

```

;-----
;
; Vertically and horizontally loaded pile in clay
;
;-----
gen zone radcyl p0 (0,0,0) p1 (8,0,0) p2 (0,0,-5) p3 (0,8,0) &
                p4 (8,0,-5) p5 (0,8,-5) p6 (8,8,0) p7 (8,8,-5) &
                p8 (.3,0,0) p9 (0,.3,0) p10 (.3,0,-5) p11 (0,.3,-5) &
                size 3 10 6 15 ratio 1 1 1 1.15
gen zone radcyl p0 (0,0,-5) p1 (8,0,-5) p2 (0,0,-8) p3 (0,8,-5) &
                p4 (8,0,-8) p5 (0,8,-8) p6 (8,8,-5) p7 (8,8,-8) &
                p8 (.3,0,-5) p9 (0,.3,-5) p10 (.3,0,-8) p11 (0,.3,-8) &
                size 3 6 6 15 ratio 1 1 1 1.15 fill
gen zone reflect dd 270 dip 90
group clay
;
interface 1 face range cylinder end1 (0,0,0) end2 (0,0,-5.1) radius .31 &
                cylinder end1 (0,0,0) end2 (0,0,-5.1) radius .29 not
interface 2 face range cylinder end1 (0,0,-4.9) end2 (0,0,-5.1) radius .31
;
gen zone cyl p0 (0,0,6) p1 (.3,0,6) p2 (0,0,1) p3 (0,.3,6) &
                p4 (.3,0,1) p5 (0,.3,1) &
                size 3 10 6
gen zone cyl p0 (0,0,6.1) p1 (.3,0,6.1) p2 (0,0,6) p3 (0,.3,6.1) &
                p4 (.3,0,6) p5 (0,.3,6) &
                size 3 1 6
gen zone reflect dd 270 dip 90 range z 1 6.1
group pile range z 1 6.1
ini z add -6.0 range group pile
;
model mohr
prop bulk 8.333e7 shear 3.846e7 coh 30000 fric 0 range group clay
model elas
range group pile
prop bulk 8.333e7 shear 3.846e7 range group pile
interface 1 prop kn 1e8 ks 1e8 fric 20 coh 30000
interface 2 prop kn 1e8 ks 1e8 fric 20 coh 30000
;
ini dens 1230 range group clay
ini dens 1230 range group pile
model null range z -0.1 0.15
;
fix z range z -8.1 -7.9
fix x range x -8.1 -7.9
fix x range x 7.9 8.1

```

```

fix y range y -.1 .1
fix y range y 7.9 8.1
set grav 0 0 -10
ini szz 0. grad 0 0 12300. range z -5.5 0.
ini szz 17600 grad 0 0 15500 range z -8 -5.5
ini sxx 0. grad 0 0 5271.4 range z -5.5 0.
ini sxx 7542.86 grad 0 0 6642.86 range z -8 -5.5
ini syy 0. grad 0 0 5271.4 range z -5.5 0.
ini syy 7542.86 grad 0 0 6642.86 range z -8 -5.5
water density 1000
water table origin 0,0,-5.5 normal 0 0 -1
ini dens 1550 range z -8 -5.5
hist unbal
;
solve rat 1.e-6
save pile0.sav
;
model elas                                range group pile
prop bulk 13.9e9    shear 10.4e9    range group pile
ini dens 2500                                range group pile
call find_add.fis
solve rat 1.e-6
save pile1.sav
;
ini state 0
ini xdis 0 ydis 0 zdis 0
;
; monitor vertical loading at pile cap
def zs_top
  ad = top_head
  zftot = 0.0
  loop while ad # null
    gp_pnt = mem(ad+1)
    zf = gp_zfunbal(gp_pnt)
    zftot = zftot + zf
    ad = mem(ad)
  endloop
  zs_top = zftot / 0.1414
end
fix z range z 0.05 .15 group pile
;
def ramp
  while_stepping
  if step < ncut then

```

```

        udapp = float(step) * udmx / float(ncut)
    else
        udapp = udmx
    endif
    ad = top_head
    loop while ad # null
        gp_pnt = mem(ad+1)
        gp_zvel(gp_pnt) = udapp
        ad = mem(ad)
    endloop
end
;
hist gp zdis 0,0,0
hist gp zvel 0,0,0
hist zs_top
hist zone szz 0,0,-.1
;
set mech damp comb
set udmx = -1e-8  ncut 30000
step 225000
save pile2.sav
;
rest pile1.sav
;
apply szz -0.354e6 range z .05 .15 group pile
ini state 0
ini xdis 0.0 ydis 0.0 zdis 0.0
;
hist unbal
hist gp zdis 0,0,0
hist gp zdis 0,0,-5
;
solve rat 1.e-6
;
save pilef2.sav
ini xdis 0.0 ydis 0.0 zdis 0.0
;
; monitor horizontal loading along pile shaft
def xf_pl
    ad = top_head
    xftot = 0.0
    loop while ad # null
        gp_pnt = mem(ad+1)
        xf = gp_xfunbal(gp_pnt)
    endloop
end

```

```

        xftot = xftot + xf
        ad = mem(ad)
    endloop
    xf_pl = xftot
end
call p-y.fis
call servo.fis
set vel_min 5e-8 vel_max 1e-6 unb_min 10 unb_max 50 horapp 5e-8
fix x range z 0.05 .15 group pile
;
hist gp xdis 0,0,0
hist gp xvel 0,0,0
hist horapp
hist tot_reac
hist xf_pl
;
step 60000
save pile2h.sav
ret

```