Moment Frame Analysis Calculations v5.0.0 3/17/14

Project:

Frame Type = OMF

Does frame support leaners? No

Gravity Loads

Roof DL =	25	psf
Roof LL =	20	psf
Snow =	15	psf
Rain =	5	psf
Floor DL =	15	psf
Floor LL =	40	psf
f1 =	0.50	
f2 =	0.20	

Roof Level Lateral Loads

Wind Load =	1000	plf	1.00	K
Seismic Load =	1000	plf	1.00	K

Lateral load tirbutary width = 1.00

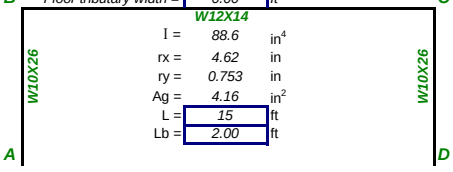
θ < 0.1, Frame is stable

Moment Frame Deflection OK 32%

Roof tributary width = 10.00 ft

Floor tributary width = 0.00 ft

δ = 1.06 in



Column Bases = Pinned

Base Plate Design information

Concrete strength, f'c =	4500	psi
Footing Width =	24	in
Footing Length =	24	in
Fy =	60000	psi
N =	10.5	in
B =	6	in
# Anchor bolts =	4	
Bolt diameter =	0.5	in
Fp =	4590	psi
f_1 =	44	psi
f_2 =	44	psi
tp =	0	in
Gussett Plate thickness =		in
Gussett Plate depth =		in
ΦMn =	N/A	
ΦVn =	N/A	

JOINT =	A	B		C		D
SPAN =	AB	BA	BC	CB	CD	DC
MAX M =	0.00	-12.65	12.65	-5.65	5.65	0.00
CONTROLLING EQN =	IBC 16-1	IBC 16-4	IBC 16-4	IBC 16-2	IBC 16-2	IBC 16-1

MAX. FRAME MEMBER REACTIONS

SPAN AB	R_{AB} =	0.90	kips	IBC 16-4
	R_{BA} =	-0.90	kips	IBC 16-4
SPAN BC	R_{BC} =	4.31	kips	IBC 16-3
	R_{CB} =	4.78	kips	IBC 16-3
SPAN CD	R_{DC} =	-0.40	kips	IBC 16-2
	R_{CD} =	0.40	kips	IBC 16-2

MAX. FRAME MEMBER AXIAL REACTIONS

SPAN AB	P_{AB} =	4.31	kips	C	IBC 16-3
SPAN BC	P_{BC} =	0.40	kips	C	IBC 16-2
SPAN CD	P_{CD} =	4.78	kips	C	IBC 16-3

Beam and Column design checks

	Beam BC		Column AB		Column CD	
Slenderness	OK	10%	OK	62%	OK	62%
Compactness	OK	96%	OK	72%	OK	72%
Seismic compactness	N/A		N/A		N/A	
Axial	OK	0%	OK	4%	OK	5%
Bending	OK	19%	OK	12%	OK	12%
Bending + Axial	OK	19%	OK	13%	OK	13%
Shear	OK	16%	OK	1%	OK	0%
Live Load Deflection	OK	24%				
Total Load Deflection	OK	41%				
	OK		OK		OK	

LOAD DISTRIBUTION FORCES SUM TO ZERO

D	OK
L	OK
Lr	OK
S	OK
R	OK
W	OK
E	OK

Beam to column connection design checks

Shear	B & C		Standard Connection	B & C	
Bolts =	OK	47%	Clear span to depth ratio =	N/A	N/A
Fracture on net =	OK	19%	Column Beam Moment Ratio =	N/A	N/A
Shear yielding of plate =	OK	29%	Fexural Strength of beam at column =	N/A	N/A
Shear rupture of the plate =	OK	32%	Continuity plate axial capacity =	OK	63%
Bolt bearing =	OK	48%	Continuity plate buckling =	OK	31%
Block Shear rupture =	OK	26%	Web panel zone shear =	OK	7%
Weld shear =	OK	26%	Continuity plates required =	YES	115%
Shear plate =	OK	19%	Continuity plate to column web welds =	OK	62%
Column flange =	OK	17%	Continuity plate to column flange welds =	OK	89%
	OK			OK	

Frame base anchorage checks

Base plate dims =	OK
Column flange welds =	OK
Bolts =	OK
	OK

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Project:

Moment Distribution Frame Analysis for D

Gravity Loads

Roof DL =	25	psf
Roof LL =	20	psf
Snow =	15	psf
Rain =	5	psf
Floor DL =	15	psf
Floor LL =	40	psf

FEM's ($WL^2/12$ for uniform loads)

Frame Span =	15.00	ft
Roof load width =	10.00	ft
Floor load width =	0.00	ft
BC =	264	plf
CB =	264	plf
Beam BC wt =	14.0	plf
Column AB wt =	26.0	plf

FEM		MID SPAN MOMENTS	
4.95	k-ft	2.48	k-ft
4.95	k-ft	2.48	k-ft

M , DISTRIBUTION

JOINT	A	B		C		D
SPAN	AB	BA	BC	CB	CD	DC
I	144	144	89	88.6	144	144
LENGTH	14	14	15	15	14	14
DF	1.000	0.635	0.365	0.365	0.635	1.000
FEM	0.000	0.000	4.950	-4.950	0.000	0.000
MD	0.000	-3.144	-1.806	1.806	3.144	0.000
COM	-1.572	0.000	0.903	-0.903	0.000	1.572
MD	1.572	-0.573	-0.329	0.329	0.573	-1.572
COM	-0.287	0.786	0.165	-0.165	-0.786	0.287
MD	0.287	-0.604	-0.347	0.347	0.604	-0.287
COM	-0.302	0.143	0.173	-0.173	-0.143	0.302
MD	0.302	-0.201	-0.116	0.116	0.201	-0.302
COM	-0.101	0.151	0.058	-0.058	-0.151	0.101
MD	0.101	-0.133	-0.076	0.076	0.133	-0.101
COM	-0.066	0.050	0.038	-0.038	-0.050	0.066
MD	0.066	-0.056	-0.032	0.032	0.056	-0.066
COM	-0.028	0.033	0.016	-0.016	-0.033	0.028
MD	0.028	-0.031	-0.018	0.018	0.031	-0.028
COM	-0.016	0.014	0.009	-0.009	-0.014	0.016
MD	0.016	-0.015	-0.008	0.008	0.015	-0.016
COM	-0.007	0.008	0.004	-0.004	-0.008	0.007
MD	0.007	-0.008	-0.004	0.004	0.008	-0.007
COM	-0.004	0.004	0.002	-0.002	-0.004	0.004
MD	0.004	-0.004	-0.002	0.002	0.004	-0.004
COM	-0.002	0.002	0.001	-0.001	-0.002	0.002
MD	0.002	-0.002	-0.001	0.001	0.002	-0.002
COM	-0.001	0.001	0.001	-0.001	-0.001	0.001
MD	0.001	-0.001	-0.001	0.001	0.001	-0.001
COM	0.000	0.000	0.000	0.000	0.000	0.000
MD	0.000	0.000	0.000	0.000	0.000	0.000
COM	0.000	0.000	0.000	0.000	0.000	0.000
MD	0.000	0.000	0.000	0.000	0.000	0.000
Totals	0.00	-3.58	3.58	-3.58	3.58	0.00

JOINT EQUILLIBRIUM

ΣM @ B =	0.00	OK
ΣM @ C =	0.00	OK

FORCE CARRY THROUGH

ΣFx @ C =	0.00	OK

FRAME EQUILLIBRIUM

ΣFy =	0.00	OK
ΣFx =	0.00	OK
ΣM @ A =	0.00	OK

FRAME MEMBER REACTIONS

SPAN AB	R_{AB} =	0.26	kips	
	R_{BA} =	-0.26	kips	
SPAN BC	R_{BC} =	1.98	kips	
	R_{CB} =	1.98	kips	
SPAN CD	R_{DC} =	-0.26	kips	
	R_{CD} =	0.26	kips	

FRAME AXIAL REACTIONS

SPAN AB	P_{AB} =	1.98	kips	C
SPAN BC	P_{BC} =	0.26	kips	C
SPAN CD	P_{CD} =	1.98	kips	C

Slope Deflection Equations check - fixed base

```
> F1:=-M[AB]+2*IAB*ES/L1*(theta[B])+FEMAB:
> F2:=-M[BA]+2*IAB*ES/L1*(2*theta[B])+FEMBA:
> F3:=-M[BC]+2*IBC*ES/S1*(2.0*theta[B]+theta[C])+FEMBC:
> F4:=-M[CB]+2*IBC*ES/S1*(2.0*theta[C]+theta[B])+FEMCB:
> F5:=-M[CD]+2*ICD*ES/L1*(2.0*theta[C])+FEMCD:
> F6:=-M[DC]+2*ICD*ES/L1*(theta[C])+FEMDC:
> F7:=M[BA]+M[BC]:
> F8:=M[CB]+M[CD]:
```

	M[AB]	M[BA]	M[BC]	M[CB]	M[CD]	M[DC]	THETA[B]	THETA [C]	
F1:	-1	0	0	0	0	0	596571.4	0	0.000
F2:	0	-1	0	0	0	0	1193143	0	0.000
F3:	0	0	-1	0	0	0	685173.3	342586.7	-4.950
F4:	0	0	0	-1	0	0	342586.7	685173.3	4.950
F5:	0	0	0	0	-1	0	0	1193143	0.000
F6:	0	0	0	0	0	-1	0	596571.4	0.000
F7:	0	1	1	0	0	0	0	0	0
F8:	0	0	0	1	1	0	0	0	0

M[AB]	-1.9229	K-FT	-1.92
M[BA]	-3.8458	K-FT	-0.27
M[BC]	3.8458	K-FT	0.27
M[CB]	-3.8458	K-FT	-0.27
M[CD]	3.8458	K-FT	0.27
M[DC]	1.9229	K-FT	1.92
THETA[B]	-0.000003	RADIANS	
THETA [C]	0.000003	RADIANS	

Slope Deflection Equations check - pinned base

```
> F1:=-M[BA]+3*IAB*ES/L1*(theta[B])+FEMBA:
> F2:=-M[BC]+2*IBC*ES/S1*(2.0*theta[B]+theta[C])+FEMBC:
> F3:=-M[CB]+2*IBC*ES/S1*(2.0*theta[C]+theta[B])+FEMCB:
> F4:=-M[CD]+3*ICD*ES/L1*(theta[C])+FEMCD:
> F5:=M[BA]+M[BC]:
> F6:=M[CB]+M[CD]:
```

	M[BA]	M[BC]	M[CB]	M[CD]	THETA[B]	THETA [C]	
F1:	-1	0	0	0	894857.14	0	0.000
F2:	0	-1	0	0	685173.33	342586.667	-4.950
F3:	0	0	-1	0	342586.67	685173.333	4.950
F4:	0	0	0	-1	0	894857.143	0.000
F5:	1	1	0	0	0	0	0
F6:	0	0	1	1	0	0	0

M[BA]	-3.580	K-FT	0.000
M[BC]	3.580	K-FT	0.000
M[CB]	-3.580	K-FT	0.000
M[CD]	3.580	K-FT	0.000
THETA[B]	-0.000004	RADIANS	
THETA [C]	0.000004	RADIANS	