

Table of Contents

CHAPTER 1 INTRODUCTION	1
1.1 General Theory	1
1.2 Introduction of Base isolation.....	3
1.2.1 Basic Mechanism.....	4
1.2.2 Historical Development	6
1.2.3 Recent Developments	7
1.3 Organization of the Thesis	9
CHAPTER 2 LITERATURE REVIEW	13
2.1 Introduction.....	13
2.2 Types of Seismic Base Isolation Techniques	14
2.2.1 Friction Pendulum System (FPS)	14
2.2.2 Electricite-de-France BI System.....	17
2.2.3 Resilient-Friction BI System	17
2.2.4 Sliding Resilient-Friction (SR-F) BI System.....	18
2.2.5 Elastomeric Bearings	18
2.2.6 Sliding BI Systems	21
2.3 Scaling and Modeling	23
2.4 Numerical Simulation and techniques	27
2.5 Comparison between Isolated Base and Fixed Base	28
2.6 Application of Base Isolation System.....	31
2.6.1 Retrofitting and Rehabilitation of historical buildings	31
2.6.2 Effect of liquid retaining structure on Isolator	32
2.6.3 Effect of Soil-Structure Interaction	33

2.6.4	3-D Base Isolator	35
2.7	Economic Benefit.....	38
2.8	Codes used for Seismic Base Isolation	41
2.9	Innovative Base Isolation Techniques.....	46
2.10	Summary	48
2.11	Research Gap	51
2.12	Objective of the Research	53
CHAPTER 3 DYNAMIC BEHAVIOR OF HIGH DAMPING RUBBER BEARINGS AND LEAD RUBBER BEARING UNDER NEAR-FAULT EARTHQUAKE		55
3.1	Introduction.....	55
3.2	Material Properties, Dimensions and Loading Condition.....	56
3.2.1	Selecting a Rubber Constitutive Model for Dynamic Analysis.....	58
3.3	Mechanical parameters of LRB and HDRB	61
3.3.1	Modelling of HDRB for Dynamic Analysis	65
3.3.2	Modelling of Lead Rubber Bearing for Dynamic Analysis.....	66
3.4	Properties of the Near-Fault Ground Motions	68
3.5	Comparison of the acceleration response	68
3.6	Result and Discussion	71
3.6.1	Validation of LRB and Analysis of HDRB	72
3.6.2	Acceleration Response.....	73
3.6.3	Displacement Response	74
3.7	Summary	76
CHAPTER 4 DYNAMIC ANALYSIS OF BASE-ISOLATED AND FIXED-BASE RC FRAME BUILDING UNDER NEAR-FIELD AND FAR-FIELD EARTHQUAKES...		79
4.1	Introduction.....	79

4.2	Methodology employed in SAP 2000.....	82
4.3	Dimension and Material Properties	82
4.4	Input Ground Motion Record	84
4.5	Result and Discussion.....	87
4.5.1	Base Shear	88
4.5.2	Acceleration Response.....	92
4.5.3	Displacement Response	98
4.6	Summary.....	103
CHAPTER 5 SLIDING BEARINGS: EXPERIMENTAL AND NUMERICAL ANALYSIS		105
5.1	Introduction.....	105
5.2	Methodology.....	107
5.2.1	Experimental Arrangement.....	109
5.2.2	Sliding Base Setup.....	111
5.2.3	Sliding Base with spring.....	112
5.3	Determining the Coefficient of Friction	112
5.4	Shake Table Setup.....	113
5.5	Dynamic Characterization of the model using Pulse Labshop Software	115
5.6	Impact Hammer	116
5.7	Spring Compression Testing.....	117
5.7.1	Dimension of the Springs	118
5.8	Properties of Earthquake Input Records	121
5.9	Numerical Simulation in Abaqus.....	122
5.9.1	Fixed Base Analysis	123