





Outline
 Background
 Behavior of Mechanical Bar Splices
 Performance of Bridge Columns
with Couplers
 Design Methods for Mechanically
Spliced Bridge Columns
4







Past App. of Precast Column Connections 57% of Agencies Used ABC Column Connections 0 5 10 15 20 No. of Agencies used: Mechanical Bar Splice Connections Grouted Duct Connections Pocket Connections 8 2 Pipe-Pin Connections **Rocking Connections** 0 Connections w/ Advanced Materials 0 Agency justifications to use ABC column connections Connection Type Agency Comments Ease of construction se of construction and performance; Contractor familiarity; Long history of their use and performance testing results; NMB splices on Edison Bridge in Fort Myers; Relieved congestion and fast erection; Relatively fast and has been tested (grouted couplers); Provides structural integrity, reduced rebar congestion, reduced materials cost; Mechanical Bar Splices Good performance, ease of use, contractors seem to like; Grouted couplers are most common for connecting vertical dowels; Ease of construction; Availability and familiarity; Short length; ABC Speed Construction issues related to past ABC column connections Connection Type Agency Comments Alignment of bar cage, orientation/placement of grout tubes; No real issues as long as tolerances were followed; Tight construction tolerance, proprietary products and expensive grout; Occasional misalignment but can usually be Mechanical Bar corrected; Expense, and clearances; Tight tolerance needed for connector locations, spacing and concrete Splices consolidation; Fit up and alignment; Concern that the grouted couplers were not totally filled with the high strength grout, alignment of the bars and filling coupler completely





















Coupler Type	Coupler Manufacturer	Coupler Model	ACI Coupler Types		Caltrans Coupler Types		AASHTO Coupler Type
			Type 1	Type 2	Service Splice	Ultimate Splice	Full Mechanica Connection (FMC)
Shear Screw Coupler	Erico International Corp.	LENTON® LOCK (B1 Series)		х		х	N.A.
Headed Bar Coupler	Headed Reinforcement Corp.	Xtender® 500/510 Standard Coupler		х		х	N.A.
Grouted Sleeve Coupler	Dayton Superior	D410 Sleeve-Lock® Grout Sleeve		х		х	х
	Splice Sleeve North America	NMB		х	х		N.A.
Threaded Coupler	Dextra America, Inc.	Bartec Standard Splice (type A)		х		х	N.A.
	Dextra America, Inc.	Bartec Position Splices (Type B)		х		х	N.A.
	Erico International Corp.	LENTON® PLUS, Standard Coupler, (A12)		х		х	х
Swaged Coupler	Bar Splice	BarGrip® XL		х		х	N.A.
Hybrid Coupler	Dextra America, Inc. Erico International Corp.	Griptec® Lenton Interlock		X X	х	X	N.A. N.A.
	More tha	n 10 coupler	mar	nufac	cture	rs.	
	60 differe	ent products.					
	We selec	ted 10 produ	icts,	9 we	ere a	vaila	ble.
	Tootod m	ore then 160			_		































Cast-in-Place Column 24in [0.61m] 24in [0.61m] SQUARE 24in [610mm] 10-#8 (10-Ø25) O B4 n [0.23m] 96in [2.44m] LATERAL LOAD APPLICATION 2in [51 84in [2.13m] OCTAGONAL #4 @ 2" HOOPS (Ø13 @ 51mm) CIP: SEC A-A ₹A $A^{\overrightarrow{}}$ T⊧ T





































Conclusions

- The coupler and column test data showed that the coupler length, size, and type significantly affect the coupler/column performance.
- Couplers with higher rigid length factors showed the lowest strain capacities.
- Columns with seismic couplers showed a reduction in the displacement capacity from 3% to 45%. The column lateral strength did not change more than 15% using couplers.
- All mechanically spliced precast bridge columns tested in the present study met the current AASHTO seismic requirements thus they may be used in all 50 states of the nation.
- New experimental database with 10 mechanically spliced bridge columns was used to validate three design methods.





