

# Contents

<b>Acknowledgements</b>	<b>iii</b>
<b>Abstract</b>	<b>v</b>
<b>Contents</b>	<b>vii</b>
<b>List of Figures</b>	<b>x</b>
<b>List of Tables</b>	<b>xvii</b>
<b>CHAPTER 1 Introduction</b>	<b>1</b>
1.1 Instrumentation Program	2
1.2 Overview of the Thesis	3
<b>CHAPTER 2 Literature Review of Wood-frame Structure Tests</b>	<b>5</b>
2.1 Significant Case Studies	5
2.2 Informative Findings	13
<b>CHAPTER 3 Seismic Records from Wood-frame Structures</b>	<b>16</b>
3.1 Parkfield and San Simeon Earthquake Records	16
3.1.1 Parkfield School Building	21
3.1.2 Templeton Hospital	26
3.2 Experimental Records	30
3.2.1 Shake Table Tests – University of California, San Diego (UCSD)	30
3.2.2 Forced Vibration Tests – Vanessa Camelo	30
3.3 Remarks	31

<b>CHAPTER 4 System Identification</b>	<b>32</b>
4.1 Linear Analysis	33
4.2 MODE-ID	34
4.3 Results	38
4.3.1 Parkfield School Building	38
4.3.2 Templeton Hospital	57
4.4 Conclusions	66
<b>CHAPTER 5 Hysteretic Characteristics in Wood-Frame Structures</b>	<b>67</b>
5.1 General Concepts	68
5.2 Extraction Process	69
5.2.1 Free Body Diagrams	70
5.2.2 Double-Integration Errors	78
5.3 CUREE Task 1.1.1: Shake Table Test - USCD	82
5.4 Damping	86
5.4.1 Compensation for Hysteretic Damping	87
5.4.2 Inconsistencies in Reported Damping Estimates	96
5.4.2.1 CUREE Task 1.3.3 – Forced Vibration Tests	96
5.4.2.2 CUREE Task 1.1.1 – Shake Table Tests	101
5.5 Conclusions	107
<b>CHAPTER 6 Hysteretic Finite Element Model Updating</b>	<b>108</b>
6.1 Finite Element Procedure	109
6.1.1 Elements	110
6.1.2 Models	112

6.2 Validating the Hysteretic Extraction Process	115
6.3 Model Optimization	119
6.3.1 Direct Search Methods	120
6.3.2 Gradient Search Methods	124
6.3.3 Bayesian Updating and Model Selection	129
6.4 Model Results	138
6.4.1 Hysteretic Behavior	138
6.4.2 Model Response	141
6.4.3 Energy Dissipation	145
6.5 Conclusions	147
<b>CHAPTER 7 Conclusions and Future Work</b>	<b>148</b>
<b>References</b>	<b>153</b>