

```
wipe  
if [catch {open Sismi/fattoridiscala.txt r} f0] {  
    puts stderr "Cannot open $infilename for reading"  
}  
  
set i 1 ;                                #First Groundmotion  
set linenumber 0;                          #Line counter  
  
foreach line [split [read $f0 ] \n] { ;      #Read each line  
set t 0  
set factor 0  
  
set linenumber [expr $linenumber+1]  
  
if {[llength $line] == 0} {  
    puts "Fine " ;                      #Empty file ;  
    close $f0  
    break  
}  
  
if {$linenumber == $i} {  
    if {[llength $line] != 0} {  
        foreach word [split $line] {  
            if {$word > 10} {  
                set t $word  
            } elseif {$word < 10} {  
                set factor $word  
            }  
        }  
        puts "Earthquake number $linenumber"  
        puts "Ground motion time $t"  
        puts "Ground motion factor $factor"  
        source DynamicAnalysis.tcl  
        wipe
```

```
if { $ok != 0} {  
  
    puts "Something wrong with $i Groundmotion" ; #If something wrong happened stop the analysis  
    break  
}  
  
incr i  
  
}  
  
}  
  
}  
  
}
```

```
source StaticAnalysis.tcl

# Damping

# D=$alphaM*M + $betaKcurr*Kcurrent + $betaKcomm*KlastCommit + $beatKinit*$Kinitial

set xDamp 0.05;                                # damping ratio

set MpropSwitch 1.0;

set KcurrSwitch 0.0;

set KcommSwitch 1.0;

set KinitSwitch 0.0;

set nEigenI 1;                                  # mode 1

set nEigenJ 3;                                  # mode 3

set lambdaN [eigen [expr $nEigenJ]];           # eigenvalue analysis for nEigenJ modes

set lambdaI [lindex $lambdaN [expr $nEigenI-1]]; # eigenvalue mode i

set lambdaJ [lindex $lambdaN [expr $nEigenJ-1]]; # eigenvalue mode j

set omegal [expr pow($lambdaI,0.5)];

set omegaJ [expr pow($lambdaJ,0.5)];

set alphaM [expr $MpropSwitch*$xDamp*(2*$omegal*$omegaJ)/($omegal+$omegaJ)]; # M-prop.
damping; D = alphaM*M

set betaKcurr [expr $KcurrSwitch*2.*$xDamp/($omegal+$omegaJ)]; # current-K; +beatKcurr*KCurrent

set betaKcomm [expr $KcommSwitch*2.*$xDamp/($omegal+$omegaJ)]; # last-committed K;
+betaKcomm*KlastCommitt

set betaKinit [expr $KinitSwitch*2.*$xDamp/($omegal+$omegaJ)]; # initial-K; +beatKinit*Kini

rayleigh $alphaM $betaKcurr $betaKinit $betaKcomm;          # Rayleigh damping

#Pattern definition

set GMfile1 Sismi/EQ$i/xa_record.txt

set AccelSeries1 "Series -dt 0.005 -filePath $GMfile1 -factor [expr $factor*1000]"

#pattern UniformExcitation $patternTag $dir -accel $tsT ag <-vel0 $vel0> <-fact $cFactor>

pattern UniformExcitation      2      1 -accel $AccelSeries1
```

```
set GMfile2 Sismi/EQ$i/ya_record.txt
set AccelSeries2 "Series -dt 0.005 -filePath $GMfile2 -factor [expr $factor*1000]"
pattern UniformExcitation      3      2 -accel $AccelSeries2
set GMfile3 Sismi/EQ$i/za_record.txt
set AccelSeries3 "Series -dt 0.005 -filePath $GMfile3 -factor [expr $factor*1000]"
pattern UniformExcitation      4      3 -acce l $AccelSeries3

#Dynamic Analysis
constraints Transformation
numberer RCM
system SparseGeneral
set Tol 1.e-8;           # Convergence Test: tolerance
set maxNumIter 10;       # Convergence Test: maximum number of iterations that will be performed
before "failure to converge" is returned
set printFlag 0;          # Convergence Test: flag used to print information on convergence (optional)
# 1: print information on each step;
set TestType EnergyIncr ; # Convergence-test type
test $TestType $To l $maxNumIter $printFlag
set algorithmType ModifiedNewton
algorithm $algorithmType;
set NewmarkGamma 0.5;    # Newmark-integrator gamma parameter (also HHT)
set NewmarkBeta 0.25;    # Newmark-integrator beta parameter
integrator Newmark $NewmarkGamma $NewmarkBeta
analysis Transient
set DtAnalysis      [expr 0.025];   # time-step Dt for lateral analysis
set TmaxAnalysis     [expr $t+10];
set Nsteps [expr int($TmaxAnalysis/$DtAnalysis)];
set ok [analyze $Nsteps $DtAnalysis]; # actually perform analysis; returns ok=0 if analysis was successful
```

```
if {$ok != 0} { ;           # if analysis was not successful.

                           # change some analysis parameters to achieve convergence

                           # performance is slower inside this loop

                           # Time-controlled analysis

set ok 0;

set controlTime [getTime];

while {$controlTime < $TmaxAnalysis && $ok == 0} {

    set ok [analyze 1 $DtAnalysis]

    set controlTime [getTime]

    set ok [analyze 1 $DtAnalysis]

    if {$ok != 0} {

        puts "Trying Newton with Initial Tangent .."

        test NormDispIncr $Tol 1000 0

        algorithm Newton -initial

        set ok [analyze 1 $DtAnalysis]

        test $TestType $Tol $maxNumIter 0

        algorithm $algorithmType

    }

    if {$ok != 0} {

        puts "Trying Broyden .."

        algorithm Broyden 8

        set ok [analyze 1 $DtAnalysis]

        algorithm $algorithmType

    }

    if {$ok != 0} {

        puts "Trying NewtonWithLineSearch .."

        algorithm NewtonLineSearch .8
```

```
        set ok [analyze 1 $DtAnalysis]

        algorithm $algorithmType

    }

}

};

# end if ok !=0

puts "Ground Motion Done. End Time: [getTime]"
```

```
#Metric units N mm kg s

model BasicBuilder -ndm 3 -ndf 6

#Creation folder

file mkdir Groundmotion$i

file mkdir Groundmotion$i/Spostamenti

file mkdir Groundmotion$i/Pilastri

file mkdir Groundmotion$i/RBase
```

```
#Create model
```

```
#Nodes
```

#Nodes	tag	X	Y	Z
node	001	0	0	0
node	002	6000	0	0
node	003	10000	0	0
node	004	0	5000	0
node	005	6000	5000	0
node	006	10000	5000	0

```
#Quota 3.40
```

node	101	0	0	3400
node	102	6000	0	3400
node	103	10000	0	3400
node	104	0	5000	3400
node	105	6000	5000	3400
node	106	10000	5000	3400

#Quota 6.5

```
node 201      0      0  6500
node 202    6000      0  6500
node 203 10000      0  6500
node 204      0  5000 6500
node 205    6000  5000 6500
node 206 10000  5000 6500
```

#Quota 9.6

```
node 301      0      0  9600
node 302    6000      0  9600
node 303 10000      0  9600
node 304      0  5000 9600
node 305    6000  5000 9600
node 306 10000  5000 9600
```

#fix

```
fixZ 0.0 1 1 1 1 1 1
```

#Rigid diafragm

#Quota 3.40

```
node 110 3000 2500 3400
```

```
node 111 8000 2500 3400
```

```
fix 110 0 0 1 1 1 0
```

```
fix 111 0 0 1 1 1 0
```

```
rigidDiaphragm 3 110 101 102 104 105
```

```
rigidDiaphragm 3 111 102 103 105 106
```

```
#Quota 6.5
```

```
node 210 3000 2500 6500
```

```
node 211 8000 2500 6500
```

```
fix 210 0 0 1 1 1 0
```

```
fix 211 0 0 1 1 1 0
```

```
rigidDiaphragm 3 210 201 202 204 205
```

```
rigidDiaphragm 3 211 202 203 205 206
```

```
#Quota 9.6
```

```
node 310 3000 2500 9600
```

```
node 311 8000 2500 9600
```

```
fix 310 0 0 1 1 1 0
```

```
fix 311 0 0 1 1 1 0
```

```
rigidDiaphragm 3 310 301 302 304 305
```

```
rigidDiaphragm 3 311 302 303 305 306
```

#MATERIAL

#Steel

```
#uniaxialMaterial Steel      tag  fy   Young's Modulus    b     R0      cR1   cR2
uniaxialMaterial Steel02    3    450.0  210000.0       0.000 15    0.925  0.15
```

#SECTION

```
source Columnsection.tcl
```

```
source Beamsection.tcl
```

#ELEMENT

#Column

```
geomTransf Linear 1 0 1 0
```

```
set np 5
```

```
set eletype nonlinearBeamColumn
```

```
#element nonlinearBeamColumn eleTag  iNode  jNode  numIntgrPts  secTag transfTag
```

#Da quota 0 a quota 3.40

element	\$eletype	001	001	101	\$np	403	1
element	\$eletype	002	002	102	\$np	401	1
element	\$eletype	003	003	103	\$np	404	1
element	\$eletype	004	004	104	\$np	404	1
element	\$eletype	005	005	105	\$np	401	1
element	\$eletype	006	006	106	\$np	403	1

#Da quota 3.40 a quota 6.50

element \$eletype	101	101	201	\$np	403	1
element \$eletype	102	102	202	\$np	401	1
element \$eletype	103	103	203	\$np	404	1
element \$eletype	104	104	204	\$np	404	1
element \$eletype	105	105	205	\$np	401	1
element \$eletype	106	106	206	\$np	403	1

#Da quota 6.5 a quota 9.6

element \$eletype	201	201	301	\$np	401	1
element \$eletype	202	202	302	\$np	401	1
element \$eletype	203	203	303	\$np	404	1
element \$eletype	204	204	304	\$np	404	1
element \$eletype	205	205	305	\$np	401	1
element \$eletype	206	206	306	\$np	401	1

#Beam

geomTransf Linear 2 0 0 -1

set np 5

set beamtype dispBeamColumn

#Quota 3.40

#element dispBeamColumn eleTag iNode jNode numIntgrPts secTag transfTag

element \$beamtype	301	101	102	\$np	102	2
--------------------	-----	-----	-----	------	-----	---

element \$beamtype	302	102	103	\$np	103	2
element \$beamtype	303	101	104	\$np	101	2
element \$beamtype	304	104	105	\$np	102	2
element \$beamtype	305	105	102	\$np	105	2
element \$beamtype	306	105	106	\$np	102	2
element \$beamtype	307	106	103	\$np	104	2

#Quota 6.5

#element dispBeamColumn	eleTag	iNode	jNode	numIntgrPts	secTag	transfTag
element \$beamtype	401	201	202	\$np	203	2
element \$beamtype	402	202	203	\$np	203	2
element \$beamtype	403	201	204	\$np	201	2
element \$beamtype	404	204	205	\$np	202	2
element \$beamtype	405	205	202	\$np	205	2
element \$beamtype	406	205	206	\$np	203	2
element \$beamtype	407	206	203	\$np	204	2

#Quota 9.6

#element dispBeamColumn	eleTag	iNode	jNode	numIntgrPts	secTag	transfTag
element \$beamtype	501	301	302	\$np	301	2
element \$beamtype	502	302	303	\$np	301	2
element \$beamtype	503	301	304	\$np	301	2
element \$beamtype	504	304	305	\$np	301	2

element \$beamtype	505	305	302	\$np	302	2
element \$beamtype	506	305	306	\$np	301	2
element \$beamtype	507	306	303	\$np	301	2

#Mass

#Quota 9.6

#mass	nodeTag	(ndf \$massValues)					
#		X	Y	Z	RX	RY	RZ
mass	301	4346.58	4346.58	4346.58	0	0	0
mass	302	7123.68	7123.68	7123.68	0	0	0
mass	303	2952.22	2952.22	2952.22	0	0	0
mass	304	4346.58	4346.58	4346.58	0	0	0
mass	305	7123.68	7123.68	7123.68	0	0	0
mass	306	2952.22	2952.22	2952.22	0	0	0

#Quota 6.5

#mass	nodeTag	(ndf \$massValues)					
#		X	Y	Z	RX	RY	RZ
mass	201	9049.53	9049.53	9049.53	0	0	0
mass	202	11393.8	11393.8	9049.53	0	0	0
mass	203	6812.77	6812.77	6812.77	0	0	0
mass	204	9049.53	9049.53	9049.53	0	0	0
mass	205	11393.8	11393.8	9049.53	0	0	0
mass	206	6812.77	6812.77	6812.77	0	0	0

```
#Quota 3.40
```

```
#mass           nodeTag (ndf $massValues)
```

#		X	Y	Z	RX	RY	RZ
mass	101	9056.28	9056.28	9056.28	0	0	0
mass	102	11399.45	11399.45	11399.45	0	0	0
mass	103	6819.52	6819.52	6819.52	0	0	0
mass	104	9056.28	9056.28	9056.28	0	0	0
mass	105	11399.45	11399.45	11399.45	0	0	0
mass	106	6819.52	6819.52	6819.52	0	0	0

```
set pesotrave [expr 3.75];
```

```
set pesosolaio [expr 13.5686];
```

```
set pesotamp [expr 8.424]
```

```
set g 9.8
```

```
#Gravity Load
```

```
pattern Plain 1 Linear {
```

```
#Beam
```

```
#Quota 9.6 (solo solaio)
```

```
#eleLoad -ele $eleTag1 <$eleTag2 ....> -type -beamUniform $Wy $Wz <$Wx>
```

```
eleLoad -ele 501 -type -beamUniform 0. [expr $pesotrave+$pesosolaio]
eleLoad -ele 502 -type -beamUniform 0. [expr $pesotrave+$pesosolaio]
eleLoad -ele 504 -type -beamUniform 0. [expr $pesotrave+$pesosolaio]
eleLoad -ele 506 -type -beamUniform 0. [expr $pesotrave+$pesosolaio]
```

eleLoad	-ele	503	-type -beamUniform	0.	[expr \$pesotrave]
eleLoad	-ele	505	-type -beamUniform	0.	[expr \$pesotrave]
eleLoad	-ele	507	-type -beamUniform	0.	[expr \$pesotrave]

#Quota 6.5

```
#eleLoad -ele $eleTag1 <$eleTag2 ....> -type -beamUniform $Wy $Wz <$Wx>
```

eleLoad	-ele	401	-type -beamUniform	0.	[expr \$pesotrave+\$pesosolaio+\$pesotamp]
eleLoad	-ele	402	-type -beamUniform	0.	[expr \$pesotrave+\$pesosolaio+\$pesotamp]
eleLoad	-ele	403	-type -beamUniform	0.	[expr \$pesotrave+\$pesotamp]
eleLoad	-ele	404	-type -beamUniform	0.	[expr \$pesotrave+\$pesosolaio+\$pesotamp]
eleLoad	-ele	406	-type -beamUniform	0.	[expr \$pesotrave+\$pesosolaio+\$pesotamp]
eleLoad	-ele	405	-type -beamUniform	0.	[expr \$pesotrave]
eleLoad	-ele	407	-type -beamUniform	0.	[expr \$pesotrave+\$pesotamp]

#Quota 3.40

```
#eleLoad -ele $eleTag1 <$eleTag2 ....> -type -beamUniform $Wy $Wz <$Wx>
```

eleLoad	-ele	301	-type -beamUniform	0.	[expr \$pesotrave+\$pesosolaio+\$pesotamp]
eleLoad	-ele	302	-type -beamUniform	0.	[expr \$pesotrave+\$pesosolaio+\$pesotamp]
eleLoad	-ele	303	-type -beamUniform	0.	[expr \$pesotrave+\$pesotamp]
eleLoad	-ele	304	-type -beamUniform	0.	[expr \$pesotrave+\$pesosolaio+\$pesotamp]
eleLoad	-ele	306	-type -beamUniform	0.	[expr \$pesotrave+\$pesosolaio+\$pesotamp]
eleLoad	-ele	305	-type -beamUniform	0.	[expr \$pesotrave]
eleLoad	-ele	307	-type -beamUniform	0.	[expr \$pesotrave+\$pesotamp]

#Da quota 6.5 a quota 9.6

#load	nodeTag	Fx	Fy	Fz	Mx	My	Mz
load	301	0	0	[expr -139.5*\$g]	0	0	0
load	302	0	0	[expr -116.25*\$g]	0	0	0
load	303	0	0	[expr -139.5*\$g]	0	0	0
load	304	0	0	[expr -139.5*\$g]	0	0	0
load	305	0	0	[expr -116.25*\$g]	0	0	0
load	306	0	0	[expr -139.5*\$g]	0	0	0

#Da quota 3.40 a quota 6.50

load	201	0	0	[expr -139.5*\$g]	0	0	0
load	202	0	0	[expr -116.25*\$g]	0	0	0
load	203	0	0	[expr -139.5*\$g]	0	0	0
load	204	0	0	[expr -139.5*\$g]	0	0	0
load	205	0	0	[expr -116.25*\$g]	0	0	0
load	206	0	0	[expr -139.5*\$g]	0	0	0

#Da quota 0 a quota 3.40

load	101	0	0	[expr -153*\$g]	0	0	0
load	102	0	0	[expr -127.5*\$g]	0	0	0
load	103	0	0	[expr -153*\$g]	0	0	0
load	104	0	0	[expr -153*\$g]	0	0	0
load	105	0	0	[expr -127.5*\$g]	0	0	0
load	106	0	0	[expr -153*\$g]	0	0	0

```
}
```

#RECORDER

#Base reaction and displacement

```
recorder Node -file Groundmotion$i/RBase/RzBase.out -time -node 001 002 003 004 005 006 -dof 3  
reaction;
```

```
recorder Node -file Groundmotion$i/RBase/RxBase.out -time -node 001 002 003 004 005 006 -dof 1  
reaction;
```

```
recorder Node -file Groundmotion$i/RBase/RyBase.out -time -node 001 002 003 004 005 006 -dof 2  
reaction;
```

```
recorder Node -file Groundmotion$i/RBase/MrBase.out -time -node 001 002 003 004 005 006 -dof 4  
5 6 reaction;
```

```
recorder Node -file Groundmotion$i/RBase/DBase.out -time -node 001 002 003 004 005 006 -dof 1 2  
3 4 5 6 disp;
```

#Displacement in x direction

```
recorder Node -file Groundmotion$i/Spostamenti/DxFree.Quota3.40.out -time -node 101 102 103 104  
105 106 -dof 1 disp;
```

```
recorder Node -file Groundmotion$i/Spostamenti/DxFree.Quota6.5.out -time -node 201 202 203 204  
205 206 -dof 1 disp;
```

```
recorder Node -file Groundmotion$i/Spostamenti/DxFree.Quota9.6.out -time -node 301 302 303 304  
305 306 -dof 1 disp;
```

#Displacement in y direction

```
recorder Node -file Groundmotion$i/Spostamenti/DyFree.Quota3.40.out -time -node 101 102 103 104  
105 106 -dof 2 disp;
```

```
recorder Node -file Groundmotion$i/Spostamenti/DyFree.Quota6.5.out -time -node 201 202 203 204  
205 206 -dof 2 disp;
```

```
recorder Node -file Groundmotion$i/Spostamenti/DyFree.Quota9.6.out -time -node 301 302 303 304  
305 306 -dof 2 disp;
```

#Displacement in z direction

```
recorder Node -file Groundmotion$i/Spostamenti/DzFree.Quota3.40.out -time -node 101 102 103 104  
105 106 -dof 2 disp;
```

```
recorder Node -file Groundmotion$i/Spostamenti/DzFree.Quota6.5.out -time -node 201 202 203 204  
205 206 -dof 2 disp;
```

```
recorder Node -file Groundmotion$i/Spostamenti/DzFree.Quota9.6.out -time -node 301 302 303 304  
305 306 -dof 2 disp;
```

#Da quota 0 a quota 3.40

#Column 1

```
recorder Element -file Groundmotion$i/Pilastri/DefoEle1sec5.out -time -ele 001 section 5  
deformation;
```

```
recorder Element -file Groundmotion$i/Pilastri/ForceoEle1sec5.out -time -ele 001 section 5 force;
```

```
recorder Element -file Groundmotion$i/Pilastri/DefoEle1sec1.out -time -ele 001 section 1  
deformation;
```

```
recorder Element -file Groundmotion$i/Pilastri/ForceoEle1sec1.out -time -ele 001 section 1 force;
```

#Column 2

```
recorder Element -file Groundmotion$i/Pilastri/DefoEle2sec5.out -time -ele 002 section 5  
deformation;
```

```
recorder Element -file Groundmotion$i/Pilastri/ForceoEle2sec5.out -time -ele 002 section 5 force;
```

```
recorder Element -file Groundmotion$i/Pilastri/DefoEle2sec1.out -time -ele 002 section 1  
deformation;
```

```
recorder Element -file Groundmotion$i/Pilastri/ForceoEle2sec1.out -time -ele 002 section 1 force;
```

#Column 3

```
recorder Element -file Groundmotion$i/Pilastri/DefoEle3sec5.out -time -ele 003 section 5
deformation;

recorder Element -file Groundmotion$i/Pilastri/ForceoEle3sec5.out -time -ele 003 section 5 force;

recorder Element -file Groundmotion$i/Pilastri/DefoEle3sec1.out -time -ele 003 section 1
deformation;

recorder Element -file Groundmotion$i/Pilastri/ForceoEle3sec1.out -time -ele 003 section 1 force;
```

#Column 4

```
recorder Element -file Groundmotion$i/Pilastri/DefoEle4sec5.out -time -ele 004 section 5
deformation;

recorder Element -file Groundmotion$i/Pilastri/ForceoEle4sec5.out -time -ele 004 section 5 force;

recorder Element -file Groundmotion$i/Pilastri/DefoEle4sec1.out -time -ele 004 section 1
deformation;

recorder Element -file Groundmotion$i/Pilastri/ForceoEle4sec1.out -time -ele 004 section 1 force;
```

#Column 5

```
recorder Element -file Groundmotion$i/Pilastri/DefoEle5sec5.out -time -ele 005 section 5
deformation;

recorder Element -file Groundmotion$i/Pilastri/ForceoEle5sec5.out -time -ele 005 section 5 force;

recorder Element -file Groundmotion$i/Pilastri/DefoEle5sec1.out -time -ele 005 section 1
deformation;

recorder Element -file Groundmotion$i/Pilastri/ForceoEle5sec1.out -time -ele 005 section 1 force;
```

#Column 6

```
recorder Element -file Groundmotion$i/Pilastri/DefoEle6sec5.out -time -ele 006 section 5
deformation;

recorder Element -file Groundmotion$i/Pilastri/ForceoEle6sec5.out -time -ele 006 section 5 force;
```

```
recorder Element -file Groundmotion$i/Pilastri/DefoEle6sec1.out -time -ele 006 section 1  
deformation;
```

```
recorder Element -file Groundmotion$i/Pilastri/ForceoEle6sec1.out -time -ele 006 section 1 force;
```

#Da quota 3.40 a quota 6.50

#Column 101

```
recorder Element -file Groundmotion$i/Pilastri/DefoEle201sec5.out -time -ele 101 section 5  
deformation;
```

```
recorder Element -file Groundmotion$i/Pilastri/ForceoEle201sec5.out -time -ele 101 section 5 force;
```

```
recorder Element -file Groundmotion$i/Pilastri/DefoEle201sec1.out -time -ele 101 section 1  
deformation;
```

```
recorder Element -file Groundmotion$i/Pilastri/ForceoEle201sec1.out -time -ele 101 section 1 force;
```

#Column 102

```
recorder Element -file Groundmotion$i/Pilastri/DefoEle202sec5.out -time -ele 102 section 5  
deformation;
```

```
recorder Element -file Groundmotion$i/Pilastri/ForceoEle202sec5.out -time -ele 102 section 5 force;
```

```
recorder Element -file Groundmotion$i/Pilastri/DefoEle202sec1.out -time -ele 102 section 1  
deformation;
```

```
recorder Element -file Groundmotion$i/Pilastri/ForceoEle202sec1.out -time -ele 102 section 1 force;
```

#Column 103

```
recorder Element -file Groundmotion$i/Pilastri/DefoEle203sec5.out -time -ele 103 section 5  
deformation;
```

```
recorder Element -file Groundmotion$i/Pilastri/ForceoEle203sec5.out -time -ele 103 section 5 force;
```

recorder Element -file Groundmotion\$i/Pilastri/DefoEle203sec1.out -time -ele 103 section 1
deformation;

recorder Element -file Groundmotion\$i/Pilastri/ForceoEle203sec1.out -time -ele 103 section 1 force;

#Column 104

recorder Element -file Groundmotion\$i/Pilastri/DefoEle204sec5.out -time -ele 104 section 5
deformation;

recorder Element -file Groundmotion\$i/Pilastri/ForceoEle204sec5.out -time -ele 104 section 5 force;

recorder Element -file Groundmotion\$i/Pilastri/DefoEle204sec1.out -time -ele 104 section 1
deformation;

recorder Element -file Groundmotion\$i/Pilastri/ForceoEle204sec1.out -time -ele 104 section 1 force;

#Column 105

recorder Element -file Groundmotion\$i/Pilastri/DefoEle205sec5.out -time -ele 105 section 5
deformation;

recorder Element -file Groundmotion\$i/Pilastri/ForceoEle205sec5.out -time -ele 105 section 5 force;

recorder Element -file Groundmotion\$i/Pilastri/DefoEle205sec1.out -time -ele 105 section 1
deformation;

recorder Element -file Groundmotion\$i/Pilastri/ForceoEle205sec1.out -time -ele 105 section 1 force;

#Column 106

recorder Element -file Groundmotion\$i/Pilastri/DefoEle206sec5.out -time -ele 106 section 5
deformation;

recorder Element -file Groundmotion\$i/Pilastri/ForceoEle206sec5.out -time -ele 106 section 5 force;

recorder Element -file Groundmotion\$i/Pilastri/DefoEle206sec1.out -time -ele 106 section 1
deformation;

recorder Element -file Groundmotion\$i/Pilastri/ForceoEle206sec1.out -time -ele 106 section 1 force;

```
#Da quota 6.5 a quota 9.6
```

```
#Column 201
```

```
recorder Element -file Groundmotion$i/Pilastri/DefoEle101sec5.out -time -ele 201 section 5  
deformation;
```

```
recorder Element -file Groundmotion$i/Pilastri/ForceoEle101sec5.out -time -ele 201 section 5 force;
```

```
recorder Element -file Groundmotion$i/Pilastri/DefoEle101sec1.out -time -ele 201 section 1  
deformation;
```

```
recorder Element -file Groundmotion$i/Pilastri/ForceoEle101sec1.out -time -ele 201 section 1 force;
```

```
#Column 202
```

```
recorder Element -file Groundmotion$i/Pilastri/DefoEle102sec5.out -time -ele 202 section 5  
deformation;
```

```
recorder Element -file Groundmotion$i/Pilastri/ForceoEle102sec5.out -time -ele 202 section 5 force;
```

```
recorder Element -file Groundmotion$i/Pilastri/DefoEle102sec1.out -time -ele 202 section 1  
deformation;
```

```
recorder Element -file Groundmotion$i/Pilastri/ForceoEle102sec1.out -time -ele 202 section 1 force;
```

```
#Column 203
```

```
recorder Element -file Groundmotion$i/Pilastri/DefoEle103sec5.out -time -ele 203 section 5  
deformation;
```

```
recorder Element -file Groundmotion$i/Pilastri/ForceoEle103sec5.out -time -ele 203 section 5 force;
```

```
recorder Element -file Groundmotion$i/Pilastri/DefoEle103sec1.out -time -ele 203 section 1  
deformation;
```

```
recorder Element -file Groundmotion$i/Pilastri/ForceoEle103sec1.out -time -ele 203 section 1 force;
```

#Column 204

recorder Element -file Groundmotion\$i/Pilastri/DefoEle104sec5.out -time -ele 204 section 5
deformation;

recorder Element -file Groundmotion\$i/Pilastri/ForceoEle104sec5.out -time -ele 204 section 5 force;

recorder Element -file Groundmotion\$i/Pilastri/DefoEle104sec1.out -time -ele 204 section 1
deformation;

recorder Element -file Groundmotion\$i/Pilastri/ForceoEle104sec1.out -time -ele 204 section 1 force;

#Column 205

recorder Element -file Groundmotion\$i/Pilastri/DefoEle105sec5.out -time -ele 205 section 5
deformation;

recorder Element -file Groundmotion\$i/Pilastri/ForceoEle105sec5.out -time -ele 205 section 5 force;

recorder Element -file Groundmotion\$i/Pilastri/DefoEle105sec1.out -time -ele 205 section 1
deformation;

recorder Element -file Groundmotion\$i/Pilastri/ForceoEle105sec1.out -time -ele 205 section 1 force;

#Column 206

recorder Element -file Groundmotion\$i/Pilastri/DefoEle106sec5.out -time -ele 206 section 5
deformation;

recorder Element -file Groundmotion\$i/Pilastri/ForceoEle106sec5.out -time -ele 206 section 5 force;

recorder Element -file Groundmotion\$i/Pilastri/DefoEle106sec1.out -time -ele 206 section 1
deformation;

recorder Element -file Groundmotion\$i/Pilastri/ForceoEle106sec1.out -time -ele 206 section 1 force;

```
#Recorder Display
```

```
#3d view
```

```
recorder display "Displaced shape3d" 500 0 350 350 -wipe
```

```
prp 300. 200. 1;
```

```
vup 0 0 1;
```

```
vpn -1 -1 -0.3;
```

```
viewWindow -8000 8000 -8000 8000
```

```
display 1 5 20
```

```
#vista sul piano x z
```

```
recorder display "Displaced shape XZ plane" 100 0 350 350 -wipe
```

```
prp 300. 200. 1;
```

```
vup 0 0 1;
```

```
vpn 0 -1 0;
```

```
viewWindow -8000 8000 -8000 8000 ;
```

```
display 1 5 20
```

```
#3d view with node number
```

```
recorder display "Node number" 900 0 350 350 -wipe
```

```
prp 300. 200. 1;
```

```
vup 0 0 1;
```

```
vpn -1.3 -1 -0.4
```

```
viewWindow -8000 8000 -8000 8000
```

```
display 1 -1 0
```

```
# yz plane view
```

```
recorder display "Displaced shape YZ plane" 100 370 350 350 -wipe
```

```
prp 300. 200. 1;  
vup 0 0 1;  
vpn -1 0 0;  
viewWindow -8000 8000 -8000 8000 ;  
display 1 5 20
```

```
#Static Analisys  
system BandGeneral  
constraints Transformation  
numberer RCM  
test NormDispIncr 1.0e-13 1000 3  
algorithm Newton  
integrator LoadControl 0.1  
analysis Static  
analyze 10  
loadConst -time 0.0  
puts "model built"
```

```
#Column nodes *02 *05
```

```
#Materials
```

```
#Concrete
```

```
#Confined concrete
```

```
#uniaxialMaterial Concrete      tag      fpc      epsc0    fpcu      epsU    lambda   ft     Et
uniaxialMaterial Concrete02    101    -44.29   -0.0054   -9.49    -0.03     0.1     0.0     0.0
```

```
#Unconfined concrete
```

```
uniaxialMaterial Concrete02    102    -33.00   -0.002    -9.63    -0.0105   0.12    0.0     0.0
```

```
#Column 60x25
```

```
set colHeight 250.0
```

```
set colWidth 600.0
```

```
set cover 30.0
```

```
set As 153.8 ; #phi 14
```

```
set spacing [expr ($colHeight-2*$cover)/3]
```

```
set y1 [expr $colWidth/2]
```

```
set z1 [expr $colHeight/2]
```

```
section Fiber 1 {
```

```
#confined concrete
```

```
#patch rect materialtag numSubdivY numSubdivZ      yI          zI          yJ          zJ
patch rect    101      30      30      [expr $cover-$y1] [expr $cover-$z1] [expr $y1-
$cover] [expr $z1-$cover]
```

```
#unconfined concrete (top, bottom, left, right)
```

```
patch rect    102      20      20      [expr -$y1]   [expr -$z1]       $y1
[expr $cover-$z1]
patch rect    102      20      20      [expr -$y1]   [expr $z1-$cover]     $y1
$z1
patch rect    102      20      20      [expr $y1-$cover] [expr $cover-$z1]     $y1
[expr $z1-$cover]
patch rect    102      20      20      [expr -$y1]   [expr $cover-$z1] [expr $cover-$y1]
[expr $z1-$cover]
```

```
#steel (top, middle1, middle2 bottom)
```

```
#layer straight materialTag numBars areaBar      yStart          zStart          yEnd
zEnd
layer straight 3      4    $As      [expr $y1-$cover]   [expr $cover-$z1]
[expr $cover-$y1]
layer straight 3      2    $As      [expr $y1-$cover]   [expr $cover-$z1+$spacing]
[expr $cover-$y1]
layer straight 3      2    $As      [expr $y1-$cover]   [expr $cover-$z1+2*$spacing]
[expr $cover-$y1]
layer straight 3      4    $As      [expr $y1-$cover]   [expr $z1-$cover]  [expr
$cover-$y1]      [expr $z1-$cover]
```

```
}
```

```
set Acol [expr $colHeight*$colWidth]
set Gc 25000000
set c250 10
set GJtcol [expr $Gc*$c250*$colHeight*pow($colWidth,3)]
set GAcol [expr $Gc*$Acol*5/6]
uniaxialMaterial Elastic 10 $GJtcol
uniaxialMaterial Elastic 11 $GAcol

#section Aggregator $secTag $matTag $string1 $matTag2 $string2 ..... <-section $sectionTag>
section Aggregator    401      11      Vy      11      Vz    10      T      -section 1

#Column nodes *03 *04

#Materials
#Concrete

#Confined concrete
#uniaxialMaterial Concrete    tag     fpc     epsc0     fpcu     epsU  lambda   ft     Et
uniaxialMaterial Concrete02  201  -44.86  -0.0056  -10.54  -0.03   0.1  0.0  0.0

#Unconfined concrete
uniaxialMaterial Concrete02  202  -33.00  -0.002   -9.63  -0.0105  0.12  0.0  0.0

#Column 30x60

set colHeight 600.0
set colWidth 300.0
```

```
set cover 30.0

set As 153.8 ; #phi 14

set spacing [expr ($colWidth-2*$cover)/3]

set y1 [expr $colWidth/2]

set z1 [expr $colHeight/2]

section Fiber 2 {

#confined concrete

#patch rect materialtag numSubdivY numSubdivZ      yI          zI          yJ          zJ
patch rect    201      30      30      [expr $cover-$y1] [expr $cover-$z1] [expr $y1-$cover] [expr $z1-$cover]

#unconfined concrete (top, bottom, left, right)

patch rect    202      20      20      [expr -$y1]      [expr -$z1]      $y1
[expr $cover-$z1]
patch rect    202      20      20      [expr -$y1]      [expr $z1-$cover]   $y1
$z1
patch rect    202      20      20      [expr $y1-$cover] [expr $cover-$z1]   $y1
[expr $z1-$cover]
patch rect    202      20      20      [expr -$y1]      [expr $cover-$z1] [expr $cover-$y1] [expr $z1-$cover]

#steel (left, middle1, middle2 right)

#layer straight materialTag numBars areaBar      yStart          zStart          yEnd
zEnd
layer straight 3       6     $As      [expr $y1-$cover] [expr $cover-$z1] [expr $y1-$cover] [expr $z1-$cover]
```

```
layer straight 3      2 $As      [expr $y1-$cover-$spacing]  [expr $cover-$z1]
[expr $y1-$cover-$spacing]  [expr $z1-$cover]
```

```
layer straight 3      2 $As      [expr $y1-$cover-2*$spacing] [expr $cover-$z1]
[expr $y1-$cover-2*$spacing] [expr $z1-$cover]
```

```
layer straight 3      6 $As      [expr $cover-$y1]           [expr $cover-$z1]
[expr $cover-$y1]          [expr $z1-$cover]
```

```
}
```

```
set Acol [expr $colHeight*$colWidth]
```

```
set Gc 25000000
```

```
set c250 10
```

```
set GJtcol [expr $Gc*$c250*$colHeight*pow($colWidth,3)]
```

```
set GAc col [expr $Gc*$Acol*5/6]
```

```
uniaxialMaterial Elastic 12 $GJtcol
```

```
uniaxialMaterial Elastic 13 $GAc col
```

```
#section Aggregator $secTag $matTag1 $string1 $matTag2 $string2 ..... <-section $sectionTag>
```

```
section Aggregator      404      13      Vy      13      Vz      12      T -section 2
```

```
#Column nodes *01 *06
```

```
#Materials
```

```
#Concrete
```

```
#Confined concrete
```

```
#uniaxialMaterial Concrete tag fpc epsc0 fpcu epsU lambda ft Et
```

```
uniaxialMaterial Concrete02 301 -44.58 -0.0055 -9.8 -0.03 0.1 0.0 0.0
```

```
#Unconfined concrete
uniaxialMaterial Concrete02 302 -33.00 -0.002 -9.63 -0.0105 0.12 0.0 0.0

#Column 60x25

set colHeight 250.0
set colWidth 600.0

set cover 30.0
set As 153.8 ; #phi 14

set spacing [expr ($colHeight-2*$cover)/3]

set y1 [expr $colWidth/2]
set z1 [expr $colHeight/2]

section Fiber 3 {

    #confined concrete
    #patch rect materialtag numSubdivY numSubdivZ      yI          zI          yJ          zJ
    patch rect     301      30      30      [expr $cover-$y1] [expr $cover-$z1]      [expr $y1-
$cover] [expr $z1-$cover]

    #unconfined concrete (top, bottom, left, right)
    patch rect     302      20      20      [expr -$y1]      [expr -$z1]      $y1
    [expr $cover-$z1]
    patch rect     302      20      20      [expr -$y1]      [expr $z1-$cover]      $y1
    $z1
    patch rect     302      20      20      [expr $y1-$cover] [expr $cover-$z1]      $y1
    [expr $z1-$cover]
```

```
patch rect    302      20   20      [expr -$y1]      [expr $cover-$z1]      [expr $cover-
$y1] [expr $z1-$cover]

#steel (top, middle1, middle2 bottom)

#layer straight materialTag numBars areaBar      yStart      zStart      yEnd
zEnd

layer straight 3      5   $As      [expr $y1-$cover]  [expr $cover-$z1]  [expr $cover-
$y1]      [expr $cover-$z1]

layer straight 3      2   $As      [expr $y1-$cover]  [expr $cover-$z1+$spacing]
[expr $cover-$y1]      [expr $cover-$z1+$spacing]

layer straight 3      2   $As      [expr $y1-$cover]  [expr $cover-$z1+2*$spacing]
[expr $cover-$y1]      [expr $cover-$z1+2*$spacing]

layer straight 3      5   $As      [expr $y1-$cover]  [expr $z1-$cover]  [expr $cover-
$y1]      [expr $z1-$cover]

}

set Acol [expr $colHeight*$colWidth]

set Gc 25000000

set c250 10

set GJtcol [expr $Gc*c250*$colHeight*pow($colWidth,3)]

set GAcol [expr $Gc*$Acol*5/6]

uniaxialMaterial Elastic 14 $GJtcol

uniaxialMaterial Elastic 15 $GAcol

#section Aggregator $secTag $matTag1 $string1 $matTag2 $string2 ..... <-section $sectionTag>

section Aggregator      403      15      Vy      15      Vz      14      T      -section 3
```

```
#3.40 [m]
```

```
#Materials
```

```
#Concrete
```

```
#Confined concrete
```

```
#uniaxialMaterial Concrete tag fpc epsec0 fpcu epsU lambda ft Et  
uniaxialMaterial Concrete02 401 -41.17 -0.0045 -9.35 -0.0175 0.1 0.0 0.0 ;
```

```
#Unconfined concrete
```

```
uniaxialMaterial Concrete02 402 -33.00 -0.002 -9.63 -0.0105 0.1 0.0 0.0
```

```
#Beam nodes 101-104 30x50
```

```
set beamHeight 500.0
```

```
set beamWidth 300.0
```

```
set cover 30.0
```

```
set As 153.8 ; #phi 14
```

```
set y2 [expr $beamWidth/2]
```

```
set z2 [expr $beamHeight/2]
```

```
section Fiber 5 {
```

```
#confined concrete
```

```
#patch rect materialtag numSubdivY numSubdivZ      yI          zI          yJ          zJ
patch rect    401      30      30      [expr $cover-$y2] [expr $cover-$z2] [expr $y2-
$cover] [expr $z2-$cover]
```

```
#unconfined concrete (top, bottom, left, right)
```

```
patch rect    402      20      20      [expr -$y2]           [expr -$z2]           $y2
[expr $cover-$z2]
patch rect    402      20      20      [expr -$y2]           [expr $z2-$cover]        $y2      $z2
patch rect    402      20      20      [expr $y2-$cover] [expr $cover-$z2]   $y2
[expr $z2-$cover]
patch rect    402      20      20      [expr -$y2]           [expr $cover-$z2] [expr $cover-
$y2] [expr $z2-$cover]
```

```
#steel (top, middle, bottom)
```

```
layer straight 3      7      $As      [expr $y2-$cover] [expr $cover-$z2] [expr $y2-
$cover] [expr $z2-$cover]
layer straight 3      0      $As      0.0                 [expr $cover-$y2]   0.0
[expr $y2-$cover]
layer straight 3      5      $As      [expr $cover-$y2] [expr $cover-$z2] [expr $cover-
$y2] [expr $z2-$cover]
```

```
}
```

```
set Abeam [expr $beamHeight*$beamWidth]
```

```
set GJtbam [expr $Gc*$c250*$beamHeight*pow($beamWidth,3)]
```

```
set GAcot [expr $Gc*$Abeam*5/6]
```

```
uniaxialMaterial Elastic 22 $GJtcol
```

```
uniaxialMaterial Elastic 23 $GAcot
```

```
#section Aggregator $secTag $matTag1 $string1 $matTag2 $string2 ..... <-section $sectionTag>
```

```
section Aggregator      101      23      Vy      23      Vz      22      T      -section 5
```

```
#3.40 [m]
```

```
#Beam nodes 104-105 105-106 101-102 30x50
```

```
set beamHeight 500.0
```

```
set beamWidth 300.0
```

```
set cover 30.0
```

```
set As 153.8 ; #phi 14
```

```
set y2 [expr $beamWidth/2]
```

```
set z2 [expr $beamHeight/2]
```

```
section Fiber 6 {
```

```
#confined concrete
```

```
#patch rect materialtag numSubdivY numSubdivZ      yI          zI          yJ          zJ
```

```
patch rect    401      30      30      [expr $cover-$y2] [expr $cover-$z2]      [expr  
$y2-$cover] [expr $z2-$cover]
```

```
#unconfined concrete (top, bottom, left, right)
```

```

patch rect    402      20   20   [expr -$y2]      [expr -$z2]      $y2
[expr $cover-$z2]

patch rect    402      20   20   [expr -$y2]      [expr $z2-$cover]    $y2
$z2

patch rect    402      20   20   [expr $y2-$cover] [expr $cover-$z2]    $y2
[expr $z2-$cover]

patch rect    402      20   20   [expr -$y2]      [expr $cover-$z2]    [expr
$cover-$y2] [expr $z2-$cover]

```

#steel (top, middle, bottom)

```

layer straight 3      5   $As   [expr $y2-$cover] [expr $cover-$z2]    [expr
$y2-$cover] [expr $z2-$cover]

layer straight 3      0   $As   0.0           [expr $cover-$y2]    0.0
[expr $y2-$cover]

layer straight 3      4   $As   [expr $cover-$y2] [expr $cover-$z2]    [expr
$cover-$y2] [expr $z2-$cover]

```

}

```

set Abeam [expr $beamHeight*$beamWidth]
set GJtbam [expr $Gc*$c250*$beamHeight*pow($beamWidth,3)]
set GAcot [expr $Gc*$Abeam*5/6]
uniaxialMaterial Elastic 24 $GJtbam
uniaxialMaterial Elastic 25 $GAcot

```

```

#section Aggregator $secTag $matTag1 $string1 $matTag2 $string2 ..... <-section $sectionTag>
section Aggregator      102      25      Vy      25      Vz      24      T      -section 6

```

```
#3.40 [m]

#Beam nodes 102-103 30x50

set beamHeight 500.0
set beamWidth 300.0

set cover 30.0
set As 153.8 ; #phi 14

set y2 [expr $beamWidth/2]
set z2 [expr $beamHeight/2]

section Fiber 7 {

    #confined concrete
    #patch rect materialtag numSubdivY numSubdivZ      yI          zI          yJ          zJ
    patch rect    401      30      30      [expr $cover-$y2] [expr $cover-$z2] [expr $y2-$cover] [expr $z2-$cover]

    #unconfined concrete (top, bottom, left, right)
    patch rect    402      20      20      [expr -$y2]      [expr -$z2]      $y2
    [expr $cover-$z2]
    patch rect    402      20      20      [expr -$y2]      [expr $z2-$cover]      $y2
    $z2
    patch rect    402      20      20      [expr $y2-$cover] [expr $cover-$z2]      $y2
    [expr $z2-$cover]
    patch rect    402      20      20      [expr -$y2]      [expr $cover-$z2]      [expr
    $cover-$y2] [expr $z2-$cover]
```

```
#steel (top, middle, bottom)

layer straight 3      4    $As   [expr $y2-$cover]  [expr $cover-$z2]      [expr
$y2-$cover] [expr $z2-$cover]

layer straight 3      0    $As   0.0                  [expr $cover-$y2]      0.0
[expr $y2-$cover]

layer straight 3      4    $As   [expr $cover-$y2]  [expr $cover-$z2]      [expr
$cover-$y2] [expr $z2-$cover]

}


```

```
set Abeam [expr $beamHeight*$beamWidth]

set GJtbam [expr $Gc*$c250*$beamHeight*pow($beamWidth,3)]

set GAcol [expr $Gc*$Abeam*5/6]

uniaxialMaterial Elastic 26 $GJtcol

uniaxialMaterial Elastic 27 $GAcol
```

```
#section Aggregator $secTag $matTag1 $string1 $matTag2 $string2 ..... <-section $sectionTag>
section Aggregator      103      27      Vy      27      Vz      26      T      -section 7
```

#3.40 [m]

#Beam nodes 103-106 30x50

```
set beamHeight 500.0
```

```
set beamWidth 300.0
```

```
set cover 30.0
```

```
set As 153.8 ; #phi 14
```

```
set y2 [expr $beamWidth/2]
set z2 [expr $beamHeight/2]

section Fiber 8 {

    #confined concrete
    patch rect materialtag numSubdivY numSubdivZ      yI          zI          yJ          zJ
    patch rect    401      30      30      [expr $cover-$y2] [expr $cover-$z2] [expr $y2-$cover] [expr $z2-$cover]

    #unconfined concrete (top, bottom, left, right)
    patch rect    402      20      20      [expr -$y2]           [expr -$z2]           $y2
    [expr $cover-$z2]
    patch rect    402      20      20      [expr -$y2]           [expr $z2-$cover]        $y2      $z2
    patch rect    402      20      20      [expr $y2-$cover] [expr $cover-$z2]        $y2
    [expr $z2-$cover]
    patch rect    402      20      20      [expr -$y2]           [expr $cover-$z2] [expr $cover-$y2] [expr $z2-$cover]

    #steel (top, middle, bottom)
    layer straight 3      7      $As      [expr $y2-$cover] [expr $cover-$z2] [expr $y2-$cover] [expr $z2-$cover]
    layer straight 3      0      $As      0.0                  [expr $cover-$y2] 0.0
    [expr $y2-$cover]
    layer straight 3      5      $As      [expr $cover-$y2] [expr $cover-$z2] [expr $cover-$y2] [expr $z2-$cover]

}

set Abeam [expr $beamHeight*$beamWidth]
```

```
set GJtbam [expr $Gc*$c250*$beamHeight*pow($beamWidth,3)]  
set GAcol [expr $Gc*$Abeam*5/6]  
uniaxialMaterial Elastic 28 $GJtcol  
uniaxialMaterial Elastic 29 $GAcol  
  
#section Aggregator $secTag $matTag1 $string1 $matTag2 $string2 ..... <-section $sectionTag>  
section Aggregator      104      29      Vy      29      Vz      28      T      -section 8
```

#3.4 [m]

#Beam nodes 102-105 60x25

#Materials

#Concrete

#Confined concrete

```
#uniaxialMaterial Concrete    tag    fpc    epsc 0  fpcu    epsU  lambda    ft    Et  
uniaxialMaterial Concrete02  403  -39.83  -0.005  -8.16  -0.017  0.1  0.0  0.0
```

#Unconfined concrete

```
uniaxialMaterial Concrete02  404  -33.00  -0.002  -9.63  -0.0105  0.1  0.0  0.0
```

```
set beamHeight5 250.0
```

```
set beamWidth5 600.0
```

```
set cover 30.0
```

```
set As 153.8 ; #phi 14
```

```
set y2 [expr $beamWidth/2]
set z2 [expr $beamHeight/2]

section Fiber 9 {

    #confined concrete
    #patch rect materialtag numSubdivY numSubdivZ      yI           zI           yJ           zJ
    patch rect     403      30      30      [expr $cover-$y2] [expr $cover-$z2] [expr $y2-$cover] [expr $z2-$cover]

    #unconfined concrete (top, bottom, left, right)
    patch rect     404      20      20      [expr -$y2]          [expr -$z2]          $y2
    [expr $cover-$z2]
    patch rect     404      20      20      [expr -$y2]          [expr $z2-$cover]        $y2
    $z2
    patch rect     404      20      20      [expr $y2-$cover] [expr $cover-$z2]        $y2
    [expr $z2-$cover]
    patch rect     404      20      20      [expr -$y2]          [expr $cover-$z2] [expr $cover-$y2] [expr $z2-$cover]

    #steel (top, middle, bottom)
    layer straight 3       4      $As      [expr $y2-$cover] [expr $cover-$z2] [expr $y2-$cover] [expr $z2-$cover]
    layer straight 3       0      $As      0.0                  [expr $cover-$y2]  0.0
    [expr $y2-$cover]
    layer straight 3       4      $As      [expr $cover-$y2] [expr $cover-$z2] [expr $cover-$y2] [expr $z2-$cover]

}
```

```
set Abeam [expr $beamHeight*$beamWidth]
set GJtbam [expr $Gc*$c250*$beamHeight*pow($beamWidth,3)]
set GAcot [expr $Gc*$Abeam*5/6]

uniaxialMaterial Elastic 30 $GJtcol
uniaxialMaterial Elastic 31 $GAcot

#section Aggregator $secTag $matTag1 $string1 $matTag2 $string2 ..... <-section $sectionTag>
section Aggregator      105      31      Vy      31      Vz      30      T      -section 9

#6.5 [m]

#Materials
#Concrete

#Confined concrete
#uniaxialMaterial Concrete    tag      fpc      epsc0     fpcu      epsU    lambda      ft      Et
uniaxialMaterial Concrete02  501  -41.17  -0.0045  -9.35  -0.0175  0.1   0.0   0.0 ;
#Unconfined concrete
uniaxialMaterial Concrete02  502  -33.00  -0.002   -9.63  -0.0105  0.1   0.0   0.0
```

```
#Beam nodes 201-204 30x50
```

```
#Beam 30*50 section
```

```
set beamHeight 500.0
```

```
set beamWidth 300.0
```

```
set cover 30.0
```

```
set As 153.8 ; #phi 14
```

```
set y2 [expr $beamWidth/2]
```

```
set z2 [expr $beamHeight/2]
```

```
section Fiber 10 {
```

```
#confined concrete
```

```
patch rect materialtag numSubdivY numSubdivZ yI zI yJ zJ
```

```
patch rect 501 30 30 [expr $cover-$y2] [expr $cover-$z2] [expr $y2-$cover] [expr $z2-$cover]
```

```
#unconfined concrete (top, bottom, left, right)
```

```
patch rect 502 20 20 [expr -$y2] [expr -$z2] $y2  
[expr $cover-$z2]
```

```
patch rect 502 20 20 [expr -$y2] [expr $z2-$cover] $y2  
$z2
```

```
patch rect 502 20 20 [expr $y2-$cover] [expr $cover-$z2] $y2  
[expr $z2-$cover]
```

```
patch rect 502 20 20 [expr -$y2] [expr $cover-$z2] [expr $cover-$y2]  
[expr $z2-$cover]
```

```
#steel (top, middle, bottom)

layer straight 3      5 $As [expr $y2-$cover] [expr $cover-$z2] [expr $y2-$cover] [expr $z2-$cover]

layer straight 3      0 $As 0.0 [expr $cover-$y2] 0.0 [expr $y2-$cover]

layer straight 3      4 $As [expr $cover-$y2] [expr $cover-$z2] [expr $cover-$y2] [expr $z2-$cover]
```

{}

```
set Abeam [expr $beamHeight*$beamWidth]

set GJtbam [expr $Gc*$c250*$beamHeight*pow($beamWidth,3)]

set GAcot [expr $Gc*$Abeam*5/6]

uniaxialMaterial Elastic 32 $GJtcol

uniaxialMaterial Elastic 33 $GAcot
```

```
#section Aggregator $secTag $matTag1 $string1 $matTag2 $string2 ..... <-section $sectionTag>

section Aggregator 201 33 Vy 33 Vz 32 T -section 10
```

#6.5 [m]

#Trave Nodi 204-205

#Beam 30*50 section

```
set beamHeight 500.0

set beamWidth 300.0
```

```
set cover 30.0
```

```
set As 153.8 ; #phi 14
```

```
set y2 [expr $beamWidth/2]
```

```
set z2 [expr $beamHeight/2]
```

```
section Fiber 11 {
```

```
#confined concrete
```

```
#patch rect materialtag numSubdivY numSubdivZ yI zI yJ zJ
patch rect 501 30 30 [expr $cover-$y2] [expr $cover-$z2] [expr $y2-$cover] [expr $z2-$cover]
```

```
#unconfined concrete (top, bottom, left, right)
```

```
patch rect 502 20 20 [expr -$y2] [expr -$z2] $y2
[expr $cover-$z2]
patch rect 502 20 20 [expr -$y2] [expr $z2-$cover] $y2
$z2
patch rect 502 20 20 [expr $y2-$cover] [expr $cover-$z2] $y2
[expr $z2-$cover]
patch rect 502 20 20 [expr -$y2] [expr $cover-$z2] [expr $cover-$y2]
[expr $z2-$cover]
```

```
#steel (top, middle, bottom)
```

```
layer straight 3 5 $As [expr $y2-$cover] [expr $cover-$z2] [expr $y2-$cover]
[expr $z2-$cover]
```

```
layer straight 3 0 $As 0.0 [expr $cover-$y2] 0.0
[expr $y2-$cover]
```

```
layer straight 3 4 $As [expr $cover-$y2] [expr $cover-$z2] [expr $cover-$y2]
[expr $z2-$cover]
```

{

```
set Abeam [expr $beamHeight*$beamWidth]
set GJtbam [expr $Gc*$c250*$beamHeight*pow($beamWidth,3)]
set GAcot [expr $Gc*$Abeam*5/6]
uniaxialMaterial Elastic 34 $GJtcol
uniaxialMaterial Elastic 35 $GAcot

#section Aggregator $secTag $matTag1 $string1 $matTag2 $string2 ..... <-section $sectionTag>
section Aggregator      202      35      Vy      35      Vz      34      T -section 11

#6.5 [m]
```

#Beam nodes 201-202 202-203 205-206 30x50

set beamHeight 500.0

set beamWidth8 300.0

set cover 30.0

set As 153.8 ; #phi 14

set y2 [expr \$beamWidth/2]

set z2 [expr \$beamHeight/2]

section Fiber 12 {

```

#confined concrete

#patch rect    materialtag numSubdivY numSubdivZ      yI           zI           yJ           zJ
patch rect      501        30     30      [expr $cover-$y2] [expr $cover-$z2]  [expr $y2-
$cover] [expr $z2-$cover]

#unconfined concrete (top, bottom, left, right)

patch rect      502        20     20      [expr -$y2]          [expr -$z2]          $y2
[expr $cover-$z2]

patch rect      502        20     20      [expr -$y2]          [expr $z2-$cover]   $y2
$z2

patch rect      502        20     20      [expr $y2-$cover] [expr $cover-$z2]   $y2
[expr $z2-$cover]

patch rect      502        20     20      [expr -$y2]          [expr $cover-$z2] [expr $cover-
$y2] [expr $z2-$cover]

#steel (top, middle, bottom)

layer straight  3         4     $As      [expr $y2-$cover] [expr $cover-$z2]  [expr $y2-
$cover] [expr $z2-$cover]

layer straight  3         0     $As      0.0                  [expr $cover-$y2]   0.0
[expr $y2-$cover]

layer straight  3         4     $As      [expr $cover-$y2] [expr $cover-$z2]  [expr $cover-
$y2] [expr $z2-$cover]

}

set Abeam [expr $beamHeight*$beamWidth]
set GJtbam [expr $Gc*$c250*$beamHeight*pow($beamWidth,3)]
set GAcot [expr $Gc*$Abeam*5/6]
uniaxialMaterial Elastic 37 $GJtcol
uniaxialMaterial Elastic 36 $GAcot

```

```
#section Aggregator $secTag $matTag1 $string1 $matTag2 $string2 ..... <-section $sectionTag>
section Aggregator      203      36      Vy      36      Vz      37      T      -section 12

#6.5 [m]

#Beam nodes 203-206 30x50

set beamHeight 500.0
set beamWidth 300.0

set cover 30.0
set As 153.8 ; #phi 14

set y2 [expr $beamWidth/2]
set z2 [expr $beamHeight/2]

section Fiber 13 {

    #confined concrete
    #patch rect materialtag numSubdivY numSubdivZ      yI          zI          yJ          zJ
    patch rect      501      30      30      [expr $cover-$y2] [expr $cover-$z2]      [expr $y2-$cover] [expr $z2-$cover]

    #unconfined concrete (top, bottom, left, right)
    patch rect      502      20      20      [expr -$y2]          [expr -$z2]          $y2
    [expr $cover-$z2]
    patch rect      502      20      20      [expr -$y2]          [expr $z2-$cover]        $y2
    $z2
```

```
patch rect      502      20    20    [expr $y2-$cover] [expr $cover-$z2]    $y2  
[expr $z2-$cover]  
  
patch rect      502      20    20    [expr -$y2]           [expr $cover-$z2]    [expr $cover-  
$y2] [expr $z2-$cover]  
  
  
#steel (top, middle, bottom)  
  
layer straight  3       5    $As    [expr $y2-$cover] [expr $cover-$z2]    [expr $y2-  
$cover] [expr $z2-$cover]  
  
layer straight  3       0    $As    0.0                 [expr $cover-$y2]    0.0  
[expr $y2-$cover]  
  
layer straight  3       4    $As    [expr $cover-$y2] [expr $cover-$z2]    [expr $cover-  
$y2] [expr $z2-$cover]  
  
  
}  
  
  
set Abeam [expr $beamHeight*$beamWidth]set GJtbam [expr  
$Gc*$c250*$beamHeight*pow($beamWidth,3)]  
  
set GAcot [expr $Gc*$Abeam*5/6]  
  
uniaxialMaterial Elastic 39 $GJtcol  
  
uniaxialMaterial Elastic 38 $GAcot  
  
  
#section Aggregator $secTag $matTag1 $string1 $matTag2 $string2 ..... <-section $sectionTag>  
section Aggregator      204      38      Vy      38      Vz      39      T      -section 13
```

```
#6.5 [m]
```

```
#Beam nodes 202-205 60x25
```

```
#Materials
```

```
#Concrete
```

```
#Confined concrete
```

```
#uniaxialMaterial Concrete tag fpc epsec0 fpcu epsU lambda ft Et  
uniaxialMaterial Concrete02 503 -39.83 -0.005 -8.16 -0.017 0.1 0.0 0.0
```

```
#Unconfined concrete
```

```
uniaxialMaterial Concrete02 504 -33.00 -0.002 -9.63 -0.0105 0.1 0.0 0.0
```

```
set beamHeight 250.0
```

```
set beamWidth 600.0
```

```
set cover 30.0
```

```
set As 153.8 ; #phi 14
```

```
set y2 [expr $beamWidth/2]
```

```
set z2 [expr $beamHeight/2]
```

```
section Fiber 14 {
```

```

#confined concrete

#patch rect    materialtag numSubdivY numSubdivZ      yI           zI           yJ           zJ
patch rect      503        30        30      [expr $cover-$y2] [expr $cover-$z2]  [expr $y2-
$cover] [expr $z2-$cover]

#unconfined concrete (top, bottom, left, right)

patch rect      504        20        20      [expr -$y2]          [expr -$z2]          $y2
[expr $cover-$z2]

patch rect      504        20        20      [expr -$y2]          [expr $z2-$cover]   $y2
$z2

patch rect      504        20        20      [expr $y2-$cover] [expr $cover-$z2]   $y2
[expr $z2-$cover]

patch rect      504        20        20      [expr -$y2]          [expr $cover-$z2] [expr $cover-
$y2] [expr $z2-$cover]

#steel (top, middle, bottom)

layer straight  3         4    $As      [expr $y2-$cover] [expr $cover-$z2]  [expr $y2-
$cover] [expr $z2-$cover]

layer straight  3         0    $As      0.0          [expr $cover-$y2]   0.0
[expr $y2-$cover]

layer straight  3         4    $As      [expr $cover-$y2] [expr $cover-$z2]  [expr $cover-
$y2] [expr $z2-$cover]

}

set Abeam [expr $beamHeight*$beamWidth]
set GJtbam [expr $Gc*$c250*$beamHeight*pow($beamWidth,3)]
set GAcot [expr $Gc*$Abeam*5/6]
uniaxialMaterial Elastic 41 $GJtcol
uniaxialMaterial Elastic 40 $GAcot

```

```
#section Aggregator $secTag $matTag1 $string1 $matTag2 $string2 ..... <-section $sectionTag>
```

```
section Aggregator      205       40      Vy      40      Vz      41      T      -section 14
```

#9.6 [m]

#Materials

#Concrete

#Confined concrete

```
#uniaxialMaterial Concrete    tag     fpc    epsc0   fpcu    epsU    lambda    ft    Et
uniaxialMaterial Concrete02  601  -40.84  -0.0044  -9.39  -0.0175  0.1  0.0  0.0
```

#Unconfined concrete

```
uniaxialMaterial Concrete02  602  -33.00  -0.002  -9.63  -0.0105  0.1  0.0  0.0
```

#Beam nodes 301-304 301-302 302-303 304-305 305-306 303-306 30x50

```
set beamHeight 500.0
```

```
set beamWidth 300.0
```

```
set cover 30.0
```

```
set As 153.8 ; #phi 14
```

```
set y2 [expr $beamWidth/2]
```

```
set z2 [expr $beamHeight/2]
```

```
section Fiber 15 {
```

```
#confined concrete
```

```
#patch rect materialtag numSubdivY numSubdivZ      yI          zI          yJ          zJ
patch rect    601      30      30      [expr $cover-$y2] [expr $cover-$z2] [expr $y2-
$cover] [expr $z2-$cover]
```

```
#unconfined concrete (top, bottom, left, right)
```

```
patch rect    602      20      20      [expr -$y2]           [expr -$z2]           $y2
[expr $cover-$z2]
patch rect    602      20      20      [expr -$y2]           [expr $z2-$cover]       $y2
$z2
patch rect    602      20      20      [expr $y2-$cover] [expr $cover-$z2]   $y2
[expr $z2-$cover]
patch rect    602      20      20      [expr -$y2]           [expr $cover-$z2] [expr $cover-
$y2]   [expr $z2-$cover]
```

```
#steel (top, middle, bottom)
```

```
layer straight 3      4  $As      [expr $y2-$cover] [expr $cover-$z2] [expr $y2-
$cover] [expr $z2-$cover]
layer straight 3      0  $As      0.0                  [expr $cover-$y2]  0.0
[expr $y2-$cover]
layer straight 3      4  $As      [expr $cover-$y2] [expr $cover-$z2] [expr $cover-
$y2]   [expr $z2-$cover]
```

```
}
```

```
set Abeam [expr $beamHeight*$beamWidth]
```

```
set GJtbam [expr $Gc*$c250*$beamHeight*pow($beamWidth,3)]
```

```
set GAcot [expr $Gc*$Abeam*5/6]
```

```
uniaxialMaterial Elastic 43 $GJtcol
```

```
uniaxialMaterial Elastic 42 $GCol
```

```
#section Aggregator $secTag $matTag1 $string1 $matTag2 $string2 ..... <-section $sectionTag>
```

```
section Aggregator      301      42      Vy      42      Vz      43      T      -section 15
```

```
#9.6 [m]
```

```
#Beam nodes 302-305 30x50
```

```
#Materials
```

```
#Concrete
```

```
#Confined concrete
```

```
#uniaxialMaterial Concrete    tag    fpc    epsc0    fpcu    epsU    lambda    ft    Et  
uniaxialMaterial Concrete02  603  -39.83  -0.005  -8.16  -0.017  0.1  0.0  0.0
```

```
#Unconfined concrete
```

```
uniaxialMaterial Concrete02  604  -33.00  -0.002  -9.63  -0.0105  0.1  0.0  0.0
```

```
set beamHeight 250.0
```

```
set beamWidth 600.0
```

```
set cover 30.0
```

```
set As 153.8 ; #phi 14
```

```
set y2 [expr $beamWidth/2]
```

```

set z2 [expr $beamHeight/2]

section Fiber 16 {

    #confined concrete

    #patch rect materialtag numSubdivY numSubdivZ      yI          zI          yJ          zJ
    patch rect   603      30      30      [expr $cover-$y2] [expr $cover-$z2]      [expr $y2-
$cover] [expr $z2-$cover]

    #unconfined concrete (top, bottom, left, right)

    patch rect   604      20      20      [expr -$y2]           [expr -$z2]           $y2
    [expr $cover-$z2]

    patch rect   604      20      20      [expr -$y2]           [expr $z2-$cover]       $y2
    $z2

    patch rect   604      20      20      [expr $y2-$cover] [expr $cover-$z2]       $y2
    [expr $z2-$cover]

    patch rect   604      20      20      [expr -$y2]           [expr $cover-$z2]       [expr
$cover-$y2] [expr $z2-$cover]

    #steel (top, middle, bottom)

    layer straight 3      4      $As      [expr $y2-$cover] [expr $cover-$z2]      [expr $y2-
$cover] [expr $z2-$cover]

    layer straight 3      0      $As      0.0                  [expr $cover-$y2]       0.0
    [expr $y2-$cover]

    layer straight 3      4      $As      [expr $cover-$y2] [expr $cover-$z2]      [expr
$cover-$y2] [expr $z2-$cover]

}

set Abeam [expr $beamHeight*$beamWidth]
set GJtbam [expr $Gc*$c250*$beamHeight*pow($beamWidth,3)]

```

```
set GAc0l [expr $Gc*$Abeam*5/6]
```

```
uniaxialMaterial Elastic 44 $GJtcol
```

```
uniaxialMaterial Elastic 45 $GAc0l
```

```
#section Aggregator $secTag $matTag1 $string1 $matTag2 $string2 ..... <-section $sectionTag>
```

```
section Aggregator      302      45      Vy      45      Vz      44   T    -section 16
```