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SAP2000 Analysis Report

Prepared by

Microsoft

Model Name: PUENTE SAP.sdb

13 junio 2019

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1. Model geometry

This section provides model geometry information, including items such as joint coordinates, joint restraints, and element connectivity.

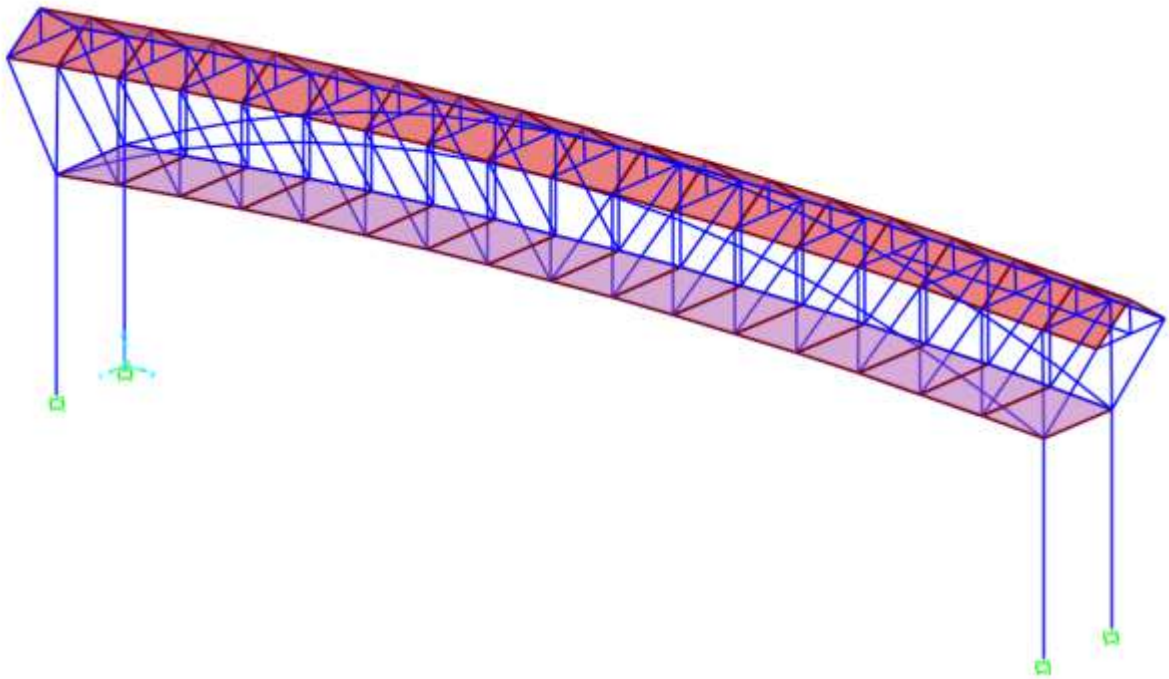

Figure 1: Finite element model

1.1. Joint coordinates

Table 1: Joint Coordinates

Table 1: Joint Coordinates

Joint	CoordSys	CoordType	GlobalX	GlobalY	GlobalZ
			m	m	m
14	GLOBAL	Cartesian	23.5204	0.	9.5738
15	GLOBAL	Cartesian	21.35032	0.	9.87114
16	GLOBAL	Cartesian	19.16728	0.	10.05005
85	GLOBAL	Cartesian	25.46484	2.99981	9.95597
86	GLOBAL	Cartesian	23.34484	2.99981	10.02333
87	GLOBAL	Cartesian	21.20561	2.99981	10.06969
107	GLOBAL	Cartesian	21.22484	2.99981	7.06219
108	GLOBAL	Cartesian	23.34484	2.99981	6.99133
109	GLOBAL	Cartesian	25.46484	2.99981	6.92047
121	GLOBAL	Cartesian	25.67111	3.	9.15892
122	GLOBAL	Cartesian	23.5204	3.	9.5738
123	GLOBAL	Cartesian	21.35032	3.	9.87114
159	GLOBAL	Cartesian	25.4404	1.49983	10.9552
160	GLOBAL	Cartesian	25.46484	1.49981	9.95601
161	GLOBAL	Cartesian	23.3204	1.49983	11.0226
162	GLOBAL	Cartesian	23.34484	1.49981	10.02341
163	GLOBAL	Cartesian	21.1812	1.49983	11.069
164	GLOBAL	Cartesian	21.20564	1.49981	10.06981

Table 1: Joint Coordinates

Joint	CoordSys	CoordType	GlobalX	GlobalY	GlobalZ
			m	m	m
166	GLOBAL	Cartesian	19.0804	1.49983	11.0996
167	GLOBAL	Cartesian	19.10484	1.49981	10.10041
191	GLOBAL	Cartesian	23.34484	-0.00019	10.02333
192	GLOBAL	Cartesian	21.20561	-0.00019	10.06969
193	GLOBAL	Cartesian	19.10484	-0.00019	10.10031
214	GLOBAL	Cartesian	19.10484	-0.00019	7.11003
215	GLOBAL	Cartesian	21.22484	-0.00019	7.06219
216	GLOBAL	Cartesian	23.34484	-0.00019	6.99133

1.2. Joint restraints

1.3. Element connectivity

Table 2: Connectivity - Frame

Table 2: Connectivity - Frame

Frame	JointI	JointJ	Length
			m
99	120	121	2.19036
101	121	122	2.19036
102	122	123	2.19036
103	123	124	2.19036
115	13	14	2.19036
116	14	15	2.19036
117	15	16	2.19036
118	16	17	2.19036
137	214	193	2.99029
138	215	192	3.00756
139	216	191	3.032
155	213	193	3.67134
156	214	192	3.62944
157	215	191	3.64181
158	216	190	3.64465
174	107	87	3.00756
175	108	86	3.032
177	109	85	3.0355
185	190	191	2.12107
186	191	192	2.13974
187	192	193	2.10099
189	193	195	2.13002
207	213	214	2.13
208	214	215	2.12054
209	215	216	2.12118
210	216	217	2.12118
222	106	87	3.62944
223	107	86	3.64181
224	108	85	3.64465
225	109	84	3.63178
236	84	85	2.12177

Table 2: Connectivity - Frame

Frame	JointI	JointJ	Length
			m
237	85	86	2.12107
238	86	87	2.13974
239	87	88	2.10099
259	106	107	2.12054
260	107	108	2.12118
261	108	109	2.12118
262	109	110	2.12265
280	106	214	3.
281	107	215	3.
282	108	216	3.
283	109	217	3.
372	85	159	1.80249
373	159	190	1.80253
374	159	160	0.99949
375	190	160	1.5
376	160	85	1.5
377	86	161	1.80252
378	161	191	1.80255
379	161	162	0.99949
380	191	162	1.5
381	162	86	1.5
382	87	163	1.80254
383	163	192	1.80258
384	163	164	0.99949
385	192	164	1.5
386	164	87	1.5
387	88	166	1.80253
388	166	193	1.80256
389	166	167	0.99949
390	193	167	1.5
391	167	88	1.5

Table 3: Frame Section Assignments

Table 3: Frame Section Assignments

Frame	AnalSect	DesignSect	MatProp
99	seccion 1 30x50	N.A.	Default
101	seccion 1 30x50	N.A.	Default
102	seccion 1 30x50	N.A.	Default
103	seccion 1 30x50	N.A.	Default
115	seccion 1 30x50	N.A.	Default
116	seccion 1 30x50	N.A.	Default
117	seccion 1 30x50	N.A.	Default
118	seccion 1 30x50	N.A.	Default
137	seccion 4 20x20	N.A.	Default
138	seccion 4 20x20	N.A.	Default
139	seccion 4 20x20	N.A.	Default
155	seccion 4 20x20	N.A.	Default
156	seccion 4 20x20	N.A.	Default
157	seccion 4 20x20	N.A.	Default
158	seccion 4 20x20	N.A.	Default

Table 3: Frame Section Assignments

Frame	AnalSect	DesignSect	MatProp
174	seccion 4 20x20	N.A.	Default
175	seccion 4 20x20	N.A.	Default
177	seccion 4 20x20	N.A.	Default
185	seccion 2 30x40	N.A.	Default
186	seccion 2 30x40	N.A.	Default
187	seccion 2 30x40	N.A.	Default
189	seccion 2 30x40	N.A.	Default
207	seccion 3 40x40	N.A.	Default
208	seccion 3 40x40	N.A.	Default
209	seccion 3 40x40	N.A.	Default
210	seccion 3 40x40	N.A.	Default
222	seccion 4 20x20	N.A.	Default
223	seccion 4 20x20	N.A.	Default
224	seccion 4 20x20	N.A.	Default
225	seccion 4 20x20	N.A.	Default
236	seccion 2 30x40	N.A.	Default
237	seccion 2 30x40	N.A.	Default
238	seccion 2 30x40	N.A.	Default
239	seccion 2 30x40	N.A.	Default
259	seccion 3 40x40	N.A.	Default
260	seccion 3 40x40	N.A.	Default
261	seccion 3 40x40	N.A.	Default
262	seccion 3 40x40	N.A.	Default
280	seccion 3 40x40	N.A.	Default
281	seccion 3 40x40	N.A.	Default
282	seccion 3 40x40	N.A.	Default
283	seccion 3 40x40	N.A.	Default
372	seccion 20x10	N.A.	Default
373	seccion 20x10	N.A.	Default
374	seccion 10x10	N.A.	Default
375	seccion 20x10	N.A.	Default
376	seccion 20x10	N.A.	Default
377	seccion 20x10	N.A.	Default
378	seccion 20x10	N.A.	Default
379	seccion 10x10	N.A.	Default
380	seccion 20x10	N.A.	Default
381	seccion 20x10	N.A.	Default
382	seccion 20x10	N.A.	Default
383	seccion 20x10	N.A.	Default
384	seccion 10x10	N.A.	Default
385	seccion 20x10	N.A.	Default
386	seccion 20x10	N.A.	Default
387	seccion 20x10	N.A.	Default
388	seccion 20x10	N.A.	Default
389	seccion 10x10	N.A.	Default
390	seccion 20x10	N.A.	Default
391	seccion 20x10	N.A.	Default

Table 4: Connectivity - Area

Table 4: Connectivity - Area

Area	Joint1	Joint2	Joint3	Joint4
5	110	109	217	218
6	109	108	216	217
7	108	107	215	216
8	107	106	214	215
9	106	105	213	214
44	84	153	159	85
47	163	166	88	87
48	166	168	89	88
67	168	166	193	195
68	166	163	192	193
69	163	161	191	192
70	161	159	190	191
71	159	153	189	190
77	159	161	86	85
78	161	163	87	86

Table 5: Area Section Assignments

Table 5: Area Section Assignments

Area	Section	MatProp
5	Piso	Default
6	Piso	Default
7	Piso	Default
8	Piso	Default
9	Piso	Default
44	Cub	Default
47	Cub	Default
48	Cub	Default
67	Cub	Default
68	Cub	Default
69	Cub	Default
70	Cub	Default
71	Cub	Default
77	Cub	Default
78	Cub	Default

2. Material properties

This section provides material property information for materials used in the model.

Table 6: Material Properties 02 - Basic Mechanical Properties

Table 6: Material Properties 02 - Basic Mechanical Properties

Material	UnitWeight	UnitMass	E1	G12	U12	A1
	Kgf/m3	Kgf-s2/m4	Kgf/m2	Kgf/m2		1/C
4000Psi	2.4028E+03	2.4501E+02	2534563541.	1056068142.	0.2	9.9000E-06

Table 6: Material Properties 02 - Basic Mechanical Properties

Material	UnitWeight	UnitMass	E1	G12	U12	A1
	Kgf/m3	Kgf-s2/m4	Kgf/m2	Kgf/m2		1/C
A416Gr270	7.8490E+03	8.0038E+02	2.004E+10			1.1700E-05
A615Gr60	7.8490E+03	8.0038E+02	2.039E+10			1.1700E-05
A992Fy50	7.8490E+03	8.0038E+02	2.039E+10	7841930445.	0.3	1.1700E-05
Cub	0.0000E+00	0.0000E+00	2534563541.	1056068142.	0.2	9.9000E-06
MAT	8.0000E+02	8.1577E+01	968730402.	358789038.	0.35	1.1700E-05
PISO	0.0000E+00	0.0000E+00	2534563541.	1056068142.	0.2	9.9000E-06

Table 7: Material Properties 03a - Steel Data

Table 7: Material Properties 03a - Steel Data

Material	Fy	Fu	FinalSlope
	Kgf/m2	Kgf/m2	
A992Fy50	35153481.31	45699525.7	-0.1

Table 8: Material Properties 03b - Concrete Data

Table 8: Material Properties 03b - Concrete Data

Material	Fc	eFc	FinalSlope
	Kgf/m2	Kgf/m2	
4000Psi	2812278.5	2812278.5	-0.1
Cub	2812278.5	2812278.5	-0.1
PISO	2812278.5	2812278.5	-0.1

Table 9: Material Properties 03e - Rebar Data

Table 9: Material Properties 03e - Rebar Data

Material	Fy	Fu	FinalSlope
	Kgf/m2	Kgf/m2	
A615Gr60	42184177.57	63276266.35	-0.1

Table 10: Material Properties 03f - Tendon Data

Table 10: Material Properties 03f - Tendon Data

Material	Fy	Fu	FinalSlope
	Kgf/m2	Kgf/m2	
A416Gr270	172322365.4	189828799.1	-0.1

3. Section properties

This section provides section property information for objects used in the model.

3.1. Frames

Table 11: Frame Section Properties 01 - General, Part 1 of 4

Table 11: Frame Section Properties 01 - General, Part 1 of 4

SectionName	Material	Shape	t3	t2	tf	tw	t2b	tfb
			m	m	m	m	m	m
FSEC1	A992Fy50	Rectangular	0.5	0.3				
seccion 1 30x50	MAT	SD Section						
seccion 10x10	MAT	SD Section						
seccion 2 30x40	MAT	SD Section						
seccion 20x10	MAT	SD Section						
seccion 3 40x40	MAT	SD Section						
seccion 4 20x20	MAT	SD Section						
seccion concreto 1.1	PISO	Circle	1.1					
W18X35	A992Fy50	I/Wide Flange	0.44958	0.1524	0.010795	0.00762	0.1524	0.010795

Table 11: Frame Section Properties 01 - General, Part 2 of 4

Table 11: Frame Section Properties 01 - General, Part 2 of 4

SectionName	Area	TorsConst	I33	I22	I23	AS2	AS3
	m2	m4	m4	m4	m4	m2	m2
FSEC1	0.15	0.002817	0.003125	0.001125	0.	0.125	0.125
seccion 1 30x50	0.117054	0.000904	0.002414	0.000853	0.	0.059984	0.058607
seccion 10x10	0.007804	9.691E-06	4.846E-06	4.846E-06	0.	0.007045	0.007045
seccion 2 30x40	0.093643	0.000623	0.001229	0.000682	0.	0.047608	0.046885
seccion 20x10	0.015607	0.000019	9.692E-06	0.000049	0.	0.01409	0.00759
seccion 3 40x40	0.124858	0.001155	0.001638	0.001638	0.	0.063477	0.063477
seccion 4 20x20	0.031214	0.000069	0.000097	0.000097	0.	0.01518	0.01518
seccion concreto 1.1	0.950332	0.143738	0.071869	0.071869	0.	0.855299	0.855299
W18X35	0.006645	2.106E-07	0.000212	6.368E-06	0.	0.003426	0.002742

Table 11: Frame Section Properties 01 - General, Part 3 of 4

Table 11: Frame Section Properties 01 - General, Part 3 of 4

SectionName	S33	S22	Z33	Z22	R33	R22
	m3	m3	m3	m3	m	m
FSEC1	0.0125	0.0075	0.01875	0.01125	0.144338	0.086603
seccion 1 30x50	0.009655	0.005687	0.014542	0.008629	0.1436	0.085368
seccion 10x10	0.000097	0.000097	0.000165	0.000165	0.02492	0.02492
seccion 2 30x40	0.006143	0.00455	0.009364	0.006903	0.114547	0.085368
seccion 20x10	0.000194	0.000487	0.00033	0.00078	0.02492	0.055866
seccion 3 40x40	0.008191	0.008191	0.012486	0.012486	0.114547	0.114547
seccion 4 20x20	0.000974	0.000974	0.001561	0.001561	0.055866	0.055866
seccion concreto 1.1	0.130671	0.130671	0.221833	0.221833	0.275	0.275
W18X35	0.000944	0.000084	0.00109	0.000132	0.178731	0.030957

Table 11: Frame Section Properties 01 - General, Part 4 of 4

Table 11: Frame Section Properties 01 - General, Part 4 of 4

SectionName	AMod	A2Mod	A3Mod	JMod	I2Mod	I3Mod	MMod	WMod
FSEC1	1.	1.	1.	1.	1.	1.	1.	1.
seccion 1 30x50	1.	1.	1.	1.	1.	1.	1.	1.
seccion 10x10	1.	1.	1.	1.	1.	1.	1.	1.
seccion 2 30x40	1.	1.	1.	1.	1.	1.	1.	1.
seccion 20x10	1.	1.	1.	1.	1.	1.	1.	1.
seccion 3 40x40	1.	1.	1.	1.	1.	1.	1.	1.
seccion 4 20x20	1.	1.	1.	1.	1.	1.	1.	1.
seccion concreto 1.1	1.	1.	1.	1.	1.	1.	1.	1.
W18X35	1.	1.	1.	1.	1.	1.	1.	1.

Table 12: Frame Section Properties 02 - Concrete Column, Part 1 of 2

Table 12: Frame Section Properties 02 - Concrete Column, Part 1 of 2

SectionName	RebarMatL	RebarMatC	ReinfConfig	LatReinf	Cover	NumBarsCirc	BarSizeL
					m		
seccion concreto 1.1	A615Gr60	A615Gr60	Circular	Spiral	0.05	26	#10

Table 12: Frame Section Properties 02 - Concrete Column, Part 2 of 2

Table 12: Frame Section Properties 02 - Concrete Column, Part 2 of 2

SectionName	BarSizeC	SpacingC
		m
seccion concreto 1.1	#4	0.1

3.2. Areas

Table 13: Area Section Properties, Part 1 of 3

Table 13: Area Section Properties, Part 1 of 3

Section	Material	AreaType	Type	DrillDOF	Thickness	BendThick	F11Mod
					m	m	
ASEC1	4000Psi	Shell	Shell-Thin	Yes	0.25	0.25	1.
Cub	Cub	Shell	Membrane	Yes	0.001	0.001	1.
Piso	PISO	Shell	Membrane	Yes	0.001	0.001	1.

Table 13: Area Section Properties, Part 2 of 3

Table 13: Area Section Properties, Part 2 of 3

Section	F22Mod	F12Mod	M11Mod	M22Mod	M12Mod	V13Mod	V23Mod
ASEC1	1.	1.	1.	1.	1.	1.	1.
Cub	1.	1.	1.	1.	1.	1.	1.

Table 13: Area Section Properties, Part 2 of 3

Section	F22Mod	F12Mod	M11Mod	M22Mod	M12Mod	V13Mod	V23Mod
Piso	1.	1.	1.	1.	1.	1.	1.

Table 13: Area Section Properties, Part 3 of 3

Table 13: Area Section Properties, Part 3 of 3

Section	MMod	WMod
ASEC1	1.	1.
Cub	1.	1.
Piso	1.	1.

3.3. Solids

Table 14: Solid Property Definitions

Table 14: Solid Property Definitions

SolidProp	Material	MatAngleA	MatAngleB	MatAngleC
		Degrees	Degrees	Degrees
Solid1	4000Psi	0.	0.	0.

4. Load patterns

This section provides loading information as applied to the model.

4.1. Definitions

Table 15: Load Pattern Definitions

Table 15: Load Pattern Definitions

LoadPat	DesignType	SelfWtMult	AutoLoad
DEAD	Dead	1.	
Sx	Quake	0.	USER COEFF
Sy	Quake	0.	USER COEFF
WIND	Wind	0.	None
SDEAD	Super Dead	0.	
LIVE	Live	0.	

4.2. Auto seismic loading

Table 16: Auto Seismic - User Coefficient

Table 16: Auto Seismic - User Coefficient

LoadPat	Dir	PercentEcc	C	K
Sx	X	0.05	0.592	1.
Sy	X	0.05	0.592	1.

5. Load cases

This section provides load case information.

5.1. Definitions

Table 17: Load Case Definitions, Part 1 of 2

Table 17: Load Case Definitions, Part 1 of 2

Case	Type	InitialCond	ModalCase	BaseCase	MassSource	DesActOpt
DEAD	LinStatic	Zero				Prog Det
MODAL	LinModal	Zero				Prog Det
Sx	LinStatic	Zero				Prog Det
Sy	LinStatic	Zero				Prog Det
WIND	LinStatic	Zero				Prog Det
SDEAD	LinStatic	Zero				Prog Det
LIVE	LinStatic	Zero				Prog Det

Table 17: Load Case Definitions, Part 2 of 2

Table 17: Load Case Definitions, Part 2 of 2

Case	DesignAct
DEAD	Non-Composite
MODAL	Other
Sx	Short-Term Composite
Sy	Short-Term Composite
WIND	Short-Term Composite
SDEAD	Long-Term Composite
LIVE	Short-Term Composite

5.2. Static case load assignments

Table 18: Case - Static 1 - Load Assignments

Table 18: Case - Static 1 - Load Assignments

Case	LoadType	LoadName	LoadSF
DEAD	Load pattern	DEAD	1.
Sx	Load pattern	Sx	1.
Sy	Load pattern	Sy	1.
WIND	Load pattern	WIND	1.
SDEAD	Load pattern	SDEAD	1.
LIVE	Load pattern	LIVE	1.

5.3. Response spectrum case load assignments

Table 19: Function - Response Spectrum - User

Table 19: Function - Response Spectrum - User

Name	Period	Accel	FuncDamp
	Sec		
UNIFRS	0.	1.	0.05
UNIFRS	1.	1.	

6. Load combinations

This section provides load combination information.

Table 20: Combination Definitions

Table 20: Combination Definitions

ComboName	ComboType	CaseName	ScaleFactor
RESISTENCIA I Max	Linear Add	SDEAD	1.25
RESISTENCIA I Max		LIVE	1.75
RESISTENCIA I Min	Linear Add	SDEAD	0.9
RESISTENCIA I Min		LIVE	1.75
RESISTNECIA III Max	Linear Add	SDEAD	1.25
RESISTNECIA III Max		WIND	1.4
RESISTENCIA III Min	Linear Add	SDEAD	0.9
RESISTENCIA III Min		WIND	1.4
EVENTO EXTREMO I Max en X	Linear Add	SDEAD	1.25
EVENTO EXTREMO I Max en X		LIVE	0.5

Table 20: Combination Definitions

ComboName	ComboType	CaseName	ScaleFactor
EVENTO EXTREMO I Max en X		Sx	1.
EVENTO EXTREMO I Max en Y	Linear Add	SDEAD	1.25
EVENTO EXTREMO I Max en Y		LIVE	0.5
EVENTO EXTREMO I Max en Y		Sy	1.
EVENTO EXTREMO I Min en X	Linear Add	SDEAD	0.9
EVENTO EXTREMO I Min en X		LIVE	0.5
EVENTO EXTREMO I Min en X		Sx	1.
EVENTO EXTREMO I Min en Y	Linear Add	SDEAD	0.9
EVENTO EXTREMO I Min en Y		LIVE	0.5
EVENTO EXTREMO I Min en Y		Sy	1.
SERVICIO I	Linear Add	SDEAD	1.
SERVICIO I		LIVE	1.
SERVICIO I		WIND	0.3
SERVICIO III	Linear Add	SDEAD	1.
SERVICIO III		LIVE	0.8

7. Material take-off

This section provides a material take-off.

Table 21: Material List 2 - By Section Property

Table 21: Material List 2 - By Section Property

Section	ObjectType	NumPieces	TotalLength	TotalWeight
			m	Kgf
seccion 1 30x50	Frame	8	17.52288	1640.9
seccion 2 30x40	Frame	8	16.97538	1271.71
seccion 3 40x40	Frame	12	28.97847	2894.55
seccion 4 20x20	Frame	14	47.23983	1179.65
seccion 20x10	Frame	16	26.4203	329.88
seccion 10x10	Frame	4	3.99796	24.96
Piso	Area			0.
Cub	Area			0.