

## Problem Description

```
title = "4000-foot MOOS Mooring Benthic Design"
type = surface
```

## Analysis Parameters

```
static-outer-iterations = 1000
static-iterations       = 5000
static-relaxation       = 0.1
static-tolerance        = 0.01
static-outer-tolerance  = 0.01

duration                = 400.0
time-step               = 0.1
dynamic-tolerance       = 1e-6
dynamic-relaxation      = 1.0
dynamic-iterations      = 20
ramp-time               = 30.0
```

## Environment

```
rho          = 1025
gravity       = 9.81
x-current     = (0.0, 0.70) (20.0, 0.60) (40, 0.55) (100, 0.40) (120, 0.3)
              (500, 0.25) (4000, 0.0)
```

```
/*    x-current     = (0.0, 0.35) (20.0, 0.30) (40, 0.275) (100, 0.20) (120, 0.15)
              (500, 0.25) (4000, 0.0)    */
```

```
/*    x-current     = (0.0, 0.05) (4000, 0.0) */
```

```
x-wind        = 15.0      /* use 15.0 12.0, 6.0, and 0.0 for wind speeds
depth         = 4000
input-type    = random
forcing-method = wave-follower
x-wave        = (4.85, 17.1, 0.0) /* sea state 8 */
bottom-stiffness = 0.0
bottom-damping  = 0.0
```

## Buoys

```
buoy_LB type = cylinder
        m = 3200 /* not including fuel! */
        Cdn = 1.0
        Cdt = 1.0
        Cdw = 1.5
        Sw = 6 + 0.2
        d = 3.5
        h = 1.4
```

```
float    type = sphere
        m = 65
        d = 1.22
        Cdn = 1.0
```

## Anchors

```
clump      color = red
```

## Connectors

```

termination_B  m = 4.45/2.205
                wet = 4.45*4.448*.8667
                Cdn = 0.5
                d = 0.168

```

```

shackle        d = 0.375*0.0254
                wet = 8.0
                Cdn = 0.1
                m = 1.0

```

```

ssf_1          d = 1.422
                m = 724.3
                wet = -8010
                Cdn = 0.8

```

```

ssf_2          d = 1.605
                m = 1041.
                wet = -11570
                Cdn = 0.8

```

```

football       d = 0.5657
                m = 35.7
                am = 28.6
                wet = -272
                Cdn = 1.0
                Cdt = 0.2

```

## Materials

|           |                                        |                                       |                                        |
|-----------|----------------------------------------|---------------------------------------|----------------------------------------|
| chain_1_2 | EA = 5.5e7<br>m = 4.5<br>d = 0.0265    | EI = 0.01<br>am = 0.584<br>Cdt = 0.01 | GJ = 0.1<br>wet = 38.1<br>Cdn = 1.0    |
| nylon_1   | EA = 2.2e5<br>m = .388<br>d = 0.0254   | EI = 500<br>am = .341<br>Cdt = 0.01   | GJ = 25<br>wet = .533<br>Cdn = 1.5     |
| glass_17  | EA = 5.5e7<br>m = 46.5<br>d = 0.34     | EI = 0.01<br>am = 0.5<br>Cdt = 0.01   | GJ = 0.1<br>wet = -196.27<br>Cdn = 1.5 |
| dummy_17  | EA = 5.5e7<br>m = 46.5<br>d = 0.34     | EI = 0.01<br>am = 0.5<br>Cdt = 0.01   | GJ = 0.1<br>wet = 2.149<br>Cdn = 1.5   |
| wire_1_4  | EA = 4.4e6<br>m = 0.186<br>d = 0.0079  | EI = 500<br>am = 0.0507<br>Cdt = 0.01 | GJ = 25<br>wet = 1.327<br>Cdn = 1.5    |
| wire_5_16 | EA = 6.8e6<br>m = 0.2917<br>d = 0.0095 | EI = 500<br>am = 0.0727<br>Cdt = 0.01 | GJ = 25<br>wet = 2.149<br>Cdn = 1.5    |
| wire_3_8  | EA = 9.8e6<br>m = 0.390<br>d = 0.0116  | EI = 500<br>am = 0.108<br>Cdt = 0.01  | GJ = 25<br>wet = 3.82<br>Cdn = 1.5     |

|              |                                       |                                        |                                                       |
|--------------|---------------------------------------|----------------------------------------|-------------------------------------------------------|
| array        | EA = 4.4e6<br>m = 1.484<br>d = 0.028  | EI = 500<br>am = 0.631<br>Cdt = 0.01   | GJ = 25<br>wet = 8.514<br>Cdn = 2.0                   |
| EM_cable     | EA = 1.0e7<br>m = 1.042<br>d = 0.0173 | EI = 0.0437<br>am = 0.24<br>Cdt = 0.01 | GJ = 0.01<br>wet = 8.145<br>Cdn = 1.5                 |
| FB_cable     | EA = 1.0e7<br>m = 46.3<br>d = 0.3192  | EI = 0.0437<br>am = 36.3<br>Cdt = 0.01 | GJ = 0.01<br>wet = -337.0<br>Cdn = 1.2                |
| pole         | EA = 5.5e7<br>m = 4.5<br>d = 0.0265   | EI = 0.01<br>am = 0.584<br>Cdt = 0.01  | GJ = 0.1<br>wet = 38.1<br>Cdn = 1.0                   |
| b_tether     | EA = 1.0e7<br>m = 4.160<br>d = 0.05   | EI = 800<br>am = 2.08<br>Cdt = 0.01    | GJ = 40<br>wet = -4.45<br>Cdn = 1.5                   |
| w_tether     | EA = 1.0e7<br>m = 4.160<br>d = 0.05   | EI = 800<br>am = 2.08<br>Cdt = 0.01    | GJ = 40<br>wet = 2.67<br>Cdn = 1.5                    |
| snubber      | EA = 3.13e4<br>m = 14.07<br>d = 0.11  | EI = 1000<br>am = 9.74<br>Cdt = 0.01   | GJ = 500<br>wet = 42.46<br>Cdn = 1.5                  |
| acoustic_rel | EA = 1.0e8<br>m = 45/1.<br>d = 0.130  | EI = 1000<br>am = 18/1.<br>Cdt = 0.18  | GJ = 100<br>wet = 314/1.<br>Cdn = 1.2                 |
| VMCM         | EA = 5.0e7<br>m = 39.1<br>d = 0.30    | EI = 1000.0<br>Cdt = 0.01<br>Cmt = 1.2 | GJ = 1000.0<br>wet = 203.86<br>Cdn = 1.0<br>Cmn = 1.5 |

## Layout

```

terminal = {
  anchor = clump
}
segment = {
  length = 5.0
  material = chain_1_2
  nodes = (5, 1.0)
}
segment = {
  length = 1.0
  material = acoustic_rel
  nodes = (2, 1.0)
}
segment = {
  length = 3.7
  material = chain_1_2
  nodes = (5, 1.0)
}

```

```

segment = {
    length = 75
    material = EM_cable
    nodes = (9, 1.0)
}
segment = {                                /* this is cable w/ 8 footballs */
    length = 6.3
    material = FB_cable
    nodes = (9, 1.0)
}
segment = {                                /* this is the EM cable with 3 footballs per 100 m */
    length = 3400
    material = EM_cable
    nodes = (341, 1.0)
    attachments = football : [4, 3, 340]
}
segment = {                                /* 3 m of potted chain below SSF */
    length = 3
    material = chain_1_2
    nodes = (5, 1.0)
}
connector = ssf_2
segment = {                                /* 3 m of potted chain above SSF */
    length = 3
    material = chain_1_2
    nodes = (5, 1.0)
}
segment = {
    length = 420
    material = EM_cable
    nodes = (43, 1.0)
    attachments = football : [2, 2, 42]
}
segment = {
    length = 580
    material = EM_cable
    nodes = (59, 1.0)
}
segment = {
    length = 25
    material = snubber
    nodes = (5, 1.0)
}
terminal = {
    buoy = buoy_LB
}

```

End

