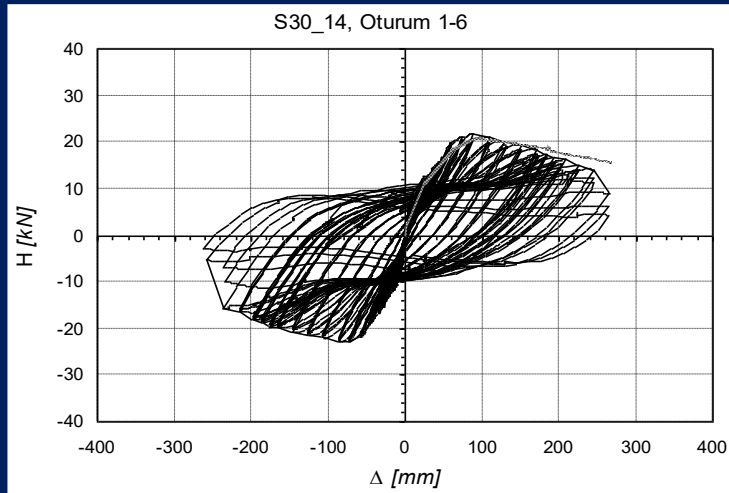


ISTANBUL TECHNICAL UNIVERSITY

ALTERNATIVE CONNECTION DETAILS



FULL SCALE COLUMN TESTS



MOMENT RESISTING BEAM-COLUMN CONNECTION TESTS

SAFECAST 2009- 2012

Industrial Type		ITMNM	ITMPM	ITC-1	ITC-2
Residential Type		RTMNM	RTMPM	RTC-1	RTC-2
IT	Industrial Type		RT	Residential Type	
M	Monotonic		C	Cyclic	
PM	Positive Moment		NM	Negative Moment	

MOMENT RESISTING BEAM-COLUMN CONNECTION TESTS SAFECAST 2009- 2012

INDUSTRIAL TYPE BEAM- COLUMN CONNECTION

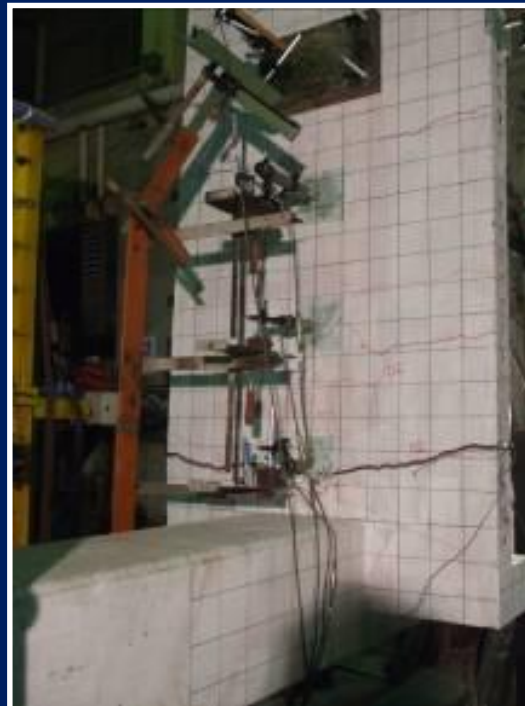
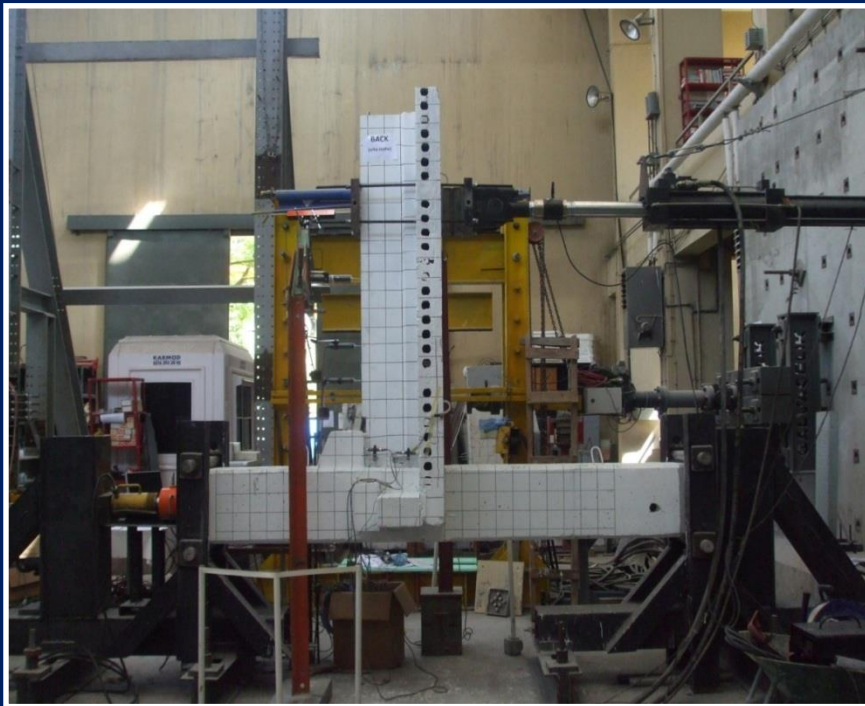


MOMENT RESISTING BEAM-COLUMN CONNECTION TESTS SAFECAST 2009- 2012



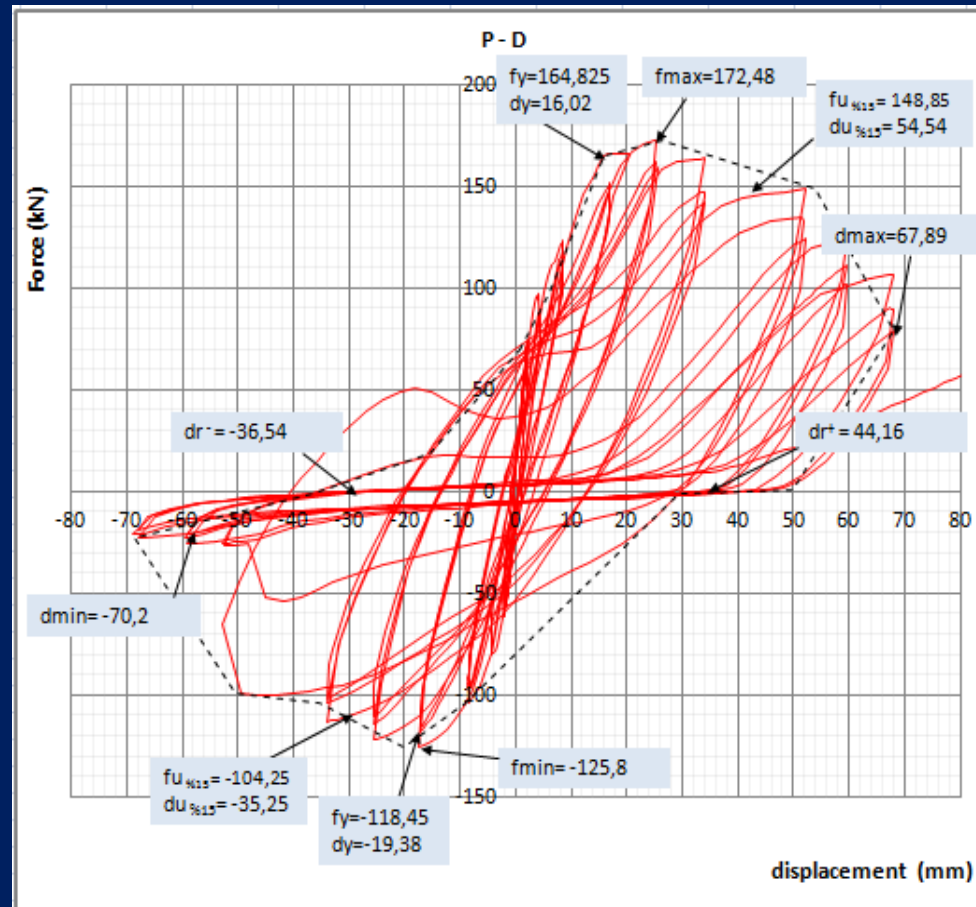
RESIDENTIAL TYPE BEAM- COLUMN CONNECTION

MOMENT RESISTING BEAM-COLUMN CONNECTION TESTS SAFECAST 2009- 2012



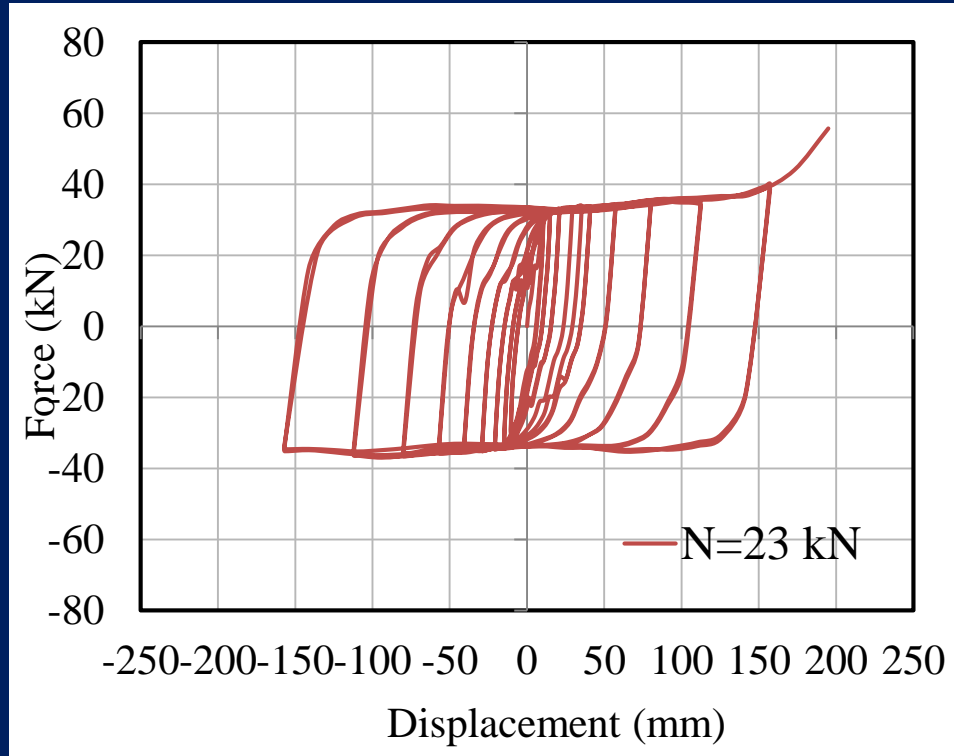
MOMENT RESISTING BEAM-COLUMN CONNECTION TESTS

SAFECAST 2009- 2012



INNOVATIVE CONNECTION DEVICES FOR CLADDINGS

SAFECLADDING 2012- 2015



ENERGY DISSIPATIVE STEEL CUSHIONS

INNOVATIVE CONNECTION DEVICES FOR CLADDINGS SAFECLADDING 2012- 2015

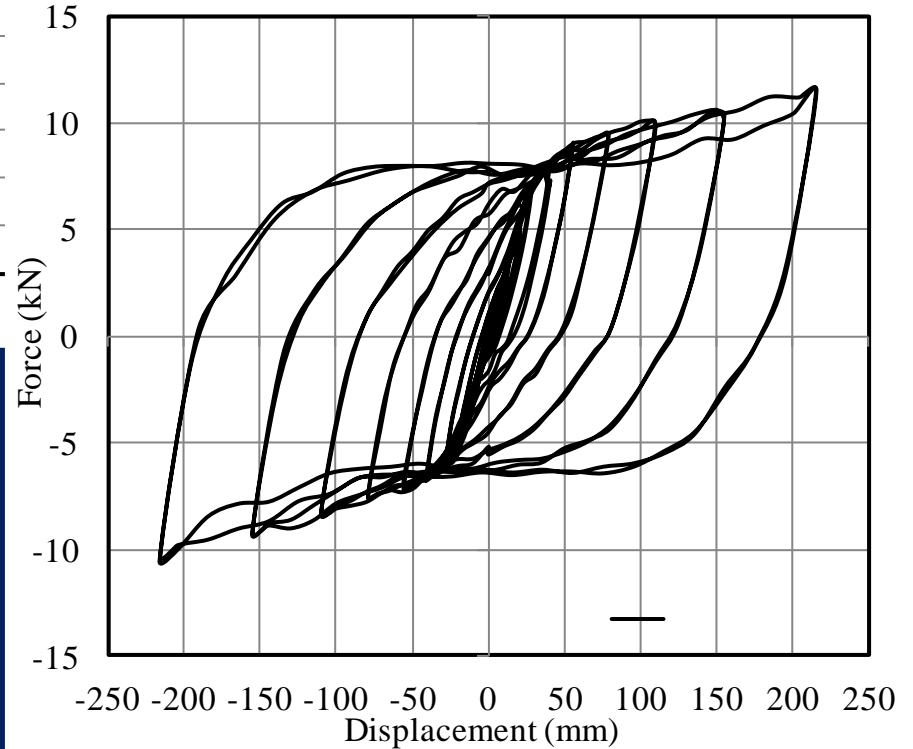
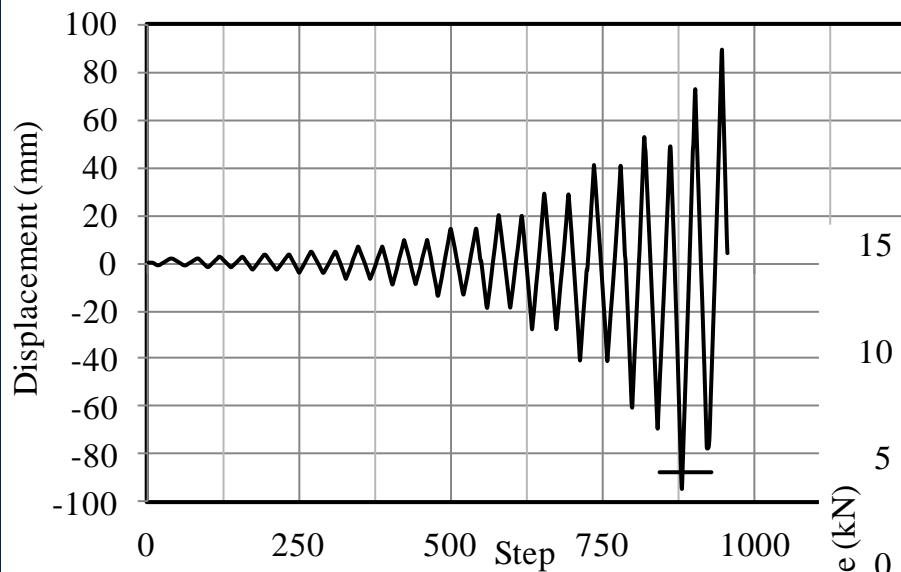


INNOVATIVE CONNECTION DETAILS FOR CLADDINGS SAFECLADDING 2012- 2015



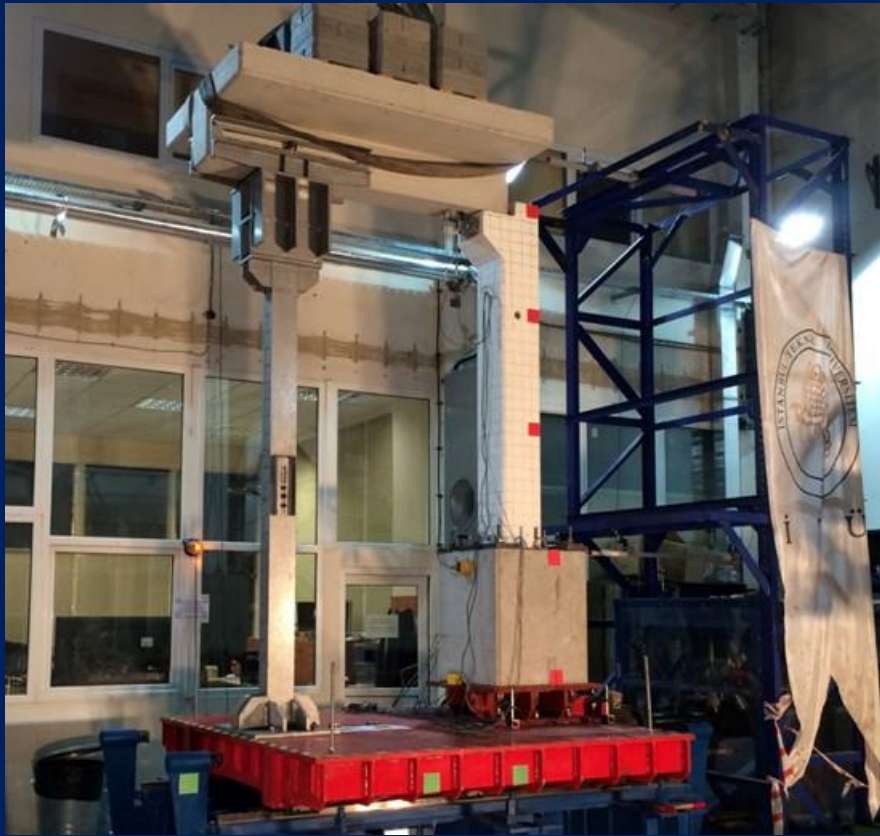
INNOVATIVE CONNECTION DETAILS FOR CLADDINGS

SAFECLADDING 2012- 2015



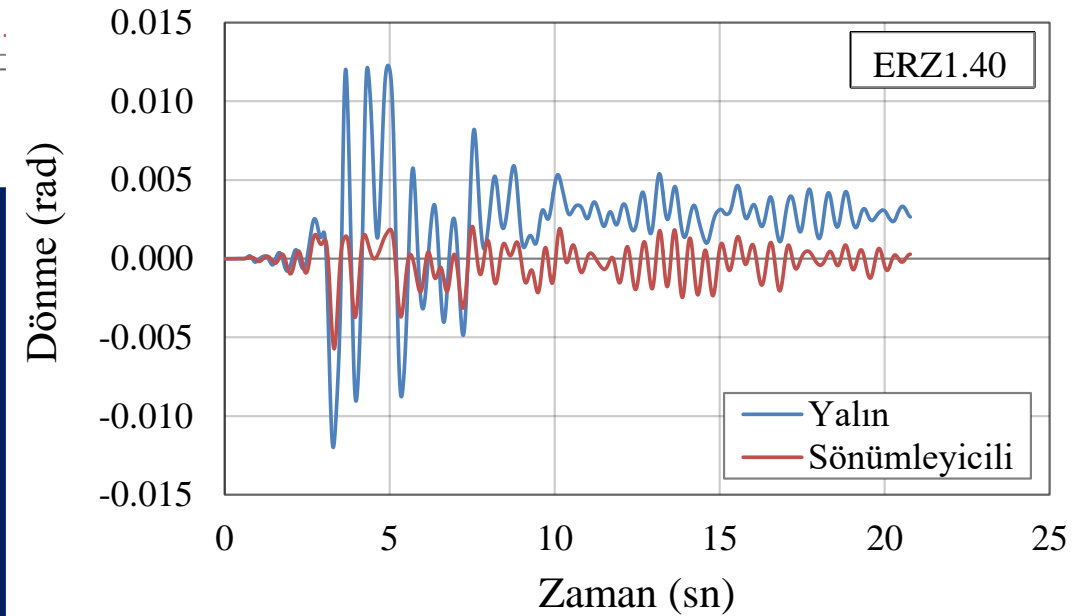
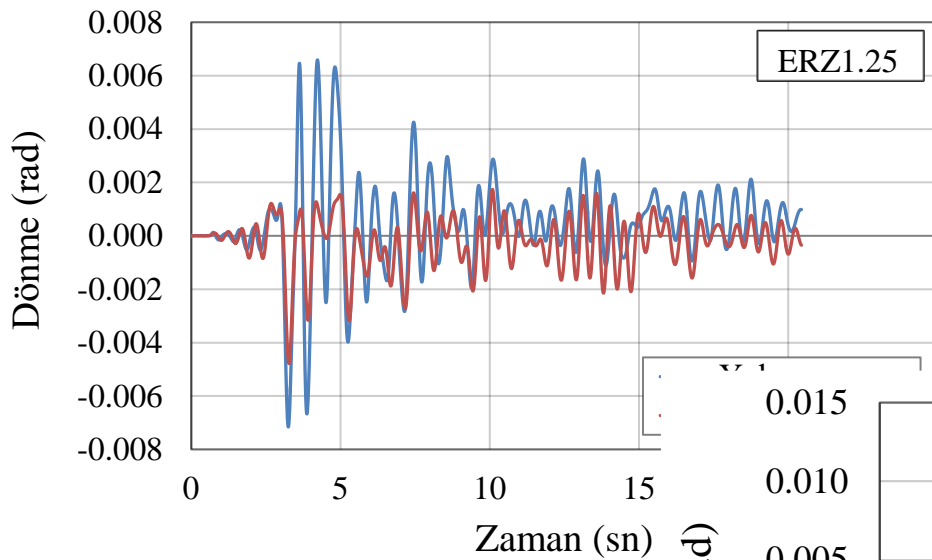
Retrofitting of the Pinned Beam to Column Connections of RC Precast Frames by Lead Extrusion Dampers

Ph.D. Thesis of Dr.Cihan SOYDAN



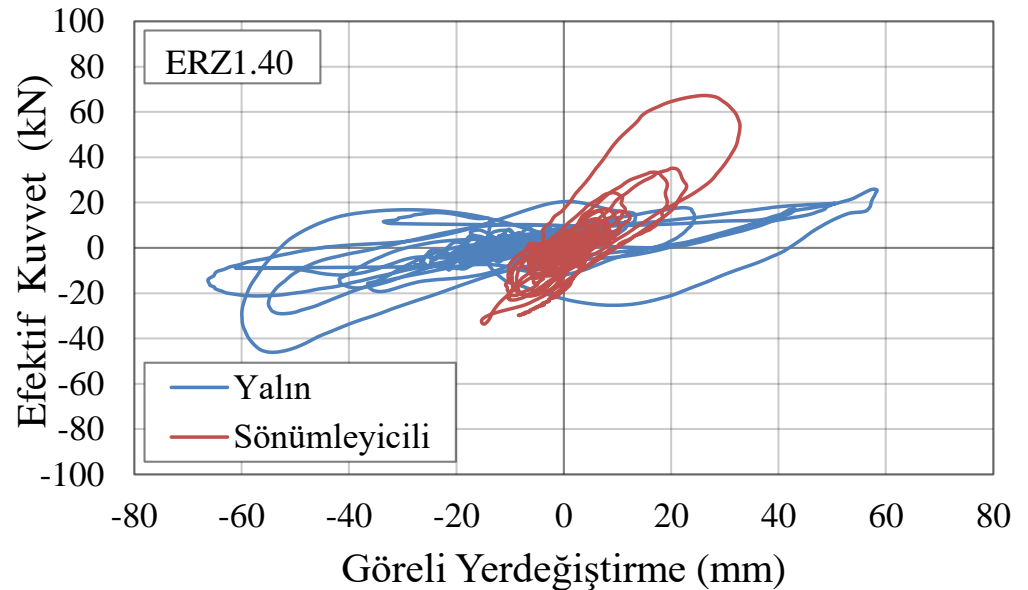
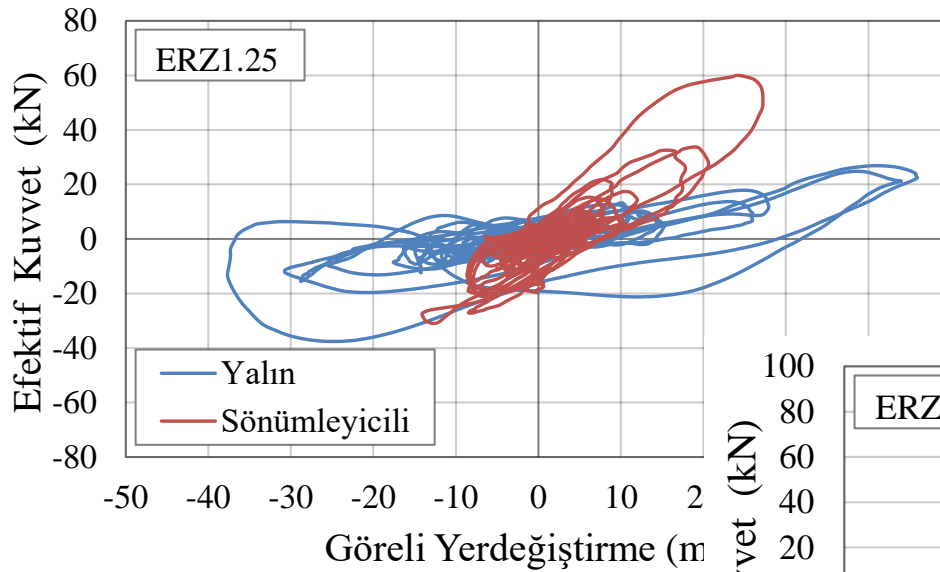
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Thanks for your interest..
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