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Reinforced Concrete Columns with High-Strength Concrete and Steel Reinforcement, Part 2

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ACI
WEB SESSIONS

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Numerical Estimates of the Seismic Response of Building Structures Reinforced with High-Strength Steel

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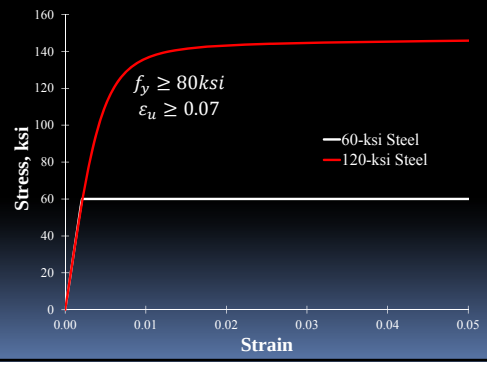
High-Strength Steel Defined



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Potential Advantages

- Reduced congestion
- Reduced shipping costs
- Reduced installation costs
- Reduced environmental impact

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Potential Drawbacks

- Higher likelihood of bar buckling
- Lower fracture strain
- Reduced post-cracking stiffness

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Effects of Using HSS

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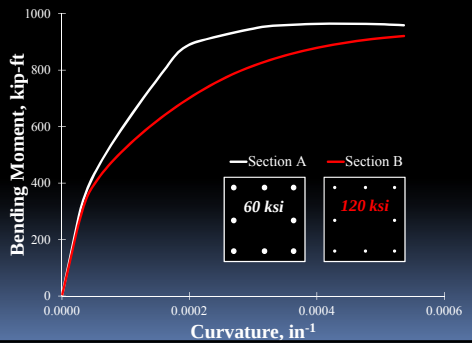
Effects of Using HSS - Sectional Response



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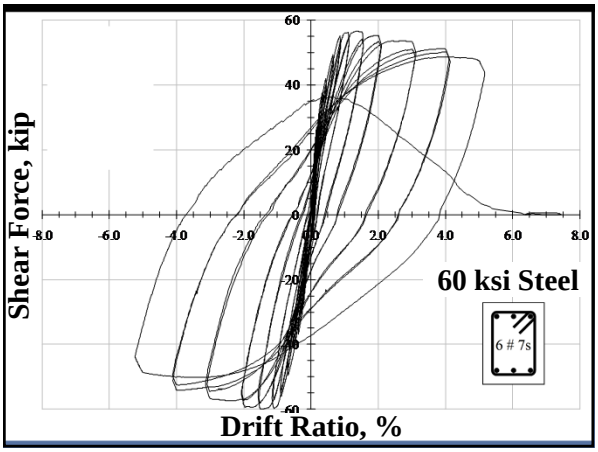

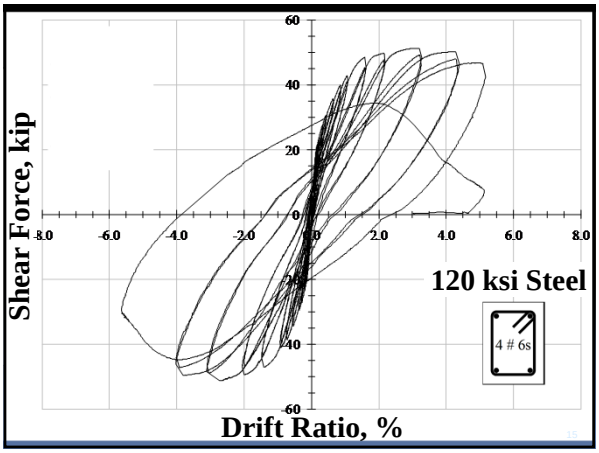

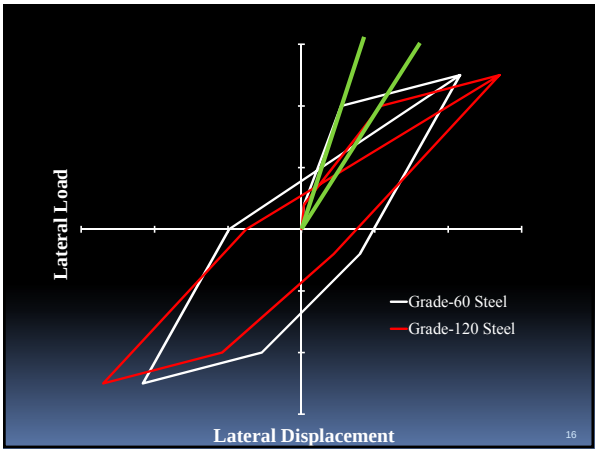

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Effects of Using HSS - Frame Response

Higher ?

$\sqrt{2} = 41\%$?

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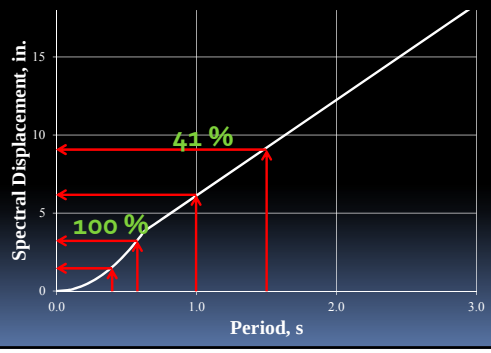
Effects of Using HSS - Frame Response



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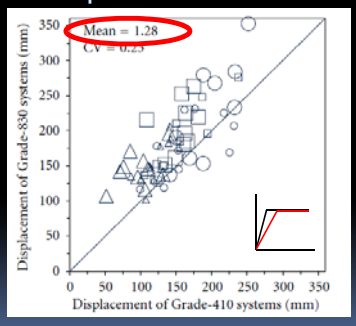
Effects of Using HSS - SDOF Response



Lepage, A; Tavallali, H; Pujol, S; Rautenberg, J (2012), "High-Performance Steel Bars and Fibers as Concrete Reinforcement for Seismic-Resistant Frames," *Advances in Civil Engineering*, Hindawi Publishing, 13 pp.

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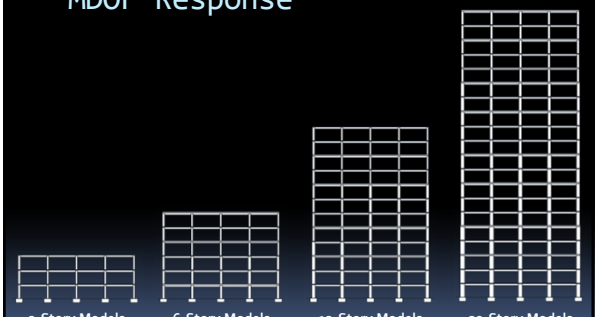
Effects of Using HSS - MDOF Response



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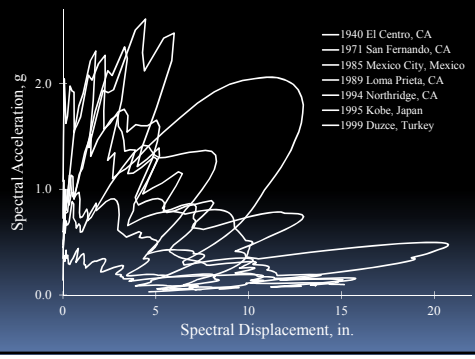
Numerical Modeling



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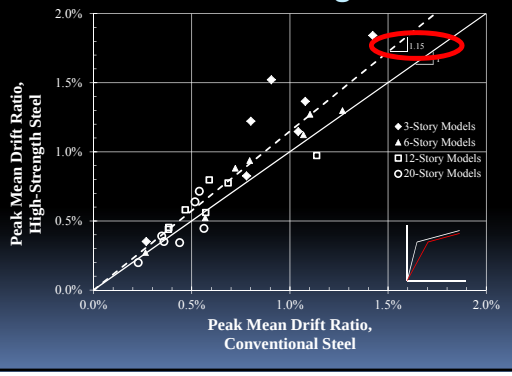
Numerical Modeling Results



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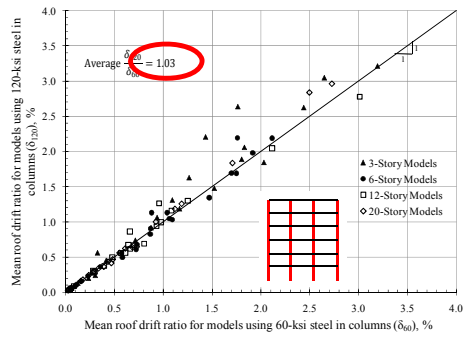
Other Studies - MDOFs



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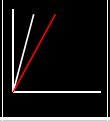
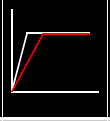
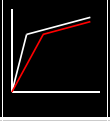
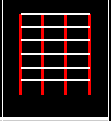
Comparison of Results

	SDOF	SDOF	MDOF	MDOF
				
High-Strength Steel Penalty	41 %	28 %	15 %	3 %

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Conclusions

- High-strength steel penalty:
  - 15% on average for frames with all members reinforced with high-strength steel
  - Decreases with number of stories (and number of participating structural members)
- Needs to be compared with physical evidence

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