



Cairo University

NUMERICAL STUDY ON SEISMIC BEHAVIOR REQUIREMENTS FOR STEEL PLATE SHEAR WALLS

By

Rehab Magdy Elsaied Rezk

A Thesis Submitted to the
Faculty of Engineering at Cairo University
In Partial Fulfillment of the
Requirements for the Degree of
MASTER OF SCIENCE
In
Structural Engineering

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Title of Thesis:

Numerical Study on Seismic Behavior Requirements for Steel Plate Shear Walls

Key Words:

Shear Strength- SPSW – Column- Tension Field- Stiffener

Summary:

Shear strength of unstiffened steel plate shear walls, SPSWs, was conventionally computed assuming fully yielded in-fill plate and collapse of boundary frame elements by uniform yielding mechanism at ultimate load. Accordingly, both Canadian and American seismic provisions for design of SPSWs did introduce a minimum stiffness for vertical boundary elements (VBE) to ensure the yielding capacity of the infill plate. These seismic provisions have been investigated numerically in this research work. Unexpected failure in the VBE has been observed despite the prescribed minimum stiffness by the codes. Hence, the infill plate could not achieve the target lateral load capacity. Accordingly, a comprehensive parametric study has been conducted on SPSWs, using nonlinear finite element analysis by ANSYS software, to modify the seismic requirements for the VBE. Both stiffened and Unstiffened SPSWs have been investigated. Based on the numerical results, equations for the modified minimum stiffness and strength of VBE have been proposed so that the infill plate attains the yielding capacity. The numerical results, based on the proposed equations, have been compared with the code target lateral load capacity where good fitting has been reported.

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Hoping this thesis would be a step towards a better understanding of our current needs and a better development of our country.

Rehab Magdy

Dedication

I Lovingly dedicate this work to *my father, my mother, my sister (Radwa) and my brother (Ahmed)*, for their care, guidance, help and patience. I do believe that, I could not success in all my life steps without their continuous support and prayers.
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Table of Contents

ACKNOWLEDGMENTS	I
TABLE OF CONTENTS	III
LIST OF TABLES	VII
LIST OF FIGURES	IX
CHAPTER 1 : INTRODUCTION.....	1
1.1. GENERAL.....	1
1.2. OBJECTIVES AND SCOPE.....	2
1.3. OUTLINE OF THE THESIS	3
CHAPTER 2 : LITERATURE REVIEW	4
2.1. INTRODUCTION	4
2.2. ANALYTICAL RESEARCH WORK	4
2.2.1. Thorburn et al. (1983)	4
2.2.2. Montgomery and Medhekar (2001)	5
2.2.3. Berman and Bruneau (2003)	5
2.2.4. Berman and Bruneau (2004)	6
2.2.5. Vian and Bruneau (2005).....	6
2.2.6. Berman and Bruneau (2008)	8
2.2.7. Sabouri Ghomi (2008).....	9
2.2.8. Qu and Bruneau (2009).....	9
2.2.9. Qu and Bruneau (2010).....	10
2.3. EXPERIMENTAL RESEARCH WORK	10
2.3.1. Timler and Kulak (1983).....	10
2.3.2. Tromposch and Kulak (1987)	11
2.3.3. Roberts and Sabouri-Ghomi (1992)	11
2.3.4. Caccese (1993).....	12
2.3.5. Driver (1997).....	12
2.3.6. Lubell (1997).....	13
2.3.7. Rezai (1999).....	13
2.3.8. Behbahanifard (2003).....	14
2.3.9. Lin and Tsai (2004).....	14
2.3.10. Yoon et al. (2004)	14
2.3.11. Berman et al. (2005).....	15
2.3.12. Lin et al. (2007).....	16
2.3.13. Park et al. (2007)	16
2.3.14. Choi and Park (2009)	17
2.3.15. Li et al. (2010).....	20
2.3.16. Vian et al. (2009).....	20
2.3.17. Sabouri-Ghomi and Sajjadi (2012)	21
2.3.18. Wang et al. 2015	21
2.4. NUMERICAL RESEARCH WORK.....	22

2.4.1.	Elgaaly et al. (1993)	22
2.4.2.	Xue and Lu (1994)	22
2.4.3.	Rezai et al. (2004)	22
2.4.4.	Shinshkin et al. (2005)	23
2.4.5.	Bhowmick et al. (2006)	23
2.4.6.	Botros and Elbadry (2006)	23
2.4.7.	Qu and Bruneau (2007)	24
2.4.8.	Purba and Bruneau (2009)	24
2.4.9.	Topkaya and Atasoy (2009)	25
2.4.10.	Chan et al. (2011)	25
2.4.11.	Neal and Qu (2011)	25
2.4.12.	Purpa and Berman (2011)	25
2.4.13.	Morgan et al. (2013)	26
2.4.14.	Hosseinzadeh and Tehranizadeh (2014)	26
2.4.15.	Machaly et al. (2014)	27
2.4.16.	ABD El-Qader et al. (2015)	27
2.4.17.	Hazem et al. (2017)	28
2.5.	DESIGN CODES	29
2.5.1.	CAN/CSA S16	29
2.5.2.	AISC 341	30
CHAPTER 3 : FINITE ELEMENT MODELING AND VERIFICATION		32
3.1.	INTRODUCTION	32
3.2.	FINITE ELEMENT MODEL	32
3.3.	ANALYSIS PROCEDURES	34
3.4.	VERIFICATION OF NUMERICAL MODEL	34
3.4.1.	SPSW tested by Park et al. (2007)	35
3.4.2.	SPSW tested by Choi and Park (2008)	38
3.4.3.	SPSW tested by Choi and Park (2009)	40
3.5.	CONCLUSION	42
CHAPTER 4 : EVALUATION OF CURRENT DESIGN CODES		43
4.1.	INTRODUCTION	43
4.2.	IN-FILL PLATE STRENGTH	43
4.3.	BOUNDARY FRAME MEMBERS:	44
4.3.1.	Horizontal boundary elements (HBEs)	44
4.3.2.	Vertical boundary elements	44
4.4.	PARAMETRIC STUDY	45
4.4.1.	Thickness of in-fill plate, t	47
4.4.2.	Yield strength of plate material, F_{yp}	49
4.4.3.	Height of in-fill plate, h_p	50
4.4.4.	Width of in-fill plate, L_p	52
4.4.5.	Number of floors, n_f	54
4.5.	CONCLUSION	57
CHAPTER 5 : PROPOSED DESIGN REQUIREMENTS FOR VBE OF UNSTIFFENED AND STIFFENED SPSWS		58

5.1.	INTRODUCTION	58
5.2.	PARAMETRIC ANALYSIS RESULTS	58
5.2.1.	Thickness of in-fill plate, t	59
5.2.2.	Yield Strength of plate material, F_{yp}	64
5.2.3.	Height of in-fill plate, h_p	70
5.2.4.	Number of floors, n_f	75
5.2.5.	Plate length, L_p	81
5.3.	COMPARING REQUIRED STEEL WEIGHT FOR VBE FOR CASE OF UNSTIFFENED ($n_s=0$) AND STIFFENED ($n_s=1,2$) SPSW.	86
5.4.	MATHEMATICAL EXPRESSIONS FOR THE REQUIRED FLEXURAL AND SHEAR STRENGTH OF VBE FOR CASE OF UNSTIFFENED SPSW.....	89
5.5.	ASSESSMENT OF PROPOSED DESIGN REQUIREMENTS OF VBE OF UNSTIFFENED SPSW	89
5.6.	MATHEMATICAL EXPRESSIONS FOR THE REQUIRED FLEXURAL AND SHEAR STRENGTH OF VBE FOR CASE OF STIFFENED SPSW USING ONE STIFFENER	96
5.7.	ASSESSMENT OF PROPOSED DESIGN REQUIREMENTS OF VBE OF STIFFENED SPSW USING ONE STIFFENER.....	96
5.8.	MATHEMATICAL EXPRESSIONS FOR THE REQUIRED FLEXURAL AND SHEAR STRENGTH OF VBE IN CASE OF STIFFENED SPSW USING TWO STIFFENER	103
5.9.	ASSESSMENT OF PROPOSED DESIGN REQUIREMENTS OF VBE OF STIFFENED SPSW USING TWO STIFFENER	103
5.10.	CONCLUSIONS	110
CHAPTER 6 : SUMMARY, CONCLUSION AND FUTURE WORK.....		111
6.1.	SUMMARY	111
6.2.	CONCLUSION	112
6.3.	FUTURE WORK	112
APPENDIX A: TABLES.....		113
APPENDIX B: MATLAB CODING		141
APPENDIX C:.....		144
EQUIVALENT VON MISES STRESSES AND OUT OF PLANE DISPLACEMENTS		144
C-1 SPSW TESTED BY PARK ET AL. (2007)		144
C-2 SPSW TESTED BY CHOI AND PARK (2008).....		149
C-3 PARAMETRIC ANALYSIS RESULT FOR SPSWs WITH VBE SATISFYING STIFFNESS REQUIREMENT GIVEN IN BOTH AMERICAN AND CANADIAN CODE		155
C.3.1 Effect of infill plate yield strength, F_{YP} (MPa)		155
C.3.2 Effect of infill plate thickness, t (mm).....		160
C.3.3 Effect of infill plate height, h_p (mm).....		165
C.3.4 Effect of infill plate Length, L_p (mm)		170
C.3.5 Effect of number of floors, n_f		175
C.4 PARAMETRIC ANALYSIS RESULTS AFTER MODIFYING VBE SECTION TO SUSTAIN FORCE EXERTED ON IT DUE TO TENSION FIELD OF WEB PLATE		181

C.4.1 Effect of yield strength of plate material, F_{yp} (MPa).....	181
C.4.2 Effect of Infill plate thickness, t (mm)	186
C.4.3 Effect of Infill plate height, h (mm)	191
C.4.4 Effect of Infill plate Length, L (mm).....	196
C.4.5. Effect of number of floors, n_f	201
LIST OF REFERENCES.....	206

List of Tables

Table (2-1) Dimensions of SPSW tested by Park et al.(2007)	17
Table (3-1) SPSWs used in Verification of Numerical Model	34
Table (4-1) Limits of Parameters included in the Parametric Analysis.....	46
Table(4-2) comparison between numerical and theoretical values for base shear capacities supported by infill plate	56
Table (5-1) Limits of Parameters included in the Parametric Analysis.....	90
Table (5-2) Comparison between numerical values for base shear supported by infill plate after VBE satisfied strength requirements given in the proposed; Equation (5-1) and (5-2) with that obtained after VBE satisfied stiffness requirements given in current design codes; Equation (4-6) together with the values obtained from theoretical expression; Equation(4-1).	95
Table (5-3) Limits of Parameters included in the Parametric Analysis.....	97
Table (5-4) Comparison between base shear capacities supported by infill plate after VBE has satisfied strength requirements given in the proposed Equations (5-3) and (5-4) with the values obtained from theoretical expression; Equation (4-1).	102
Table (5-5) Limits of Parameters included in the Parametric Analysis.....	104
Table (5-6) Comparison between base shear capacities supported by infill plate after VBE has satisfied strength requirements given in the proposed Equations (5-5) and (5-6) with the values obtained from theoretical expression; Equation (4-1).	109
Table(A-1) Variation in the stiffness and strength of VBE with increasing plate thickness until full utilization of the tensile yield strength of plate material for case of unstiffened SPSW.....	113
Table(A-2) Variation in the stiffness and strength of VBE with increasing plate thickness until full utilization of the tensile yield strength of plate material for case of stiffened (ns=1) SPSW	115
Table(A-3) Variation in the stiffness and strength of VBE with increasing plate thickness until full utilization of the tensile yield strength of plate material for case of stiffened (ns=2) SPSW	117
Table(A-4) Variation in the stiffness and strength of VBE with increasing yield strength of plate material until full utilization of the tensile yield strength of infill plate for case of unstiffened SPSW	118
Table(A-5) Variation in the stiffness and strength of VBE with increasing yield strength of plate material until full utilization of the tensile yield strength of infill plate for case of stiffened (ns=1) SPSW	120
Table(A-6) Variation in the stiffness and strength of VBE with increasing yield strength of plate material until full utilization of the tensile yield strength of infill plate for case of stiffened (ns=2) SPSW	122
Table(A-7) Variation in the stiffness and strength of VBE with increasing plate height until full utilization of the tensile yield strength of infill plate for case of unstiffened SPSW	124
Table(A-8) Variation in the stiffness and strength of VBE with increasing plate height until full utilization of the tensile yield strength of infill plate for case of stiffened (ns=1) SPSW.....	126
Table(A-9) Variation in the stiffness and strength of VBE with increasing plate height until full utilization of the tensile yield strength of infill plate for case of stiffened (ns=2) SPSW.....	127

Table(A-10) Variation in the stiffness and strength of VBE with increasing no of floors until full utilization of the tensile yield strength of infill plate for case of unstiffened SPSW	129
Table(A-11) Variation in the stiffness and strength of VBE with increasing no of floors until full utilization of the tensile yield strength of infill plate for case of stiffened (ns=1) SPSW.....	131
Table(A-12) Variation in the stiffness and strength of VBE with increasing no of floors until full utilization of the tensile yield strength of infill plate for case of stiffened (ns=2) SPSW.....	133
Table(A-13) Variation in the stiffness and strength of VBE with increasing plate length until full utilization of the tensile yield strength of infill plate for case of unstiffened SPSW	135
Table(A-14) Variation in the stiffness and strength of VBE with increasing plate length until full utilization of the tensile yield strength of infill plate for case of stiffened (ns=1) SPSW.....	137
Table(A-15) Variation in the stiffness and strength of VBE with increasing plate length until full utilization of the tensile yield strength of infill plate for case of stiffened (ns=2) SPSW.....	139

List of Figures

Figure (1-1): Geometric Configuration of a typical SPSW	2
Figure (2-1) proposed cases for the behavior of HBEs (Vian and Bruneau 2005).....	7
Figure (2-2): Forces exerted on boundary frame members from tension field of web plate suggested by Berman and Bruneau (2008)	9
Figure (2-3) Specimen tested by Park et al. (2007)	17
Figure (2-4) Specimens tested by Choi and Park (2009).....	19
Figure (2-5) Horizontal Strut of SPSW.	31
Figure (3-1): SHELL 181 geometry	32
Figure (3-2): Finite element model of a typical SPSW:(a) unstiffened, (b) stiffened (ns=1), and (c) stiffened (ns=2)	33
Figure (3-3): Material model	33
Figure (3-4) Hysteretic curve and load displacement curve for SC2T specimen tested by Park et al. (2007)	35
Figure (3-5) Hysteretic curve and load displacement curve for SC4T specimen tested by Park et al (2007)	36
Figure (3-6) Hysteretic curve and load displacement curve for SC6T specimen tested by Park et al (2007)	36
Figure (3-7) Hysteretic curve and load displacement curve for WC4T specimen tested by Park et al (2007)	37
Figure (3-8) Hysteretic curve and load displacement curve for WC6T specimen tested by Park et al (2007)	38
Figure (3-9) Hysteretic curve and load displacement curve for FSPSW1 specimen tested by Choi and Park 2008	38
Figure (3-10) Hysteretic curve and load displacement curve for FSPSW2 specimen tested by Choi and Park 2008	39
Figure (3-11) Hysteretic curve and load displacement curve for FSPSW3 specimen tested by Choi and Park 2008	40
Figure (3-12) Hysteretic curve and load displacement curve for FSPSW4 specimen tested by Choi and Park (2009).....	41
Figure (3-13) Hysteretic curve and load displacement curve for FSPSW5 specimen tested by Choi and Park (2009).....	41
Figure (4-1): Geometric configuration of SPSW.....	46
Figure (4-2): Effect of in-fill plate thickness, t (mm) on base shear supported by infill plate, V_p (kN)	47
Figure (4-3): Effect of in-fill plate thickness, t (mm) on $R_{base\ shear}$	48
Figure (4-4): Effect of yield strength of in-fill plate, F_{yp} (MPa) on base shear supported by infill plate, V_p (kN).....	49
Figure (4-5): Effect of yield strength of infill plate, F_{yp} (MPa) on $R_{base\ shear}$...	50
Figure (4-6): Effect of height of in-fill plate, h_p (mm) on base shear supported by infill plate, V_p (kN)	51
Figure (4-7): Effect of height of in-fill plate, h_p (mm) on $R_{base\ shear}$	52
Figure (4-8): Effect of length of in-fill plate, h_p (mm) on base shear supported by infill plate, V_p (kN)	53
Figure (4-9): Effect of length of in-fill plate, h_p (mm) on $R_{base\ shear}$	53
Figure (4-10): Effect of number of floors, n_f on base shear supported by infill plate, V_p (kN).....	55

Figure (4-11): Effect of number of floors, nf on $R_{base\ shear}$	55
Figure (5-1): Effect of infill plate thickness, t (mm) on base shear supported by infill plate, V_p (kN)	60
Figure (5-2): Effect of infill plate thickness, tp (mm), on $R_{base\ shear}$	60
Figure (5-3): Effect of infill plate thickness, t (mm) on the required stiffness of VBE	61
Figure (5-4): Effect of infill plate thickness, t (mm) on $R_{stiffness}$	62
Figure (5-5): Effect of infill plate thickness, t (mm) on the required flexural strength of VBE	63
Figure (5-6): Effect of infill plate thickness, t (mm) on $R_{Flexural}$	63
Figure (5-7): Effect of infill plate thickness, t (mm) on the required shear strength of VBE	64
Figure (5-8): Effect of infill plate thickness, t (mm) on R_{shear}	64
Figure (5-9): Effect of infill plate yield stress, F_{yp} (MPa) on base shear supported by infill plate, V_p (kN)	65
Figure (5-10): Effect of infill plate yield stress, F_{yp} (MPa) on $R_{base\ shear}$	66
Figure (5-11): Effect of infill plate yield stress, F_{yp} (MPa) on the required stiffness of VBE	67
Figure (5-12): Effect of infill plate yield stress, F_{yp} (MPa) on $R_{stiffness}$	68
Figure (5-13): Effect of infill plate yield stress, F_{yp} (MPa) on the required flexural strength of VBE	68
Figure (5-14): Effect of infill plate yield stress, F_{yp} (MPa) on $R_{Flexural}$	69
Figure (5-15): Effect of infill plate yield stress, F_{yp} (MPa) on the required shear strength of VBE	69
Figure (5-16): Effect of infill plate yield stress, F_{yp} (MPa) on R_{shear}	70
Figure (5-17): Effect of infill plate height, h (mm) on base shear supported by infill plate, V_p (kN)	71
Figure (5-18): Effect of infill plate height, h (mm) on $R_{base\ shear}$	71
Figure (5-19): Effect of infill plate height, h (mm) on the required stiffness of VBE	73
Figure (5-20): Effect of infill plate height, h (mm) on $R_{stiffness}$	73
Figure (5-21): Effect of infill plate height, h (mm) on the required flexural strength of VBE	74
Figure (5-22): Effect of infill plate height, h (mm) on $R_{Flexural}$	74
Figure (5-23): Effect of infill plate height, h (mm) on the required shear strength of VBE	75
Figure (5-24): Effect of infill plate height, h (mm) on R_{shear}	75
Figure (5-25): Effect of number of floors, n on base shear supported by infill plate, V_p (kN)	76
Figure (5-26): Effect of number of floors, n on $R_{base\ shear}$	77
Figure (5-27): Effect of number of floors on the required stiffness of VBE	78
Figure (5-28): Effect of number of floors on $R_{stiffness}$	79
Figure (5-29): Effect of number of floors on the required flexural strength of VBE	79
Figure (5-30): Effect of number of floors on $R_{Flexural}$	80
Figure (5-31): Effect of number of floors on the required shear strength of VBE ...	80
Figure (5-32): Effect of number of floors on R_{shear}	81
Figure (5-33): Effect of infill plate length , L (mm) on base shear supported by infill plate, V_p (kN)	82
Figure (5-34): Effect of infill plate length , L (mm) on $R_{base\ shear}$	82

.....	83
Figure (5-35): Effect of infill plate length, $L(\text{mm})$ on the required stiffness of VBE	83
Figure (5-36): Effect of infill plate length, $L(\text{mm})$ on $R_{\text{stiffness}}$	84
Figure (5-37): Effect of infill plate length, $L(\text{mm})$ on the required flexural strength of VBE	85
Figure (5-38): Effect of infill plate length, $L(\text{mm})$ on R_{flexural}	85
Figure (5-39): Effect of infill plate length, $L(\text{mm})$ on the required shear strength of VBE	86
Figure (5-40): Effect of infill plate length, $L(\text{mm})$ on R_{shear}	86
Figure (5-41): Effect of infill plate thickness, $t(\text{mm})$ on the required steel weight of VBE	87
Figure (5-42): Effect of infill yield strength, $F_{yp}(\text{MPa})$ on the required steel weight of VBE	87
Figure (5-43): Effect of infill height, $h_p(\text{mm})$ on the required steel weight of VBE	88
Figure (5-44): Effect of infill length, $L_p(\text{mm})$ on the required steel weight of VBE	88
Figure (5-45): Effect of number of floors, n_f on the required steel weight of VBE	89
Figure (5-46): Effect of infill plate yield stress, $F_{yp}(\text{MPa})$ on the base shear supported by infill plate, $V_p(\text{kN})$	90
Figure (5-47): Effect of infill plate yield stress, $F_{yp}(\text{MPa})$ on $R_{\text{base shear}}$	91
Figure (5-48): Effect of infill plate thickness, $t(\text{mm})$ on the base shear supported by infill plate, $V_p(\text{kN})$	91
Figure (5-49): Effect of infill plate thickness, $t(\text{mm})$ on $R_{\text{base shear}}$	92
Figure (5-50): Effect of infill plate height, $h(\text{mm})$ on the base shear supported by infill plate, $V_p(\text{kN})$	92
Figure (5-51): Effect of infill plate height, $h(\text{mm})$ on $R_{\text{base shear}}$	93
Figure (5-52): Effect of infill plate length, $L(\text{mm})$ on the base shear supported by infill plate, $V_p(\text{kN})$	93
Figure (5-53): Effect of infill plate length, $L(\text{mm})$ on $R_{\text{base shear}}$	94
Figure (5-54): Effect of no of floors, n on the base shear supported by infill plate, $V_p(\text{kN})$	94
Figure (5-55): Effect of no of floors, n on $R_{\text{base shear}}$	95
Figure (5-56): Effect of infill plate yield stress, $F_{yp}(\text{MPa})$ on the base shear supported by infill plate, $V_p(\text{kN})$	97
Figure (5-57): Effect of infill plate yield stress, $F_{yp}(\text{MPa})$ on $R_{\text{base shear}}$	98
Figure (5-58): Effect of infill plate thickness, $t(\text{mm})$ on the base shear supported by infill plate, $V_p(\text{kN})$	98
Figure (5-59): Effect of infill plate thickness, $t(\text{mm})$ on $R_{\text{base shear}}$	99
Figure (5-60): Effect of infill plate height, $h(\text{mm})$ on the base shear supported by infill plate, $V_p(\text{kN})$	99
Figure (5-61): Effect of infill plate height, $h(\text{mm})$ on $R_{\text{base shear}}$	100
Figure (5-62): Effect of infill plate length, $L(\text{mm})$ on the base shear supported by infill plate, $V_p(\text{kN})$	100
Figure (5-63): Effect of infill plate length, $L(\text{mm})$ on $R_{\text{base shear}}$	101
Figure (5-64): Effect of number of floors, n_f on the base shear supported by infill plate, $V_p(\text{kN})$	101
Figure (5-65): Effect of number of floors, n_f on $R_{\text{base shear}}$	102
Figure (5-66): Effect of infill plate yield stress, n_f on base shear supported by infill plate, $V_p(\text{kN})$	104