

```
#include "ESP.spec"
```

Problem Description

```
title = TITLE
type = surface
```

Analysis Parameters

```
duration      = TF
time-step     = DT
static-relaxation    = 0.1
static-outer-relaxation = 0.97
static-tolerance = 0.000001
static-outer-tolerance = 0.0001
dynamic-relaxation    = 1.0
/* dynamic-lambda = DYNAMICLAMBDA */
max-iterations = 3000
dynamic-tolerance    = 1e-8
ramp-time            = RAMPTIME
static-initial-guess = catenary
```

Environment

```
forcing-method = wave-follower
input-type     = random

x-wave         = (XWAVEAMP, XWAVEPERIOD, XWAVEDIR)

x-current      = XCURRENT

x-wind         = XWIND
rho            = 1025
gravity        = 9.81
depth          = DEPTH /* DEPTH is 0.8m shallower than actual depth to account for anchor */
```

Buoys

```
esp_buoy_1 type = axisymmetric
m = 34 /* Estimated at 75 lbs */
diameters = (0.0, 0.0762) (.838, 0.0762) (0.8382, .279)
            (1.067, 0.406) (1.75, .406)
Cdn = .75 Cdt = 0.25
Sw = .2 Cdw = 1.0
```

Anchors

```
clump
```

Connectors

```
sphere64 d = 1.6256 Cdn = 0.5 Cdt = 0.5
          wet = -11120 m = 1172.
/* length = 1.6256 */

ESP d = .762 Cdn = 1.0 Cdt = 1.0
   wet = -890 m = 386
/* length = 2.0 */

syn_floats d = .0762 Cdn = 0.5 Cdt = 0.5
           wet = -2.17 m = .230

bail_float d = .1 Cdn = 0.01 Cdt = 0.01
           wet = -2000 m = .1

/* length = .1016 */

Pivot d = .1 Cdn = 0.5 Cdt = 0.5
      wet = 0.1 m = 1
```

```

/*          length = .1 */

ESP_Can    d = .762      Cdn = 0.5      Cdt = 0.5
           wet = -1540    m = 235
/*          length = 0.84 */

shackle_pair d = .0762 Cdn = 0.5      Cdt = 0.1
            wet = 8      m = 2
/*          length = 0.1 */

```

Materials

rochester_cable	EA = 3.226e+06 m = 0.37 d = 0.0096	EI = .01 Cdn = 1.0 Can = 1.0	GJ = 1.0 wet = 2.97 Cdt = 0.01 Cat = 0.0
nilspin_5d16in	EA = 3.434e+06 m = 0.3124 d = 0.0111	EI = 24.0 Cdn = 1.5 Can = 1.0	GJ = 1.0 wet = 2.0867 Cdt = 0.005 Cat = 0.0
shockle_linear	EA = 1335 m = .909 d = 0.052	EI = .226 Cdt = 0.1 Cat = 0.1	GJ = 1e-4 wet = 0.1 Cdn = 1.0 Can = 1.0
shockle_lockout	EA = 1335 m = .909 d = 0.052 T = 1335*e+.2*exp(4*e*e) Te = 1335+.16*e*exp(4*e*e) Tee = .16*(.16*e*e+1)*exp(4*e*e)	EI = .226 Cdt = 0.1 Cat = 0.1	GJ = 1e-4 wet = 0.1 Cdn = 1.0 Can = 1.0
polyester_7d8in	EA = 1e6 m = .403 d = 0.0222	EI = 31 Cdt = 0.01 Cat = 0.01	GJ = 1e-4 wet = 1.0 Cdn = 1.0 Can = 1.0
polyester_5d8in	EA = 560000 m = .2088 d = 0.0159	EI = 22 Cdt = 0.01 Cat = 0.01	GJ = 1e-4 wet = 0.778 Cdn = 1.0 Can = 1.0
polyester_1d2in	EA = 346500 m = .1223 d = 0.0127	EI = 10 Cdt = 0.01 Cat = 0.01	GJ = 1e-4 wet = 0.3115 Cdn = 1.0 Can = 1.0
trawler_1d2in	EA = 6.0e+07 m = 3.712 d = 0.0475	EI = 1e-4 Cdt = 0.05 Cat = 0.1	GJ = 1e-4 wet = 31.64 Cdn = 0.55 Can = 1.0
BatteryCase	EA = 1e+7 m = 181.8 d = .91	EI = 5e5 Cdt = 0.5 Cat = .5	GJ = 1.0 wet = 980 Cdn = 0.55 Can = 1.0
Bail	EA = 1e+7 m = 22.9 d = .15	EI = 1.4e4 Cdt = 0.1 Cat = .5	GJ = 1.0 wet = -200. Cdn = 0.1 Can = 1.0

anchor_swivel	EA = 1e+7	EI = 1.4e4	GJ = 1.0
	m = 9.4	wet = 37.7	
	d = .0762	Cdt = 0.1	Cdn = 0.5
		Cat = .5	Can = 1.0
oblong_link	EA = 1e+7	EI = 1.4e4	GJ = 1.0
	m = 10	wet = 40.0	
	d = .0762	Cdt = 0.1	Cdn = 0.5
		Cat = .5	Can = 1.0

Layout

```

    terminal = {
        anchor = clump
    }

segment = {
    length = .53
    material = anchor_swivel
    nodes = (3, 1.0)
}

connector = shackle_pair

segment = {
    length = POLY_LENGTH
    material = polyester_5d8in
    nodes = POLY_NODES
}

connector = shackle_pair

segment = {
    length = SHOCKLE_LENGTH
    material = shackle_lockout
    /* material = shackle_linear */
    nodes = SHOCKLE_NODES
}

connector = shackle_pair

segment = {
    length = 0.3
    material = oblong_link
    nodes = (3, 1.0)
}

segment = {
    length = 0.66
    material = BatteryCase
    nodes = (10, 1.0)
    attachments = ESP_Can : (9)
}

connector = Pivot

segment = {
    length = 1.35
    material = Bail
    nodes = (10, 1.0)
    /*attachments = bail_float : (9)*/
}

connector = shackle_pair

```

```
segment = {  
    length = EM_LENGTH  
    material = rochester_cable  
    nodes = EM_NODES  
    /*attachments = syn_floats : [2,2,28] */ /* floats every meter for bottom 14m of cable */  
    attachments = syn_floats : (2,3,4,5,6,7,8,10,12,14,16,18,20,22)  
}  
terminal = {  
    buoy = esp_buoy_1  
}  
End
```