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The Effect of Thickness of Jacketing on the Response of Square RC Sections

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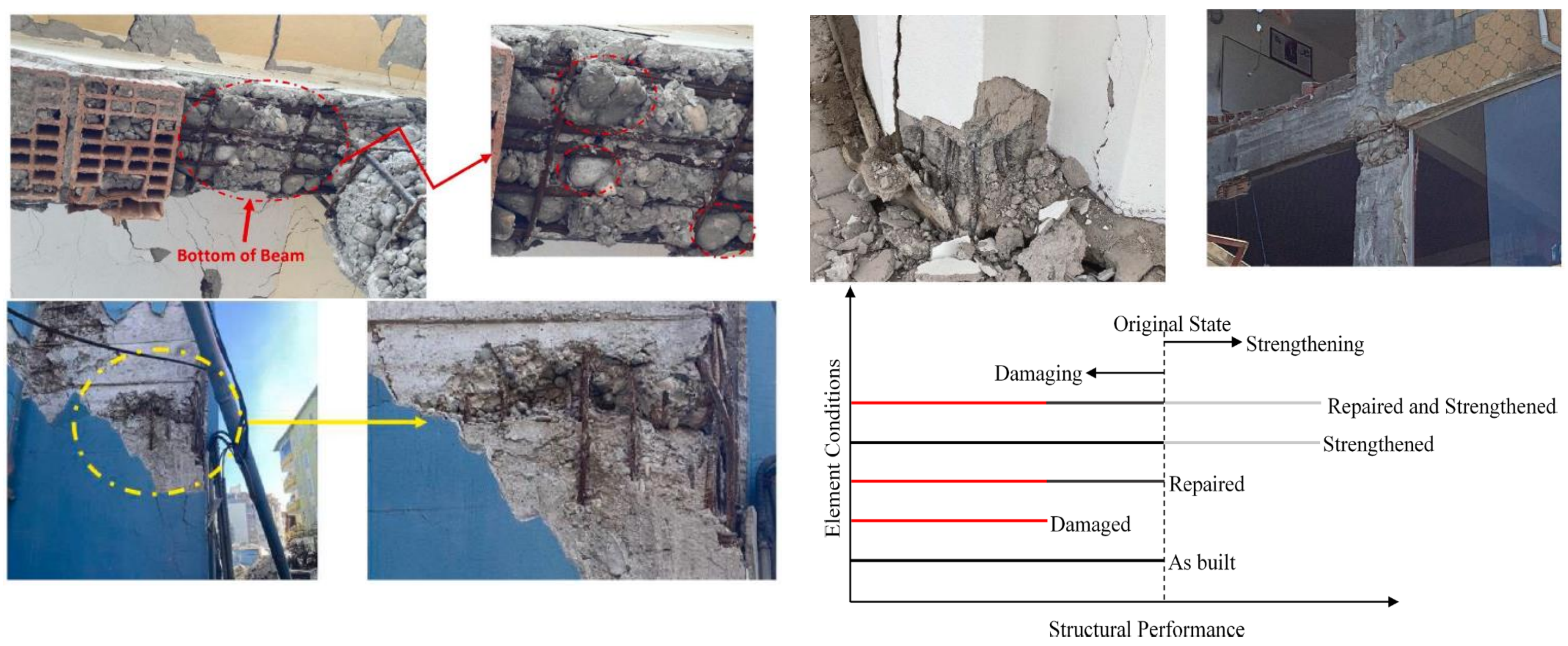
INTRODUCTION

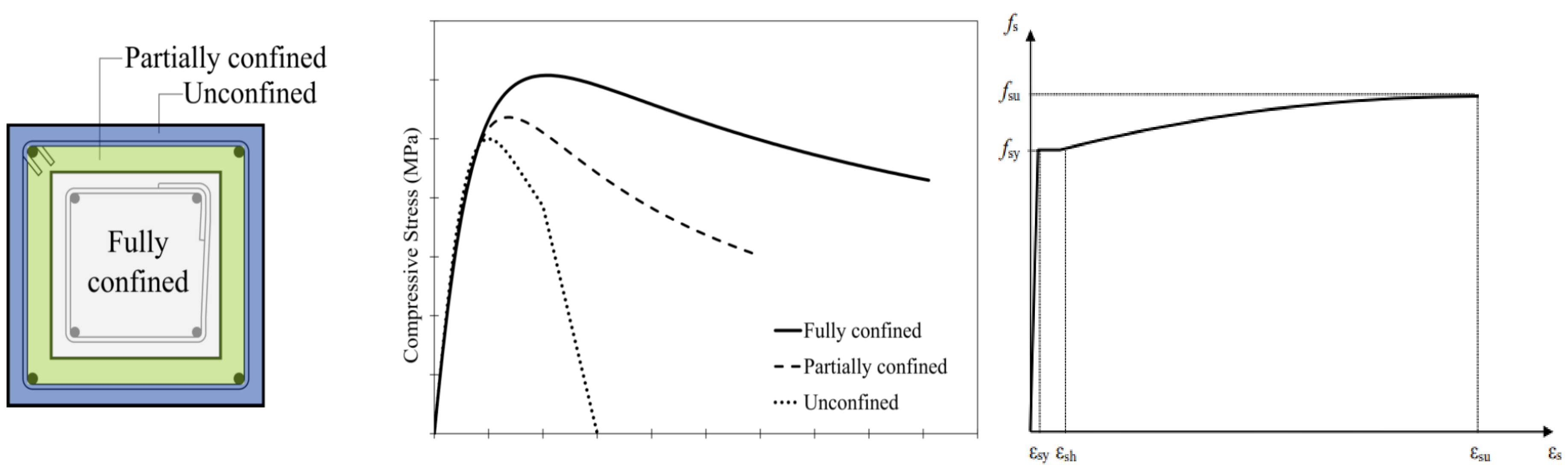
The load-resisting capacity of reinforced concrete structures is reduced due to various sources such as earthquakes, corrosion, and aging effects. Reconstruction of such structures may be an option but may cause significant costs, labor and time. Therefore, depending on the priority of the structure, strengthening becomes one of the alternatives and maybe a sustainable solution to increase the capacity in terms of both strength and ductility.



RC jacketing is considered one of the most common methods in over the world. The advantage of this method is that it needs little labor and equipment, with low costs, and the method itself can improve the strength, stiffness and, to some degree, ductility of structural elements by increasing the cross-section and lateral confinement, thus increasing the performance and service life.

MATERIALS & CODE VERIFICATION

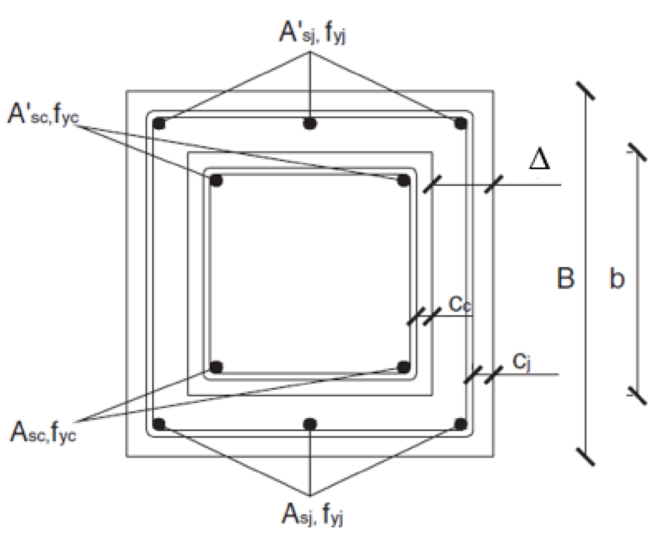
In this study, the concrete model developed by Campione et al. (2014) was used for fully confined concrete. The concrete model developed by Mander et al. (1988) was used for partially confined and unconfined concrete models. The used reinforcing bars model is given in TBEC2018.

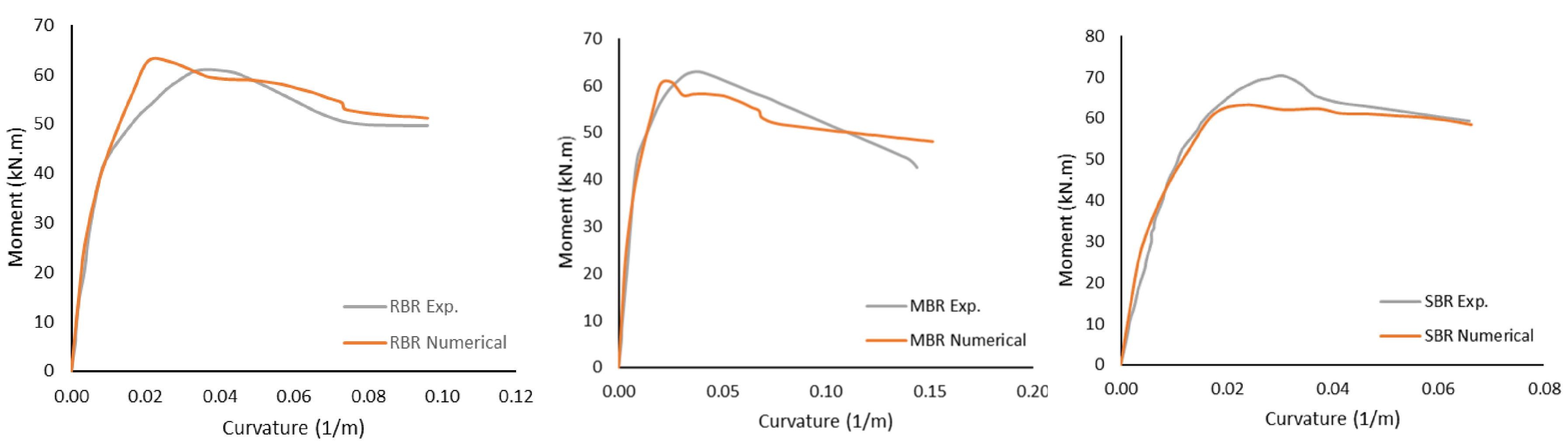


The code developed to estimate the moment-curvature relationship of jacketed RC columns was validated by experimental studies performed by Ersoy et al. (1993).

Geometrical and mechanical characteristics of specimens RBR, MBR and SBR.

Core	b (mm)	c_{co} (mm)	$f_{y,co}$ (MPa)	$d_{b,co}$ (mm)	$d_{st,co}$ (mm)	s_{co} (mm)
	160	15	300	12	4	100
Jacket	Δ (mm)	c_j (mm)	$f_{y,j}$ (MPa)	$d_{b,j}$ (mm)	$d_{st,co}$ (mm)	s_j (mm)
	35	15	280	12	8	100
	MBR		RBR		SBR	
	$f_{c,co}$ (MPa)	$f_{c,j}$ (MPa)	$f_{c,co}$ (MPa)	$f_{c,j}$ (MPa)	$f_{c,co}$ (MPa)	$f_{c,j}$ (MPa)
	31.5	31.5	30.7	34.5	33	40.3

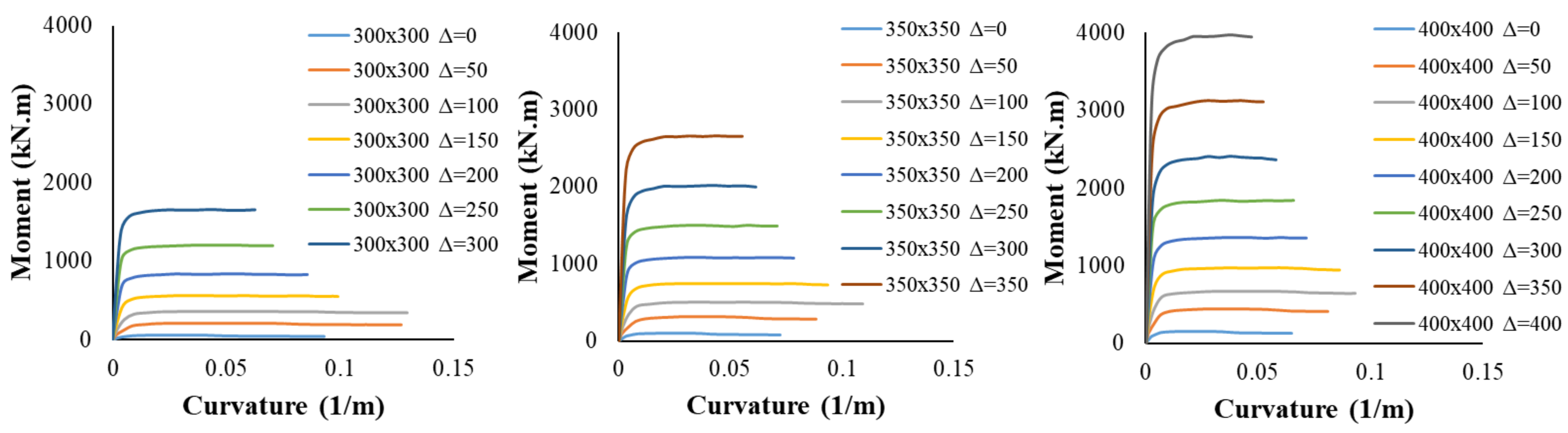




NUMERICAL STUDY

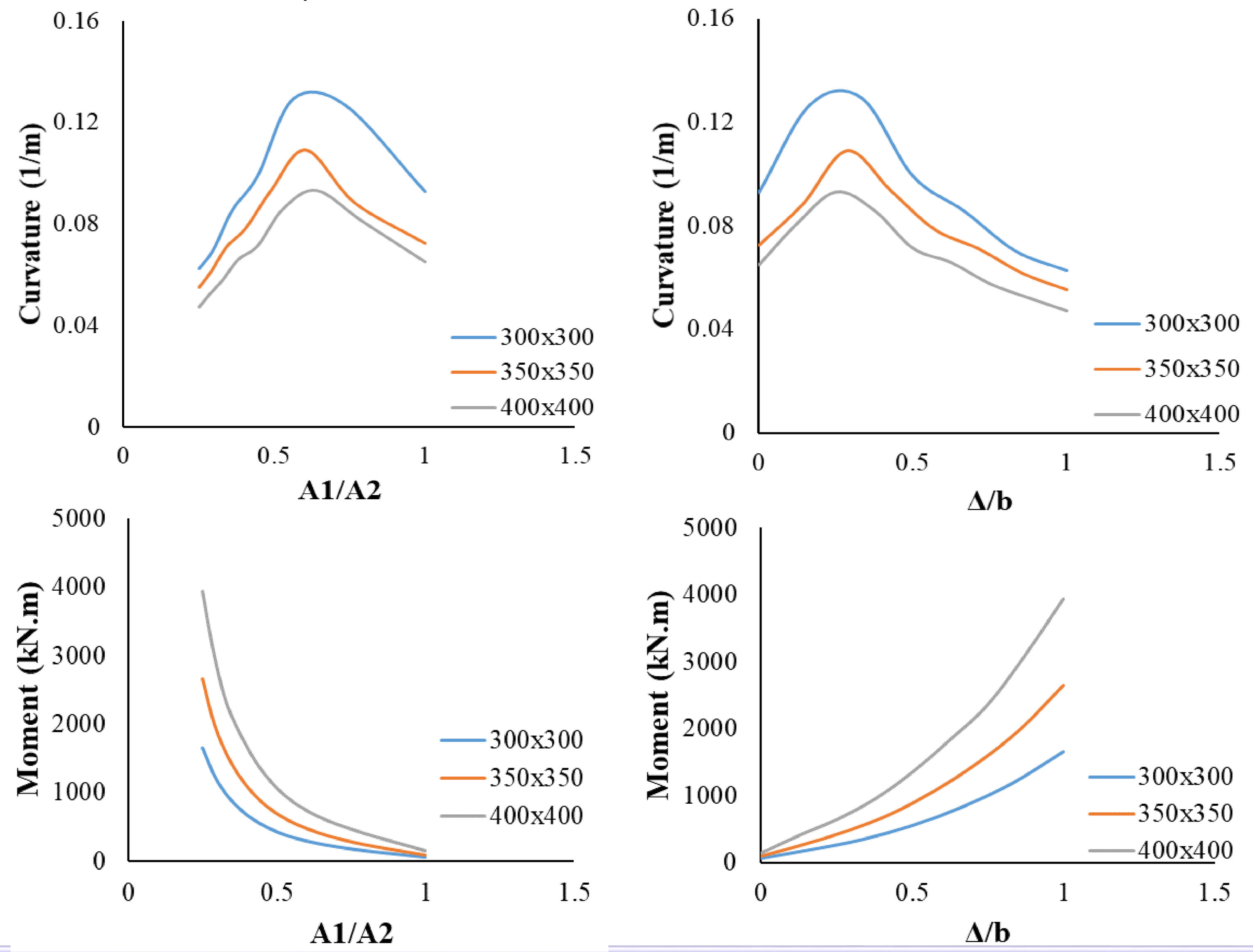
This study examines the behavior of different cross-section strengths with RC jacketing. Using the improved jacketing behavior models in the experimental studies, the mechanical behavior of RC jacketing was investigated using three different reinforced concrete square sections with varying jacketing thicknesses. The axial load ratio of a column before strengthening was taken as 30%, and the longitudinal reinforcement ratio of the jacketed and as-built sections was assumed to be 1%. The compressive strength of the existing column and RC jacket was 15MPa and 40MPa, respectively.

b (mm)	h (mm)	N (kN)	ρ_c (%)	f_c (MPa)	f_{yc} (MPa)	s_c (mm)	c_c (mm)	$ø_{etr}$ (mm)	Es (GPa)	$ø_{etrj}$ (mm)	f_{yj} (Mpa)	Δ (mm)	s_{etrj} (mm)	c_j (mm)	ρ_j (%)	f_{cj} (MPa)
300	300	397	1	15	220	200	24	8	200	8	420	50 100 150 200 250 300	100	24	1	40
350	350	540	1	15	220	200	24	8	200	8	420	50 100 150 200 250 300 350	100	24	1	40
400	400	706	1	15	220	200	24	8	200	8	420	50 100 150 200 250 300 350 400	100	24	1	40



CONCLUSION

The changes in the strength and ductility of the sections were evaluated using parameters such as the ratio of jacket thickness to cross-section depth (Δ/b) and the ratio of cross-sectional area to the area of the jacketed RC section (A1/A2) Which is b^2/B^2. The evaluations revealed a strong relationship between these parameters and the section responses.



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