
```
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 {[length $line] == 0} {
    puts "Fine " ;      #Empty file ;
    close $f0
    break
}
if {$linenumber == $i} {
    if {[length $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  
        }  
  
    } elseif { $linenumber != $i } {  
    }  
}
```

```

source StaticAnalysis.tcl

# Damping
#  $D = \alpha M * M + \beta_{curr} * K_{current} + \beta_{comm} * K_{lastCommit} + \beta_{init} * K_{initial}$ 
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 $nEigenJ-1]]; # eigenvalue mode j
set omegaI [expr pow($lambdaI,0.5)];
set omegaJ [expr pow($lambdaJ,0.5)];

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

set betaKcurr [expr $KcurrSwitch*2.*$xDamp/($omegaI+$omegaJ)]; # current-K; +beatKcurr*KCurrent
set betaKcomm [expr $KcommSwitch*2.*$xDamp/($omegaI+$omegaJ)]; # last-committed K;
+betaKcomm*KlastCommitt
set betaKinit [expr $KinitSwitch*2.*$xDamp/($omegaI+$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 $Tol $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 NormDisplnCr $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/Pilastr

file mkdir Groundmotion\$i/RBase

#Create model

#Nodes

#Nodes tag	X	Y	Z
------------	---	---	---

#Quota zero

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 diafragn

#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;
```

```
#Displacment 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 Analysis

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	lamba	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] [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 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 Gjtcoll [expr $Gc*$c250*$colHeight*pow($colWidth,3)]
```

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

```
uniaxialMaterial Elastic 10 $Gjtcoll
```

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

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

```
uniaxialMaterial Elastic 12 $Gjtcoll
```

```
uniaxialMaterial Elastic 13 $GAcol
```

```
#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 lamba 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 Gjtc [expr $Gc*$c250*$colHeight*pow($colWidth,3)]
```

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

```
uniaxialMaterial Elastic 14 $Gjtc
```

```
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	epsc0	fpcu	epsU	lamba	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 GAcol [expr $Gc*$Abeam*5/6]
```

```
uniaxialMaterial Elastic 22 $GJtcol
```

```
uniaxialMaterial Elastic 23 $GAcol
```

```
#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 GAcol [expr $Gc*$Abeam*5/6]
```

```
uniaxialMaterial Elastic 24 $GJtcol
```

```
uniaxialMaterial Elastic 25 $GAcol
```

```
#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 lamba 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 $GJtbam
```

```
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      lamba      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 GAcol [expr $Gc*$Abeam*5/6]
```

```
uniaxialMaterial Elastic 32 $GJtcol
```

```
uniaxialMaterial Elastic 33 $GAcol
```

```
#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 yl zl 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 GAcol [expr $Gc*$Abeam*5/6]
```

```
uniaxialMaterial Elastic 34 $GJtcol
```

```
uniaxialMaterial Elastic 35 $GAcol
```

```
#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    yl        zl        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 GAcol [expr $Gc*$Abeam*5/6]

uniaxialMaterial Elastic 39 $GJtcol

uniaxialMaterial Elastic 38 $GAcol

#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	epsc0	fpcu	epsU	lamba	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  yl      zl      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 lamba 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 GAcol [expr $Gc*$Abeam*5/6]
```

```
uniaxialMaterial Elastic 43 $GJtcol
```

uniaxialMaterial Elastic 42 \$GAcot

#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	lamba	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 GAcol [expr $Gc*$Abeam*5/6]
```

```
uniaxialMaterial Elastic 44 $GJtcol
```

```
uniaxialMaterial Elastic 45 $GAcol
```

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

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