CHAPTER 4

Discussion of Analysis and Design Results of Tall Buildings

4.1 Introduction

In chapter 3, the analysis results were tabulated and viewed in a graphical presentation. In this chapter, the design sections were tabulated for each case. In order to choose the frame with the least weight of each frame type. The weight of the frames of tall building were compared and discussed. Finally, the distribution of storey displacements charts was drawn and depicted in previous chapter. In order to decide which bracing system has the largest effect on the frames. Then, the maximum value of story displacement on each frame was compared and discussed each structural frame type individually.

4.2 Design Results of Steel Tall Building Models

4.2.1 Rigid Frames Design Results

Firstly, the design results of beams (B1), (B348), (B350) and (B190) and columns (C1) and (C24) of braced and unbraced rigid frames of tall building were presented in **Tables (4.1)-(4.2)-(4.3)-(4.4) and (4.5)-(4.6)**, respectively. Secondly, the design results of beam (B5) and columns (C1) and (C24) of shear-wall of unbraced and braced frames were tabulated in **Tables (4.7)-(4.8) and (4.9)**, respectively. Finally, the design results of beams (B50), (B53) and (B206) and columns (C11), (C16), (C20) and (C27) of unbraced and braced tube frames were presented in **Tables (4.10)-(4.11)-(4.12) and (4.13)-(4.14)-(4.15)-(4.16)**.

Table (4.1): Sections of B1 for rigid frames.

Storey	Unbraced Frame	Cross Bracing	Diagonal Bracing	V-Shape Bracing
Storey25	W14X34	W14X34	W14X34	W14X34
Storey24	W14X34	W14X34	W14X34	W14X34
Storey23	W14X34	W14X34	W14X34	W14X34
Storey22	W14X34	W12X30	W14X30	W12X30
Storey21	W16X36	W12X30	W14X30	W12X30
Storey20	W16X40	W12X26	W14X30	W12X30
Storey19	W16X40	W12X26	W14X30	W12X30
Storey18	W16X40	W12X26	W14X30	W12X26
Storey17	W16X40	W12X26	W14X30	W12X30
Storey16	W14X43	W12X30	W14X30	W12X30
Storey15	W14X43	W12X30	W14X30	W12X30
Storey14	W14X48	W12X30	W14X30	W12X30
Storey13	W14X48	W12X30	W14X30	W12X30
Storey12	W14X53	W12X30	W14X30	W12X30
Storey11	W14X53	W12X30	W14X30	W12X30
Storey10	W14X53	W12X30	W14X30	W12X30
Storey9	W14X53	W12X30	W14X30	W12X30
Storey8	W14X48	W12X30	W14X30	W12X30
Storey7	W14X48	W12X30	W14X34	W12X30
Storey6	W14X43	W12X30	W14X30	W12X30
Storey5	W14X43	W12X30	W14X34	W12X30
Storey4	W14X43	W12X30	W14X34	W12X30
Storey3	W14X43	W12X30	W14X30	W12X30
Storey2	W14X43	W12X30	W14X34	W12X30
Storey1	W14X38	W12X30	W14X30	W12X30

Table (4.2): Sections of B348 for rigid frames.

Storey	Unbraced Frame	Cross Bracing	Diagonal Bracing	V-Shape Bracing
Storey25	W21X201	W21X201	W14X30	W21X201
Storey24	W21X201	W12X16	W14X30	W12X14
Storey23	W21X201	W12X16	W14X30	W12X14
Storey22	W21X201	W12X14	W14X30	W12X14
Storey21	W21X201	W12X14	W14X30	W12X14
Storey20	W21X201	W12X14	W14X30	W12X14
Storey19	W21X201	W12X14	W14X30	W12X14
Storey18	W21X201	W12X19	W14X30	W12X14
Storey17	W21X201	W12X22	W14X30	W12X14
Storey16	W21X201	W12X14	W14X30	W12X14
Storey15	W21X201	W12X14	W14X30	W12X14
Storey14	W21X201	W12X16	W14X30	W12X14
Storey13	W21X201	W12X14	W14X30	W12X14
Storey12	W21X201	W12X14	W14X30	W12X14
Storey11	W21X201	W12X14	W14X30	W12X14
Storey10	W21X201	W12X14	W14X30	W12X14
Storey9	W21X201	W12X14	W14X30	W12X14
Storey8	W21X201	W12X14	W14X30	W12X14
Storey7	W21X201	W12X14	W14X30	W12X14
Storey6	W21X201	W12X14	W14X30	W12X14
Storey5	W21X201	W12X14	W14X30	W12X14
Storey4	W21X201	W12X14	W14X30	W12X14
Storey3	W21X201	W12X14	W14X30	W12X14
Storey2	W21X201	W12X14	W14X30	W12X14
Storey1	W21X201	W12X14	W14X30	W12X14

Table (4.3): Sections of B350 for rigid frames.

Storey	Unbraced Frame	Cross Bracing	Diagonal Bracing	V-Shape Bracing
Storey25	W12X22	W21X201	W14X30	W21X201
Storey24	W21X201	W12X14	W14X30	W12X14
Storey23	W21X201	W12X14	W14X30	W12X14
Storey22	W21X201	W12X14	W14X30	W12X14
Storey21	W21X201	W12X14	W14X30	W12X14
Storey20	W21X201	W12X14	W14X30	W12X14
Storey19	W21X201	W12X14	W14X30	W12X14
Storey18	W21X201	W12X14	W14X30	W12X14
Storey17	W21X201	W12X14	W14X30	W12X14
Storey16	W21X201	W12X14	W14X30	W12X14
Storey15	W12X22	W12X14	W14X30	W12X14
Storey14	W12X14	W12X14	W14X30	W12X14
Storey13	W12X14	W12X14	W14X30	W12X14
Storey12	W12X14	W12X14	W14X30	W12X14
Storey11	W12X14	W12X14	W14X30	W12X14
Storey10	W12X26	W12X14	W14X30	W12X14
Storey9	W21X201	W12X14	W14X30	W12X14
Storey8	W21X201	W12X14	W14X30	W12X14
Storey7	W21X201	W12X14	W14X30	W12X14
Storey6	W21X201	W12X14	W14X30	W12X14
Storey5	W21X201	W12X14	W14X30	W12X14
Storey4	W21X201	W12X14	W14X30	W12X14
Storey3	W21X201	W12X14	W14X30	W12X14
Storey2	W24X55	W12X14	W14X30	W12X14
Storey1	W21X201	W12X14	W14X30	W12X14

Table (4.4): Sections of B190 for rigid frames.

Storey	Unbraced Frame	Cross Bracing	Diagonal Bracing	V-Shape Bracing
Storey25	W16X36	W21X201	W16X36	W21X201
Storey24	W21X201	W21X201	W21X201	W21X201
Storey23	W21X201	W21X201	W21X201	W21X201
Storey22	W21X201	W21X201	W21X201	W21X201
Storey21	W21X201	W21X201	W24X55	W21X201
Storey20	W21X201	W21X201	W24X55	W24X55
Storey19	W24X68	W21X201	W14X30	W14X30
Storey18	W24X131	W21X201	W14X30	W12X30
Storey17	W24X55	W16X50	W14X30	W12X30
Storey16	W16X36	W16X50	W14X30	W12X26
Storey15	W12X26	W16X40	W14X30	W12X26
Storey14	W16X40	W16X50	W14X30	W12X26
Storey13	W16X31	W16X31	W14X30	W12X26
Storey12	W16X31	W12X30	W14X30	W12X26
Storey11	W16X31	W12X19	W14X30	W12X26
Storey10	W16X31	W12X19	W14X30	W12X26
Storey9	W24X55	W12X22	W14X30	W12X26
Storey8	W24X55	W12X19	W14X30	W12X26
Storey7	W24X55	W16X31	W14X30	W12X26
Storey6	W24X55	W12X19	W14X30	W12X26
Storey5	W24X55	W12X19	W14X30	W12X26
Storey4	W24X55	W12X26	W14X30	W12X26
Storey3	W24X55	W14X30	W14X30	W12X26
Storey2	W14X30	W12X26	W14X30	W12X30
Storey1	W12X22	W12X26	W14X30	W12X26

Table (4.5): Sections of C1 for rigid frames.

Storey	Unbraced Frame	Cross Bracing	Diagonal Bracing	V-Shape Bracing
Storey25	W12X26	W12X26	W12X26	W12X26
Storey24	W14X34	W14X34	W14X34	W14X34
Storey23	W14X43	W14X43	W14X43	W14X43
Storey22	W14X53	W14X53	W14X53	W14X53
Storey21	W12X53	W12X58	W12X58	W12X58
Storey20	W12X58	W16X67	W16X67	W16X67
Storey19	W16X67	W12X72	W12X72	W12X72
Storey18	W12X72	W12X79	W12X79	W12X79
Storey17	W12X79	W18X86	W12X87	W18X86
Storey16	W12X79	W14X90	W14X90	W14X90
Storey15	W12X87	W14X99	W14X99	W14X99
Storey14	W14X90	W14X99	W24X117	W14X99
Storey13	W14X99	W21X111	W21X122	W24X117
Storey12	W24X117	W21X122	W24X131	W21X122
Storey11	W24X117	W24X131	W24X146	W24X131
Storey10	W24X131	W24X146	W24X146	W24X146
Storey9	W24X146	W24X146	W18X158	W24X146
Storey8	W24X146	W24X146	W24X162	W18X158
Storey7	W24X146	W24X162	W18X175	W24X162
Storey6	W18X158	W24X162	W21X182	W21X166
Storey5	W24X162	W18X175	W30X191	W24X176
Storey4	W24X176	W21X182	W30X191	W21X182
Storey3	W21X182	W30X191	W33X201	W30X191
Storey2	W24X192	W30X191	W30X211	W33X201
Storey1	W24X207	W30X191	W30X211	W33X201

Table (4.6): Sections of C24 for rigid frames.

Storey	Unbraced Frame	Cross Bracing	Diagonal Bracing	V-Shape Bracing
Storey25	W12X26	W14X48	W12X26	W12X26
Storey24	W12X30	W14X48	W12X26	W12X30
Storey23	W14X43	W14X48	W14X38	W14X38
Storey22	W16X50	W14X53	W14X38	W14X43
Storey21	W14X53	W14X53	W14X43	W14X43
Storey20	W14X53	W18X60	W14X43	W14X43
Storey19	W16X67	W14X53	W14X43	W14X43
Storey18	W16X67	W12X58	W14X43	W14X43
Storey17	W18X76	W14X53	W14X53	W14X43
Storey16	W12X72	W14X53	W14X53	W14X48
Storey15	W12X79	W12X53	W12X53	W14X48
Storey14	W12X87	W12X58	W12X53	W14X48
Storey13	W12X87	W12X58	W14X61	W14X48
Storey12	W12X96	W12X58	W12X58	W14X53
Storey11	W12X96	W12X58	W16X67	W14X53
Storey10	W24X117	W14X61	W12X58	W12X53
Storey9	W24X131	W12X58	W16X67	W12X53
Storey8	W24X146	W16X67	W16X67	W12X58
Storey7	W24X146	W16X67	W12X72	W12X58
Storey6	W24X146	W16X67	W12X72	W14X61
Storey5	W18X158	W12X72	W18X76	W16X67
Storey4	W18X158	W12X72	W18X76	W14X68
Storey3	W18X158	W14X74	W12X79	W12X72
Storey2	W18X175	W18X76	W18X86	W14X53
Storey1	W24X207	W16X67	W18X86	W12X53

Table (4.7): Sections of B5 for shear-wall frames.

Storey	Unbraced Frame	Cross Bracing	Diagonal Bracing	V-Shape Bracing
Storey25	W24X94	W14X43	W24X55	W14X48
Storey24	W24X117	W24X68	W24X55	W24X55
Storey23	W24X104	W16X36	W16X40	W24X55
Storey22	W24X117	W16X36	W24X55	W24X55
Storey21	W24X104	W16X36	W16X45	W24X55
Storey20	W24X103	W16X36	W24X55	W24X55
Storey19	W24X103	W16X36	W16X45	W24X55
Storey18	W24X103	W14X34	W16X40	W24X55
Storey17	W24X103	W16X31	W16X45	W24X55
Storey16	W24X94	W16X31	W16X50	W24X55
Storey15	W24X84	W16X31	W16X40	W24X55
Storey14	W24X76	W16X31	W16X40	W24X55
Storey13	W24X68	W16X31	W16X36	W24X55
Storey12	W24X68	W16X31	W16X36	W24X55
Storey11	W24X55	W16X31	W16X36	W24X55
Storey10	W24X76	W16X31	W16X36	W24X55
Storey9	W24X68	W16X31	W16X36	W12X26
Storey8	W24X55	W16X31	W16X36	W12X26
Storey7	W24X55	W16X31	W16X36	W12X26
Storey6	W24X55	W16X31	W16X36	W12X26
Storey5	W14X30	W16X31	W16X36	W12X26
Storey4	W12X30	W16X31	W16X36	W12X26
Storey3	W12X30	W16X31	W16X31	W12X26
Storey2	W12X26	W16X31	W16X31	W12X22
Storey1	W12X26	W14X30	W16X31	W12X19

Table (4.8): Sections of C1 for shear-wall frames.

Storey	Unbraced Frame	Cross Bracing	Diagonal Bracing	V-Shape Bracing
Storey25	W12X26	W12X26	W12X26	W12X26
Storey24	W12X26	W12X26	W12X26	W12X26
Storey23	W14X43	W14X43	W14X43	W12X26
Storey22	W14X43	W14X43	W14X43	W12X30
Storey21	W14X53	W14X48	W14X48	W14X43
Storey20	W12X53	W12X53	W12X53	W14X43
Storey19	W16X67	W12X53	W12X58	W14X43
Storey18	W16X67	W12X58	W14X61	W12X53
Storey17	W12X72	W12X72	W12X72	W12X53
Storey16	W12X79	W12X72	W12X72	W12X58
Storey15	W12X87	W12X79	W12X79	W12X72
Storey14	W14X90	W12X79	W18X86	W12X72
Storey13	W14X99	W12X87	W14X90	W12X79
Storey12	W14X99	W14X90	W14X90	W12X79
Storey11	W21X111	W14X99	W14X99	W14X90
Storey10	W21X122	W14X99	W14X99	W14X90
Storey9	W24X131	W21X111	W24X117	W14X99
Storey8	W24X146	W24X117	W21X122	W21X111
Storey7	W24X146	W24X131	W24X131	W21X122
Storey6	W24X146	W24X131	W24X146	W24X131
Storey5	W24X162	W24X146	W24X146	W24X146
Storey4	W24X162	W24X146	W18X158	W24X146
Storey3	W18X175	W18X158	W24X162	W24X146
Storey2	W24X192	W24X162	W21X166	W24X162
Storey1	W21X182	W24X162	W18X175	W24X162

Table (4.9): Sections of C24 for shear-wall frames.

Storey	Unbraced Frame	Cross Bracing	Diagonal Bracing	V-Shape Bracing
Storey25	W16X67	W16X67	W18X86	W18X55
Storey24	W14X99	W18X60	W12X16	W14X38
Storey23	W14X99	W14X48	W24X94	W14X48
Storey22	W18X76	W16X67	W12X14	W14X43
Storey21	W14X99	W14X53	W24X104	W14X43
Storey20	W18X76	W14X48	W12X22	W14X48
Storey19	W14X99	W18X55	W18X86	W14X43
Storey18	W18X76	W14X43	W12X19	W14X48
Storey17	W14X90	W18X60	W14X90	W14X48
Storey16	W21X111	W14X43	W12X22	W14X43
Storey15	W14X53	W18X55	W18X86	W14X48
Storey14	W14X99	W14X43	W14X22	W14X43
Storey13	W14X53	W14X48	W16X67	W14X43
Storey12	W12X72	W14X48	W12X26	W14X43
Storey11	W12X53	W14X43	W18X60	W12X30
Storey10	W16X67	W14X48	W12X26	W14X43
Storey9	W14X53	W14X38	W14X48	W14X38
Storey8	W12X72	W14X38	W12X26	W14X38
Storey7	W12X58	W12X30	W14X43	W14X38
Storey6	W12X53	W12X30	W12X26	W14X38
Storey5	W12X58	W12X26	W14X34	W14X38
Storey4	W12X53	W12X26	W12X26	W14X38
Storey3	W16X67	W12X30	W12X30	W14X43
Storey2	W16X67	W12X26	W12X26	W14X38
Storey1	W16X67	W12X26	W12X30	W14X30

Table (4.10): Sections of B50 for tube frames.

Storey	Unbraced Frame	Cross Bracing	Diagonal Bracing	V-Shape Bracing
Storey25	W21X201	W21X201	W21X201	W21X201
Storey24	W21X201	W21X201	W21X201	W21X201
Storey23	W21X201	W21X201	W21X201	W21X201
Storey22	W21X201	W21X201	W21X201	W21X201
Storey21	W21X201	W21X201	W21X201	W21X201
Storey20	W21X201	W21X201	W21X201	W21X201
Storey19	W21X201	W21X201	W21X201	W14X30
Storey18	W21X201	W21X201	W21X201	W16X31
Storey17	W21X201	W21X201	W21X201	W14X30
Storey16	W21X201	W21X201	W21X201	W21X201
Storey15	W21X201	W24X76	W21X201	W21X201
Storey14	W21X201	W21X201	W24X55	W21X201
Storey13	W21X201	W12X30	W16X31	W21X201
Storey12	W21X201	W21X201	W24X103	W24X55
Storey11	W21X201	W12X19	W21X201	W24X131
Storey10	W21X201	W21X201	W12X26	W21X201
Storey9	W21X201	W12X19	W21X201	W24X84
Storey8	W21X201	W21X201	W12X14	W14X30
Storey7	W21X201	W12X26	W24X162	W24X55
Storey6	W21X201	W21X201	W12X14	W12X22
Storey5	W21X201	W24X94	W24X76	W21X201
Storey4	W21X201	W12X30	W12X14	W12X19
Storey3	W21X201	W16X40	W24X55	W24X55
Storey2	W21X201	W16X36	W14X30	W14X30
Storey1	W21X201	W24X55	W16X45	W24X55

Table (4.11): Sections of B53 for tube frames.

Storey	Unbraced Frame	Cross Bracing	Diagonal Bracing	V-Shape Bracing
Storey25	W21X201	W21X201	W21X201	W21X201
Storey24	W21X201	W21X201	W21X201	W21X201
Storey23	W21X201	W21X201	W24X146	W21X201
Storey22	W21X201	W21X201	W21X201	W21X201
Storey21	W24X62	W21X201	W24X117	W21X201
Storey20	W24X55	W21X201	W21X201	W16X31
Storey19	W24X55	W21X201	W21X201	W12X30
Storey18	W24X62	W21X201	W24X76	W12X30
Storey17	W16X50	W24X62	W24X55	W14X30
Storey16	W16X45	W21X201	W24X55	W21X201
Storey15	W16X50	W16X50	W24X55	W16X36
Storey14	W24X55	W24X94	W16X31	W24X62
Storey13	W24X55	W14X34	W14X30	W24X55
Storey12	W24X62	W12X26	W24X103	W16X31
Storey11	W24X62	W21X201	W12X26	W16X40
Storey10	W24X62	W16X31	W21X201	W24X62
Storey9	W24X62	W21X201	W12X22	W16X45
Storey8	W24X68	W16X36	W21X201	W14X30
Storey7	W24X62	W24X176	W12X22	W16X31
Storey6	W24X62	W24X55	W24X192	W21X201
Storey5	W24X62	W24X55	W12X19	W12X26
Storey4	W24X62	W14X30	W24X94	W24X131
Storey3	W24X76	W24X55	W12X22	W14X30
Storey2	W24X62	W24X55	W24X55	W24X76

Table (4.12): Sections of B206 for tube frames.

Storey	Unbraced Frame	Cross Bracing	Diagonal Bracing	V-Shape Bracing
Storey25	W21X201	W21X201	W21X201	W21X201
Storey24	W21X201	W21X201	W21X201	W24X76
Storey23	W21X201	W21X201	W21X201	W21X201
Storey22	W21X201	W21X201	W21X201	W24X176
Storey21	W21X201	W21X201	W24X146	W21X201
Storey20	W24X146	W21X201	W21X201	W24X62
Storey19	W24X62	W21X201	W24X68	W24X76
Storey18	W24X84	W24X68	W24X117	W24X76
Storey17	W24X55	W24X55	W24X104	W24X103
Storey16	W24X62	W24X94	W24X84	W24X55
Storey15	W24X62	W24X62	W24X55	W24X55
Storey14	W24X68	W24X84	W24X68	W24X84
Storey13	W24X68	W24X62	W24X55	W24X55
Storey12	W24X68	W24X68	W24X62	W24X62
Storey11	W24X76	W24X84	W24X68	W24X76
Storey10	W24X76	W24X62	W24X62	W24X55
Storey9	W24X76	W24X62	W24X55	W24X55
Storey8	W24X84	W24X76	W24X55	W24X55
Storey7	W24X84	W24X76	W24X55	W24X55
Storey6	W24X84	W24X62	W24X84	W24X55
Storey5	W24X84	W24X84	W24X68	W24X55
Storey4	W24X84	W24X55	W24X55	W24X62
Storey3	W24X84	W24X55	W24X55	W24X55
Storey2	W24X76	W24X55	W24X55	W24X55
Storey1	W24X55	W24X55	W24X55	W24X55

Table (4.13): Sections of C11 for tube frames.

Storey	Unbraced Frame	Cross Bracing	Diagonal Bracing	V-Shape Bracing
Storey25	W14X48	W14X38	W14X43	W14X43
Storey24	W14X43	W12X30	W14X34	W14X34
Storey23	W14X48	W14X38	W14X43	W14X43
Storey22	W18X65	W14X43	W14X43	W14X53
Storey21	W16X67	W14X43	W18X55	W14X43
Storey20	W21X68	W16X50	W14X48	W18X60
Storey19	W18X76	W14X48	W18X65	W14X53
Storey18	W18X76	W14X53	W12X58	W16X67
Storey17	W21X93	W18X60	W16X67	W12X58
Storey16	W18X86	W14X61	W14X61	W21X73
Storey15	W21X101	W16X67	W21X73	W12X65
Storey14	W21X111	W14X61	W16X67	W18X76
Storey13	W24X117	W18X76	W21X83	W18X76
Storey12	W24X131	W12X72	W14X74	W14X82
Storey11	W24X146	W18X76	W18X86	W14X82
Storey10	W24X146	W14X82	W18X76	W18X86
Storey9	W18X158	W16X89	W24X94	W18X86
Storey8	W24X162	W16X89	W18X86	W18X97
Storey7	W18X175	W14X90	W24X104	W18X97
Storey6	W21X182	W24X104	W14X99	W21X101
Storey5	W18X192	W14X99	W21X111	W21X101
Storey4	W24X207	W21X111	W24X104	W21X111
Storey3	W27X217	W21X111	W24X117	W21X111
Storey2	W36X256	W24X117	W24X117	W24X117
Storey1	W36X282	W21X111	W21X122	W21X111

Table (4.14): Sections of C16 for tube frames.

Storey	Unbraced Frame	Cross Bracing	Diagonal Bracing	V-Shape Bracing
Storey25	W12X14	W12X14	W12X14	W12X14
Storey24	W12X14	W12X14	W12X14	W12X14
Storey23	W12X19	W12X14	W12X14	W12X19
Storey22	W14X22	W12X14	W12X16	W12X22
Storey21	W12X26	W12X19	W12X22	W14X22
Storey20	W12X26	W12X22	W12X22	W12X26
Storey19	W12X26	W14X22	W12X26	W12X26
Storey18	W12X26	W14X22	W12X26	W12X26
Storey17	W12X26	W12X26	W12X26	W12X26
Storey16	W12X26	W12X26	W12X26	W12X30
Storey15	W12X30	W12X26	W12X26	W14X34
Storey14	W12X30	W12X26	W12X26	W14X34
Storey13	W12X30	W12X26	W12X26	W12X40
Storey12	W14X34	W12X26	W12X26	W12X40
Storey11	W14X34	W12X26	W12X30	W12X40
Storey10	W12X35	W12X30	W12X30	W12X45
Storey9	W14X38	W12X30	W12X35	W14X48
Storey8	W12X40	W14X34	W14X34	W12X53
Storey7	W12X40	W14X34	W12X40	W12X58
Storey6	W12X40	W14X38	W12X40	W12X65
Storey5	W12X40	W14X38	W14X48	W12X65
Storey4	W12X40	W12X40	W14X48	W12X72
Storey3	W12X45	W12X40	W12X65	W12X72
Storey2	W14X48	W12X45	W12X65	W12X40
Storey1	W14X48	W12X53	W18X86	W14X38

Table (4.15): Sections of C20 for tube frames.

Storey	Unbraced Frame	Cross Bracing	Diagonal Bracing	V-Shape Bracing
Storey25	W12X14	W12X14	W12X14	W12X14
Storey24	W12X26	W12X14	W12X14	W12X16
Storey23	W12X26	W12X14	W12X19	W12X22
Storey22	W12X26	W12X19	W12X22	W14X22
Storey21	W12X26	W12X22	W14X22	W12X26
Storey20	W12X26	W14X22	W14X22	W12X26
Storey19	W12X26	W14X22	W12X26	W12X26
Storey18	W12X26	W14X22	W12X26	W12X26
Storey17	W12X26	W12X26	W12X26	W12X26
Storey16	W12X26	W12X26	W12X26	W12X30
Storey15	W12X26	W12X26	W12X26	W14X34
Storey14	W12X26	W12X26	W12X26	W12X35
Storey13	W12X30	W12X26	W12X26	W14X38
Storey12	W12X30	W12X26	W12X26	W12X40
Storey11	W12X30	W12X26	W12X30	W12X40
Storey10	W12X30	W12X26	W12X30	W14X43
Storey9	W12X30	W12X26	W12X30	W14X43
Storey8	W12X30	W12X26	W12X30	W14X48
Storey7	W12X30	W12X30	W12X35	W14X48
Storey6	W14X34	W12X30	W12X35	W14X53
Storey5	W14X34	W14X34	W12X40	W12X53
Storey4	W14X34	W12X35	W12X40	W12X58
Storey3	W14X34	W14X34	W12X40	W12X65
Storey2	W14X34	W12X40	W12X40	W14X34
Storey1	W14X34	W12X40	W14X43	W12X30

Table (4.16): Sections of C27 for tube frames.

Storey	Unbraced Frame	Cross Bracing	Diagonal Bracing	V-Shape Bracing
Storey25	W18X55	W14X48	W14X43	W18X55
Storey24	W14X48	W14X43	W14X43	W14X34
Storey23	W14X48	W14X43	W14X43	W18X55
Storey22	W18X60	W18X55	W18X55	W14X43
Storey21	W18X60	W18X60	W14X48	W18X60
Storey20	W18X65	W18X60	W21X68	W18X65
Storey19	W21X73	W18X65	W14X53	W16X67
Storey18	W18X76	W21X73	W21X83	W16X67
Storey17	W21X83	W18X76	W14X61	W18X76
Storey16	W18X86	W18X76	W27X84	W18X76
Storey15	W24X94	W18X86	W18X76	W18X86
Storey14	W18X97	W18X86	W21X93	W18X86
Storey13	W21X101	W21X101	W27X94	W24X94
Storey12	W24X104	W18X97	W21X101	W21X101
Storey11	W21X111	W24X104	W21X101	W21X101
Storey10	W24X117	W21X111	W24X117	W21X111
Storey9	W24X117	W24X104	W21X111	W21X111
Storey8	W24X131	W24X117	W24X117	W24X117
Storey7	W24X131	W24X117	W24X117	W24X131
Storey6	W24X146	W24X117	W24X131	W24X131
Storey5	W24X146	W24X131	W24X131	W24X146
Storey4	W24X146	W24X131	W24X146	W24X146
Storey3	W18X158	W24X146	W24X146	W24X146
Storey2	W24X162	W24X146	W27X146	W18X158
Storey1	W24X162	W24X146	W24X146	W24X146

4.2.2 Shear-wall and Tube Frames Design Results

By the same way, all frames were designed by ETABS 2013.Then, the design results of the beams and columns of shear-wall and tube frame buildings were tabulated in **Appendix (D)**.

4.3 Discussion of Tall Building Frames Weights

After design the frames it was noticed that by using bracing system in each frame type the sections were reduced compared with unbraced frames. Therefore, that caused a reduction in contact pressure on the columns bases. In order to get the lightest frame of the three structural frame types of tall building, it was consider the building dimensions, height and the applied loads were be equal. The weights of all structural frames with unbraced and braced system were presented in **Table (4.17)**.

To compare the effect of the bracing systems that reduced the frames weight on each structural frames type, the weights of bracing frames were considered as percentage of unbraced frame for each structural frame type individually. **Figure (4.1)** show the percentages of rigid braced frames compared with unbraced frame by assuming the weight of unbraced frame was 100%. In same manner, the percentages of the braced frames compared with unbraced frame for shear-wall and tube frames were presented as shown in **Figures (4.2) and (4.3)**, respectively.

Table (4.17): The weights of all structural tall building frames.

Type of Frame	Type of Bracing	Base Reaction KN
Rigid Frame	Unbraced	95329.2
	Cross bracing	94828.4
	Diagonal bracing	94850.5
	V-shape bracing	93056.0
Shear wall Frame	Unbraced	115265.3
	Cross bracing	115192.6
	Diagonal bracing	115111.4
	V-shape bracing	114192.4
Tube Frame	Unbraced	111108.9
	Cross bracing	98170.6
	Diagonal bracing	97120.1
	V-shape bracing	97088.7

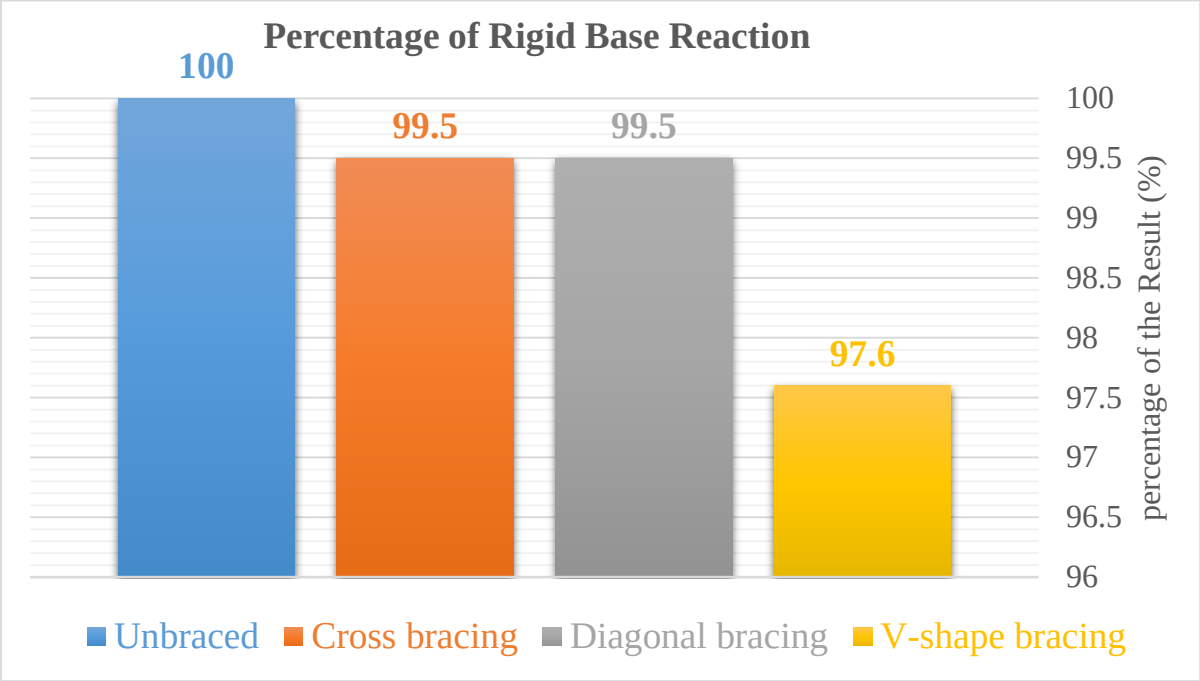

Figure (4.1): Percentage of rigid frames base reactions.

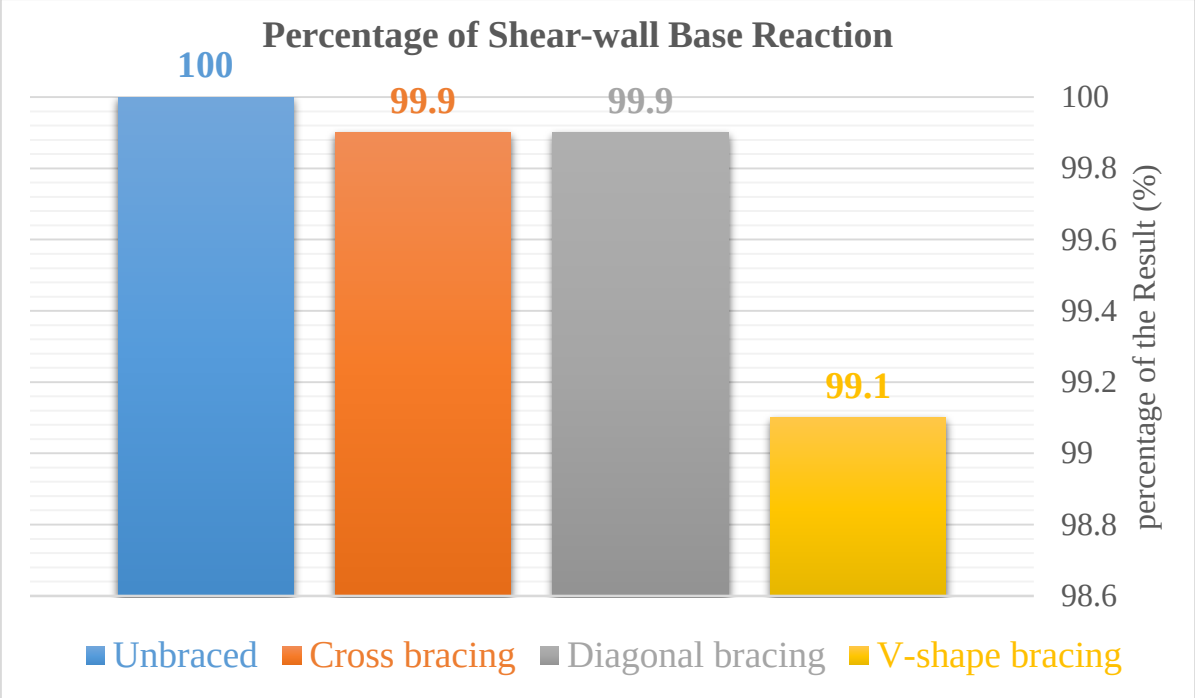

Figure (4.2): Percentage of shear-wall frames base reactions.

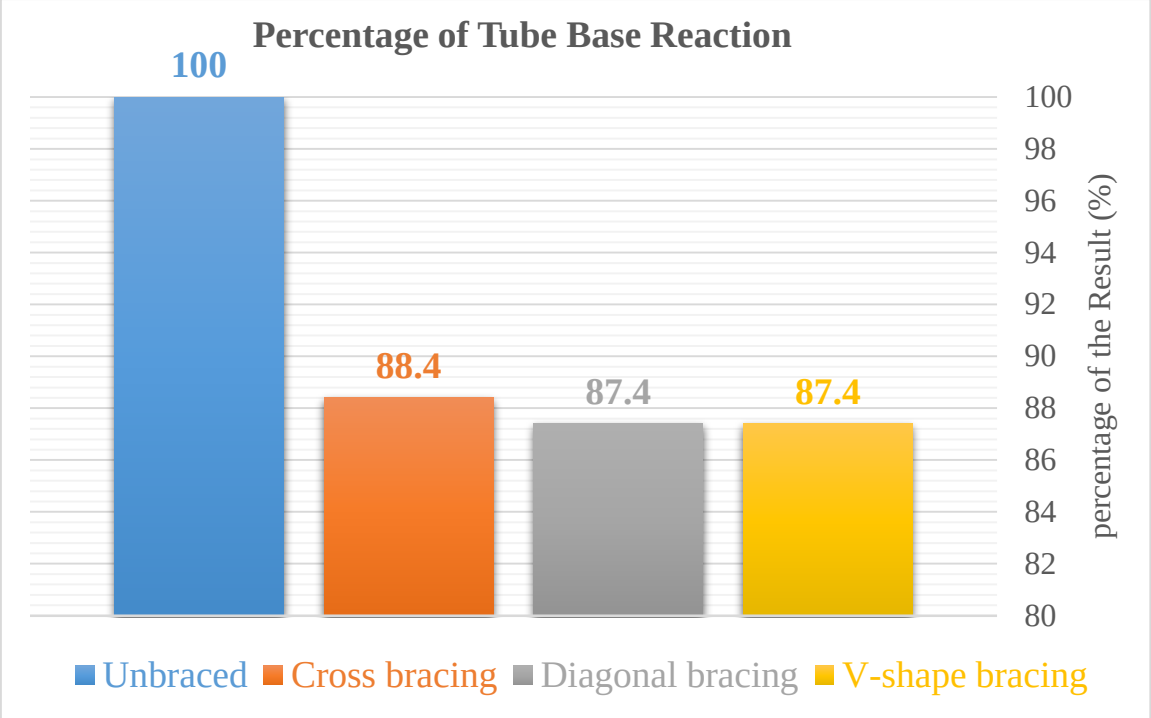

Figure (4.3): Percentage of tube frames base reactions.

4.4 Discussion of The Story displacement of The Tall Building Frames

As mentioned in chapter 2, the bracing system increase the stability of the steel frames showed as reduction in the story displacement values. In order to study the effect of bracing system on story displacements, comparison was made by considering the maximum story displacement values of unbraced frames as reference for each structural frames type. Then, the maximum story displacement value of the structural braced frames were calculated as percentage. Note that, the story displacements in x- direction was neglected, because it were too small comparing with the story displacements in y- direction. The maximum story displacement percentages of rigid frames, shear-wall frames and tube frames were presented in **Figure (4.4), (4.5) and (4.6)** respectively**.**

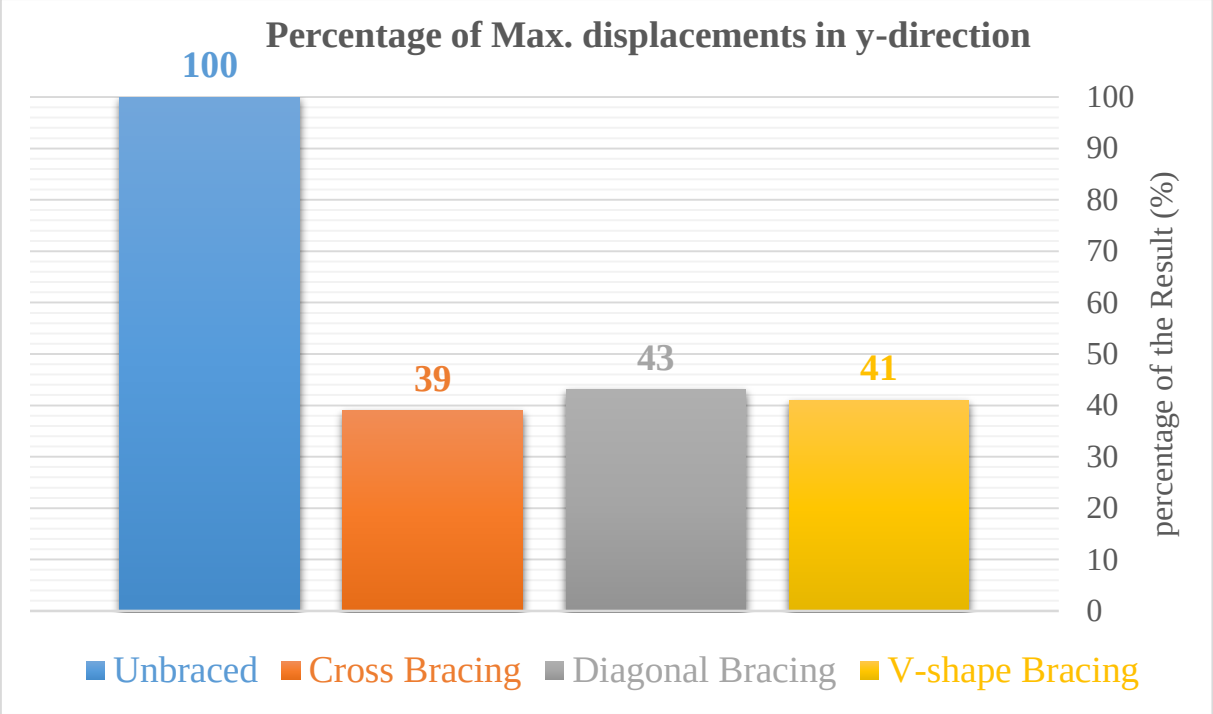

Figure (4.4): Percentage of maximum story displacement of rigid frames in y- direction.

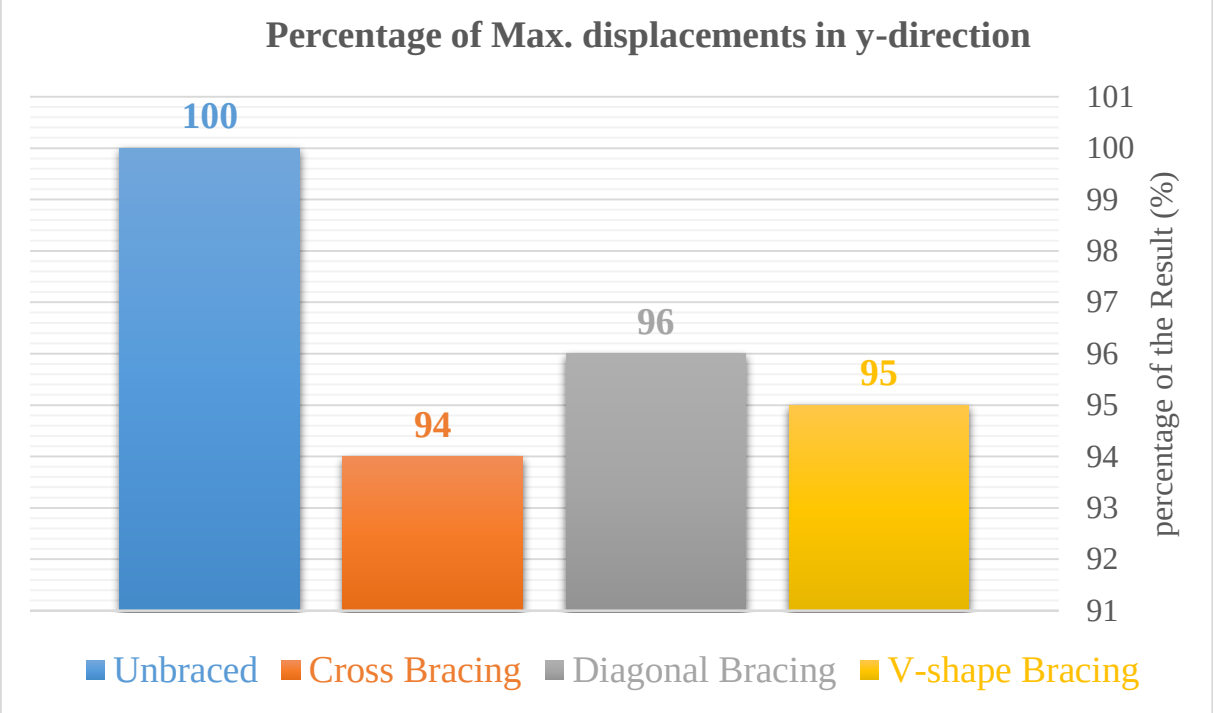

Figure (4.5): Percentage of maximum story displacement of shear-wall frames in y- direction.

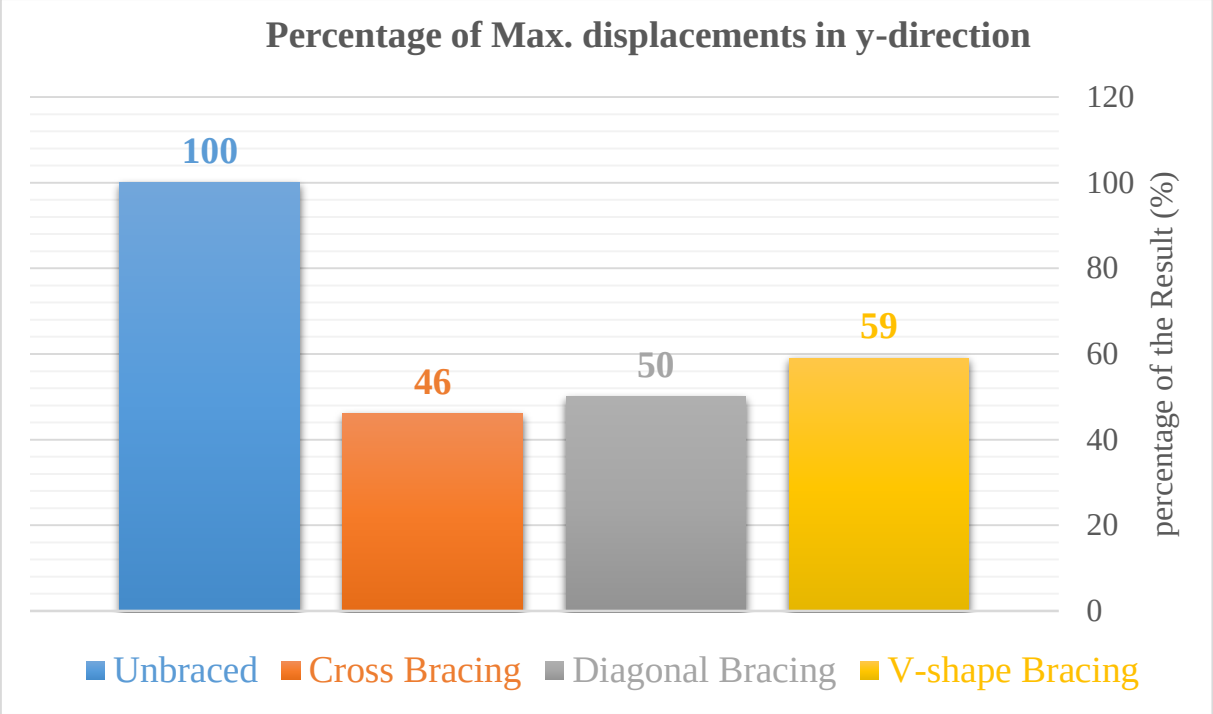

Figure (4.6): Percentage of maximum story displacement of tube frames in y- direction.