STONE & WEBSTER ENGINEERING CORPORATION

CLIENT & PROJECT
PRIVATE FUEL STORAGE FACILITY – PRIVATE FUEL STORAGE,LLC

PAGE 1 OF 15
PLUS 9 PGS OF ATTACHMENTS

CALCULATION TITLE

Crane Decoupling Evaluation – Canister Transfer Building

QA CATEGORY (X)

X I - NUCLEAR SAFETY RELATED

___ II ___ III ___ OTHER

CALCULATION IDENTIFICATION NUMBER

J.O. OR W.O. NO.	DIVISION & GROUP	CURRENT CALC. NO.	OPTIONAL TASK CODE	OPTIONAL WORK PACKAGE NO.
05996.02	**STRUCTURAL**	**SC-8**	**NA**	**NA**

APPROVALS - SIGNATURE & DATE

PREPARER(S)/DATE(S)	REVIEWER(S)/DATE(S)	INDEPENDENT REVIEWER(S)/DATE(S)	REV. NO. OR NEW CALC. NO	SUPERSEDES CALC. NO. OR REV. NO.	CONFIRMATION REQUIRED (X) YES	CONFIRMATION REQUIRED (X) NO
B.E. EBBESON 12/11/98	D. SECARY 12/14/98	D. SECARY 12/14/98	0	NA		X

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SUBJECT/TITLE Crane Decoupling Evaluation – Canister Transfer Building			QA CATEGORY/CODE CLASS I	

HISTORICAL DATA – REVISION 0

Page no.	Description
None	Original Issue

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PURPOSE

The purpose of this calculation is to verify that it is not necessary to consider coupling between the Canister Transfer Building (CTB) and the 200 Ton bridge crane when performing the seismic analysis of the crane. The seismic analysis of the building (Ref. 1) and the analysis of the crane (Ref. 4) were performed independently, and do not include dynamic coupling between them.

METHOD

The justification to perform uncoupled analyses of the CTB and the bridge crane will be based on the requirements of NOG-1 (Ref. 5). The mass of the crane will be compared to that of the supporting structure. If the mass ratio is less than .01, no coupling is required. If the mass ratio is greater than 0.1, coupling is required. If the mass ratio is between 0.01 and 0.1, coupling is required only if the frequency ratio is between 0.8 and 1.25.

The mass of the crane is taken from Ref. 4. The mass of the structure is taken from Ref. 1. In the E-W direction only the mass of node 6 of the model is considered, since local bending of the wall can occur. In the N-S and vertical directions, the mass of the entire building is used, since the structure is rigid in those directions, and the entire building moves as one.

Since it was found that the mass ratio was greater than 0.01 (but less than 0.1) in the E-W direction, it was necessary to perform the frequency ratio test. To do this, the frequency of the structure was found by converting the lumped mass model of the structure developed in Ref. 1 into a STRUDL model. The soil impedance functions were replaced by soil springs. An eigenvalue analysis performed to obtain the first ten frequencies and mode shapes. The first mode was found to be the fundamental E-W mode. The results of the crane analysis (Ref. 4) were examined to find the E-W crane fundamental mode. None were found. From this information it was found that concluded that the lowest E-W mode of the crane has a frequency of at least 16.7 Hz. From this information the frequency ratio was conservatively calculated.

REFERENCES

1. Calculation 05996.01-SC-5, "Seismic Analysis of Canister Transfer Building", Rev. 0
2. Calculation 09996.01-SC-4, "Development of Soil Impedance Functions for Canister Transfer Building", Rev. 0
3. ASCE-4, "Seismic Analysis of Safety-Related Nuclear Structures and Commentary on Standard for Seismic Analysis of Safety-Related Nuclear Structures", 1986, ASCE
4. "Seismic Qualification Analysis, 200 Ton Overhead Bridge Crane, Private Fuel Storage Facility, Skull Valley, Utah", Anatech Corp., November, 1998.
5. ASME NOG-1-1995

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CONCLUSION

It is concluded that the analyses of the CTB and the bridge crane can be performed independently without considering dynamic coupling.

<u>DECOUPLING CRITERIA</u> (See p. 21 of Ref 5)

A. VERTICAL & N-S

CRANE WT. = 310 K (Ref. 4)

MASS = $310/32.2 = 9.63$ K-SEC²/FT

MASS RATIO $= \dfrac{9.63}{\underbrace{2252.7}_{\text{See p. 10}}} = .0043 < .01$

∴ NO COUPLING REQUIRED

B. E-W (Use only mass 6)

MASS RATIO $= \dfrac{9.63}{\underbrace{142.2}_{\text{See p. 10}}} = .068 > .01$

Since the mass ratio is greater than .01 (but less than 0.1), it is necessary to check the frequency ratio.

Ref. 4 (Figures 4-8 through 4-15) show the frequencies and mode shapes

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of the fundamental modes. All of these modes are vertical or N-S modes. The last mode shown has a frequency of 16.7 Hz for the lowest frequency case (Trolley at west end) If it is assumed that the lowest E-W mode is at least 16.7 Hz, the frequency ratio is:

$$R_f = \frac{16.7}{\underbrace{2.90}_{\text{See p. 14}}} = 5.8 > 1.25$$

∴ No coupling is required

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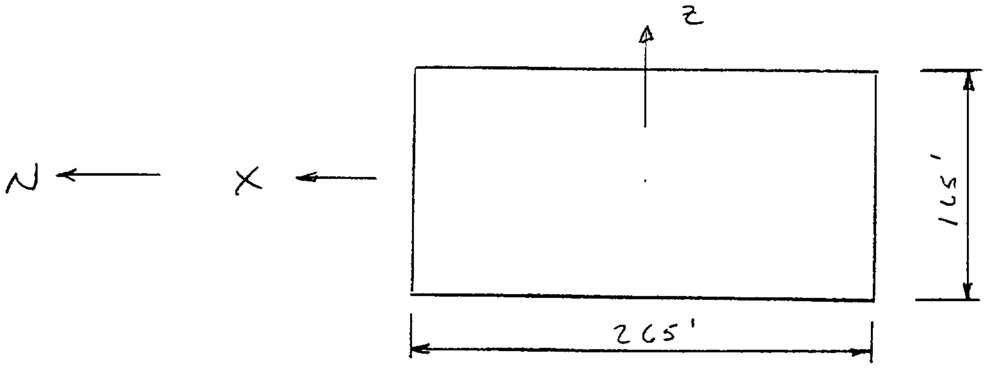
CALCULATION OF BUILDING MASS

JOINT	MASS
1	1257.
2	480.
3	153.7
4	166.9
5	52.9
6	142.2 ←
	2252.7

(Ref: Calc. SC-5)

TO ESTIMATE THE FREQUENCIES OF THE CTB, THE MODEL DEVELOPED IN CALCULATION SC - 5 (Ref 1) FOR USE IN THE PROGRAM 'FRIDAY' WILL BE CONVERTED FOR USE IN THE PROGRAM STRUDL - SW. TO REPRESENT THE SOIL, SPRINGS WILL BE COUPLED TO THE BUILDING MODEL. THE VALUE OF THESE SPRINGS WILL BE TAKEN TO BE THE DIAGONAL TERMS OF THE REAL PART OF IMPEDANCE FUNCTION DEVELOPED IN CALCULATION SC - 4 (Ref 2) AT 0 Hz.



$K_X = 8.66 \times 10^5$

$K_Y = 3.83 \times 10^6$

$K_Z = 9.00 \times 10^5$

$K_{MX} = 1.00 \times 10^{10}$

$K_{MY} = 9.37 \times 10^9$

$K_{MZ} = 2.49 \times 10^{10}$

(BASED ON NOMINAL SOIL CASE)

To check the approach used, an equivalent shear modulus 'G' will be calculated, using the vertical stiffness, from the equations in Table 3300-2 of ASCE 4-86 (Ref 3)

$$K_v = \frac{G}{1-\mu} \beta_3 \sqrt{BL} = 3.83 \times 10^6 \ ^K/_{FT}$$

$$G = \frac{(3.83 \times 10^6)(1-\mu)}{\beta_3 \sqrt{BL}}$$

$B = 245'$

$L = 165$

$\beta_3 \approx 2.15$

$\mu \approx .43$

$$G = 4856. \quad ^K/_{FT^2}$$

Using a density of 100 pcf, this corresponds to a shear wave velocity of

$$\sqrt{\frac{4856}{.100/32.2}} = 1250 \text{ fps}$$

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This value is consistent with the values given on page 9 of Ref. 2, which show shear wave velocity varying with depth.

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RESULTS OF STRUDL ANALYSIS

The results (Attachment A) show that the first mode frequency is 2.90 Hz, and reflects an almost purely z (E-W) direction motion. The mode shape (eigenvector) shows that the mode couples soil motion and building deflection. Conservatively, only the mass at node 6 will be used to calculate the mass ratio. Note that the peak of the response spectrum in the E-W direction at El. 170 (p. 24 of Ref. 1) occurs very close to 2.9 Hz

Mode 2 is the primary mode in the x (N-S) direction. Review of the eigenvector shows that the entire building participates in this mode (frequency = 3.04 Hz). Therefore, the entire structure can be used to calculate the mass ratio.

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Mode 7 is the first vertical mode (frequency = 6.34 Hz). Review of the eigenvector shows that this mode also has the entire structure participating (with additional amplitude at the roof - node 5). In the vertical direction, the entire building mass will be used to compute the mass ratio.

```
STRUDL 'FREQUENCY' 'CASK TRANSFER BUILDING NOMINAL SOIL CASE'

          **********************************************
          *                                            *
          *             ST-346 STRUDL-SW               *
          *       THE STRUCTURAL DESIGN LANGUAGE       *
          *                                            *
          *      STONE & WEBSTER ENGINEERING CORP.     *
          *            BOSTON, MASSACHUSETTS           *
          *            VERSION 03   LEVEL 03           *
          *            13:20:41     12/10/98           *
          *                                            *
          *          SYSTEM LINK-EDIT DATE/TIME        *
          *              85.177  15.13.01              *
          *                                            *
          *          SIZE OF POOL   51168 BYTES        *
          *                                            *
          **********************************************
```

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Attachment 1

```
TYPE SPACE FRAME
UNITS FEET KIPS
JOINT COORDINATES
1  123.7   95.0   0.  S
2  126.2  130.0   1.09
3  130.19 170.0  -3.15
4  131.0  190.0   0.
5  131.0  191.0   0.
6  130.19 170.0  -3.15
7  130.19 190.0  -3.15
8  130.19 130.0  -3.15
$
JOINT RELEASES
1 KFX 8.66E5  KFY 3.83E6  KFZ 9.00E5  KMX 1.00E10  KMY 9.37E9  KMZ 2.49E10
$
INER OF JOI 1  LIN ALL 1257. ANG X 3134488. Y  11133800.  Z 8083196.
INER OF JOI 2  LIN ALL  480. ANG X 1240743. Y  4813459.   Z 3639133.
INER OF JOI 3  LIN X 295.9 Y 295.9 Z 153.7 ANG X 282033. Y 2325849. Z 2097218.
INER OF JOI 4  LIN X 219.8 Y 166.9 Z 219.8 ANG X 113903. Y 1507850. Z 1398125.
INER OF JOI 5 LIN X 1. Y 52.9 Z 1. ANG X 10. Y 20. Z 10.
INER OF JOI 6  LIN X 1. Y 1. Z 142.2  ANG X 10. Y 20. Z 10.
INER OF JOI 7  LIN ALL 1. ANG X 10. Y 20. Z 10.
INER OF JOI 8  LIN ALL 1. ANG X 10. Y 20. Z 10.
MEMBER INCIDENCES
  1  1  2
  2  2  3
  3  3  4
  4  4  5
  5  8  6
```

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Attachment 1

```
  6  6  7
  7  2  8
  8  4  7
$
CONSTANTS
E 519000. ALL
G 216000. ALL
$
MEMBER PROPERTIES
 1 STIFFNESS MATRIX COLUMNS 1 2 3 4 5 6
 ROW 1   4.4278E07  2.2346E06 -1.2372E05  9.6913E06 -1.1867E07  2.4460E08
 ROW 2   2.2346E06  1.5776E07  1.5877E06 -1.1361E08  1.4197E07 -2.1567E08
 ROW 3  -1.2372E05  1.5877E06  1.2643E07  4.2929E07  1.9357E08 -2.3888E07
 ROW 4   9.6913E06 -1.1361E08  4.2929E07  9.1978E10 -1.6611E09  8.4370E09
 ROW 5  -1.1867E07  1.4197E07  1.9357E08 -1.6611E09  1.2437E11 -8.6552E10
 ROW 6   2.4460E08 -2.1567E08 -2.3888E07  8.4370E09 -8.6552E10  2.8699E11
 2 STIFFNESS MATRIX COLUMNS 1 2 3 4 5 6
 ROW 1   1.9406E07  1.9938E06  2.8635E05 -4.0349E06  2.5629E07 -4.8839E07
 ROW 2   1.9938E06  5.9981E06 -1.9673E06  7.2914E06 -3.5726E07 -1.2247E08
 ROW 3   2.8635E05 -1.9673E06  5.9497E06  1.8282E07  1.2291E08  3.9761E07
 ROW 4  -4.0349E06  7.2914E06  1.8282E07  2.0675E10 -9.3086E09 -1.0639E10
 ROW 5   2.5629E07 -3.5726E07  1.2291E08 -9.3086E09  8.8296E10  7.2803E10
 ROW 6  -4.8839E07 -1.2247E08  3.9761E07 -1.0639E10  7.2803E10  8.0790E10
 3 STIFFNESS MATRIX COLUMNS 1 2 3 4 5 6
 ROW 1   3.3207E07  4.5224E06 -3.3249E05  5.3370E05 -3.2818E06  8.6649E06
 ROW 2   4.5224E06  6.1336E06  2.0446E06 -3.2818E06  2.0180E07 -5.3282E07
 ROW 3  -3.3249E05  2.0446E06  1.2921E07 -2.0740E07  1.2754E08 -2.0714E07
 ROW 4   5.3370E05 -3.2818E06 -2.0740E07  4.3312E10 -3.0573E10  9.2028E09
 ROW 5  -3.2818E06  2.0180E07  1.2754E08 -3.0573E10  2.2634E11 -5.6590E10
 ROW 6   8.6649E06 -5.3282E07 -2.0714E07  9.2028E09 -5.6590E10  2.3092E10
```

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Attachment 1

```
MEMBER PROPE       RISMATIC
4 AX .258                    IX  35000.   IY  58590.  IZ  58590.
5 AX 10.                     IX  35000.   IY  213.8   IZ  58590.
6 AX 10.                     IX  35000.   IY  213.8   IZ  58590.
7 AX 50.                     IX  35000.   IY  30300.  IZ  58590.
8 AX 50.                     IX  35000.   IY  30300.  IZ  58590.
$
DYNAMIC ANALYSIS EIGENVECTOR 10
TIME FOR CONSISTENCY CHECKS FOR    8 MEMBERS     0.01 SECONDS
TIME TO GENERATE    8 LOCAL ST & MA MATRICES     0.01 SECONDS
TIME TO ASSEMBLE THE STIFFNESS MATRIX            0.01 SECONDS
TIME TO PROCESS    8 JOINTS                      0.0  SECONDS
```

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Attachment 1

```
****************************
*RESULTS OF LATEST ANALYSES*
****************************


 PROBLEM - FREQUENC  TITLE - CASK TRANSFER BUILDING NOMINAL SOIL CASE

 ACTIVE UNITS   FEET KIP  RAD  DEGF SEC

 ACTIVE STRUCTURE TYPE  SPACE   FRAME

 ACTIVE COORDINATE AXES  X Y Z


 EIGENVALUES

MODE-------EIGENVALUE-------CIRCULAR FREQUENCY----------FREQUENCY-------------PERIOD------/
                          (ANGULAR UNIT/TIME UNIT)   (CYCLES/TIME UNIT)  (TIME UNIT/CYCLE)

   1      3.329407D+02        1.824666D+01          2.904046D+00        3.443471D-01
   2      3.640924D+02        1.908120D+01          3.036868D+00        3.292866D-01
   3      4.550590D+02        2.133211D+01          3.395111D+00        2.945411D-01
   4      9.989075D+02        3.160550D+01          5.030171D+00        1.988004D-01
   5      1.377485D+03        3.711448D+01          5.906953D+00        1.692920D-01
   6      1.521855D+03        3.901096D+01          6.208787D+00        1.610620D-01
   7      1.587214D+03        3.983985D+01          6.340709D+00        1.577111D-01
   8      2.692738D+03        5.189160D+01          8.258805D+00        1.210829D-01
   9      5.303292D+03        7.282371D+01          1.159025D+01        8.627939D-02
  10      9.430086D+03        9.710863D+01          1.545532D+01        6.470264D-02
```

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Attachment 1

```
****************************
*RESULTS OF LATEST ANALYSES*
****************************


 PROBLEM - FREQUENC  TITLE - CASK TRANSFER BUILDING NOMINAL SOIL CASE


 ACTIVE UNITS   FEET KIP  RAD  DEGF SEC

 ACTIVE STRUCTURE TYPE  SPACE   FRAME

 ACTIVE COORDINATE AXES  X Y Z


 EIGENVECTORS


 MODE   1

JOINT             /-----------------DISPLACEMENT-----------------//-------------------ROTATION-------------------/
                      X DISP.         Y DISP.         Z DISP.         X ROT.          Y ROT.          Z ROT.


1        GLOBAL     0.0027666       0.0001668       0.4566507       0.0001410      -0.0000410      -0.0000003
2        GLOBAL     0.0026643      -0.0014402       0.5378070       0.0001517      -0.0000447      -0.0000003
3        GLOBAL     0.0054839       0.0076131       0.6532898       0.0001865      -0.0000519      -0.0000004
4        GLOBAL     0.0036273       0.0005562       0.7172939       0.0001924      -0.0000525      -0.0000004
5        GLOBAL     0.0036317       0.0006404       0.7196027       0.0001924      -0.0000525      -0.0000004
6        GLOBAL     0.0057665       0.0073011       1.0000000      -0.0007747      -0.0000500      -0.0000040
7        GLOBAL     0.0066615       0.0077636       0.7208971       0.0001880      -0.0000521      -0.0000034
8        GLOBAL     0.0035441       0.0063573       0.5415016       0.0001600      -0.0000458      -0.0000052

 MODE   2

JOINT             /-----------------DISPLACEMENT-----------------//-------------------ROTATION-------------------/
                      X DISP.         Y DISP.         Z DISP.         X ROT.          Y ROT.          Z ROT.


1        GLOBAL     0.8411286      -0.0006427      -0.0056056      -0.0000016      -0.0000109      -0.0000916
2        GLOBAL     0.9014714      -0.0031624      -0.0059372      -0.0000017      -0.0000134      -0.0000960
3        GLOBAL     0.9706905      -0.0080121      -0.0063716      -0.0000021      -0.0000157      -0.0000996
4        GLOBAL     0.9987974      -0.0089220      -0.0069295      -0.0000022      -0.0000158      -0.0001002
5        GLOBAL     1.0000000      -0.0104209      -0.0069558      -0.0000022      -0.0000158      -0.0001002
6        GLOBAL     0.9682853      -0.0080294      -0.0100994       0.0000074      -0.0000151      -0.0001369
7        GLOBAL     0.9992413      -0.0080075      -0.0076319      -0.0000055      -0.0000153      -0.0001179
8        GLOBAL     0.9040895      -0.0080508      -0.0072732       0.0000108      -0.0000146      -0.0001178

 MODE   3
```

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Attachment 1

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```
JOINT                 -----------------DISPLACEMENT-----------------//-------------------      ION-------------------/
                        X DISP.            Y DISP.           Z DISP.            X ROT.             ROT.              Z ROT.


1         GLOBAL       0.1916261          0.0002368         1.0000000          0.0001973         0.0081710         -0.0000099
2         GLOBAL       0.2834613         -0.0023039         0.8296952          0.0002109         0.0085566         -0.0000103
3         GLOBAL      -0.1770766          0.0094473         0.4950317          0.0002495         0.0094086         -0.0000106
4         GLOBAL       0.1840551         -0.0000897         0.4838123          0.0002553         0.0095768         -0.0000106
5         GLOBAL       0.1841817         -0.0001094         0.4868765          0.0002553         0.0095768         -0.0000106
6         GLOBAL      -0.1706816          0.0091362         0.9746177         -0.0011768         0.0092352          0.0000316
7         GLOBAL      -0.1758894          0.0095420         0.5829462          0.0002536         0.0095518          0.0000079
8         GLOBAL      -0.1571402          0.0082926         0.4232907          0.0002066         0.0086013          0.0000092

    MODE   4

JOINT                /-----------------DISPLACEMENT-----------------//-------------------ROTATION-------------------/
                        X DISP.            Y DISP.           Z DISP.            X ROT.            Y ROT.              Z ROT.


1         GLOBAL       0.0000410          0.0010867        -0.2111890          0.0001419         0.0000074          0.0000002
2         GLOBAL       0.0000882         -0.0004798        -0.1436406          0.0001521         0.0000068          0.0000002
3         GLOBAL      -0.0001885          0.0087181        -0.0346568          0.0001865         0.0000046          0.0000002
4         GLOBAL      -0.0000091          0.0016790         0.0332982          0.0001879         0.0000050          0.0000002
5         GLOBAL      -0.0000112          0.0027735         0.0355528          0.0001879         0.0000050          0.0000002
6         GLOBAL       0.0008705          0.0082492         1.0000000         -0.0028777         0.0000053         -0.0000092
7         GLOBAL       0.0029617          0.0085690         0.0457021          0.0001746         0.0000057         -0.0000083
8         GLOBAL      -0.0044037          0.0075460        -0.1394153          0.0001757         0.0000047         -0.0000132

    MODE   5

JOINT                /-----------------DISPLACEMENT-----------------//-------------------ROTATION-------------------/
                        X DISP.            Y DISP.           Z DISP.            X ROT.            Y ROT.              Z ROT.


1         GLOBAL      -0.6121963         -0.2084256         0.0064398         -0.0000204         0.0000068         -0.0012367
2         GLOBAL      -0.0510643         -0.2523086        -0.0029167         -0.0000230         0.0000034         -0.0012863
3         GLOBAL       0.6432707         -0.3298964        -0.0170207         -0.0000301         0.0000011         -0.0013369
4         GLOBAL       0.9838138         -0.3457003        -0.0247985         -0.0000316         0.0000015         -0.0013488
5         GLOBAL       1.0000000         -0.7584412        -0.0251779         -0.0000316         0.0000015         -0.0013488
6         GLOBAL       0.6403016         -0.3289120         0.0396587         -0.0002118         0.0000019         -0.0014499
7         GLOBAL       0.9834725         -0.3337320        -0.0257333         -0.0000419         0.0000030         -0.0013997
8         GLOBAL      -0.0453895         -0.3157799        -0.0090449          0.0000238        -0.0000002         -0.0013658

    MODE   6

JOINT                /-----------------DISPLACEMENT-----------------//-------------------ROTATION-------------------/
                        X DISP.            Y DISP.           Z DISP.            X ROT.            Y ROT.              Z ROT.


1         GLOBAL       0.0095983         -0.0624047         0.2499161         -0.0007391        -0.0000103          0.0000196
2         GLOBAL       0.0002996         -0.0557988        -0.0890400         -0.0007805        -0.0000080          0.0000206
3         GLOBAL      -0.0107040         -0.1036084        -0.5602022         -0.0009170         0.0000002          0.0000214
4         GLOBAL      -0.0160940         -0.0696486        -0.8098797         -0.0009708         0.0000004          0.0000216
```

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Attachment 1

```
 5          GLO          -0.0163529      -0.1746596      -0.8215296      -0.0009708            0004       0.0000216
 6          GLOB         -0.0089184      -0.1030248       1.0000000      -0.0058837      -0.0000028       0.0000097
 7          GLOBAL       -0.0112893      -0.1068819      -0.7910438      -0.0009911       0.0000012       0.0000097
 8          GLOBAL       -0.0056381      -0.0941023      -0.0817181      -0.0007468      -0.0000107       0.0000024

     MODE    7

 JOINT               /-----------------DISPLACEMENT-----------------//-------------------ROTATION-------------------/
                          X DISP.         Y DISP.         Z DISP.          X ROT.          Y ROT.          Z ROT.


 1          GLOBAL       -0.0309868       0.3413013       0.0206450      -0.0000610      -0.0000005      -0.0000641
 2          GLOBAL       -0.0012898       0.3544289      -0.0070944      -0.0000624      -0.0000005      -0.0000676
 3          GLOBAL        0.0359471       0.3656685      -0.0441807      -0.0000690       0.0000000      -0.0000703
 4          GLOBAL        0.0540593       0.3729474      -0.0634112      -0.0000733       0.0000001      -0.0000710
 5          GLOBAL        0.0549113       1.0000000      -0.0642909      -0.0000733       0.0000001      -0.0000710
 6          GLOBAL        0.0358540       0.3647216       0.0704831      -0.0004375      -0.0000002      -0.0000786
 7          GLOBAL        0.0543811       0.3708462      -0.0621321      -0.0000755       0.0000002      -0.0000752
 8          GLOBAL       -0.0013363       0.3480108      -0.0069644      -0.0000569      -0.0000009      -0.0000738

     MODE    8

 JOINT               /-----------------DISPLACEMENT-----------------//-------------------ROTATION-------------------/
                          X DISP.         Y DISP.         Z DISP.          X ROT.          Y ROT.          Z ROT.


 1          GLOBAL       -0.0004069      -0.0693713      -0.0003108       0.0000012       0.0000000      -0.0000010
 2          GLOBAL        0.0000488      -0.0701154       0.0002419       0.0000011       0.0000000      -0.0000009
 3          GLOBAL        0.0005859      -0.0671346       0.0005812      -0.0000002      -0.0000000      -0.0000009
 4          GLOBAL        0.0008258      -0.0638067       0.0005751      -0.0000002      -0.0000000      -0.0000009
 5          GLOBAL        0.0008365       1.0000000       0.0005723      -0.0000002      -0.0000000      -0.0000009
 6          GLOBAL        0.0005747      -0.0663647      -0.0003269       0.0000030      -0.0000000      -0.0000011
 7          GLOBAL        0.0008232      -0.0638071       0.0005615      -0.0000003      -0.0000000      -0.0000010
 8          GLOBAL        0.0000618      -0.0701025       0.0002273       0.0000012       0.0000000      -0.0000010

     MODE    9

 JOINT               /-----------------DISPLACEMENT-----------------//-------------------ROTATION-------------------/
                          X DISP.         Y DISP.         Z DISP.          X ROT.          Y ROT.          Z ROT.


 1          GLOBAL       -0.1249163      -0.0042583      -0.1565812      -0.0007540       0.0035261       0.0000718
 2          GLOBAL        0.0498196       0.0089562      -0.3051314      -0.0007123       0.0015866       0.0000715
 3          GLOBAL        0.3902649      -0.0079873       0.7338482      -0.0002775      -0.0095872       0.0000759
 4          GLOBAL       -0.0159980       0.0032354       1.0000000      -0.0001620      -0.0120585       0.0000759
 5          GLOBAL       -0.0169092      -0.0029543       0.9980560      -0.0001620      -0.0120587       0.0000759
 6          GLOBAL        0.3119128      -0.0113399      -0.1219296       0.0045723      -0.0074899      -0.0006463
 7          GLOBAL        0.4286188      -0.0029988       0.8660218      -0.0002168      -0.0117197      -0.0002662
 8          GLOBAL        0.0215240      -0.0275585      -0.4052243      -0.0004870       0.0009738      -0.0003224

     MODE   10

 JOINT               /-----------------DISPLACEMENT-----------------//-------------------ROTATION-------------------/
```

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Attachment 1

		X DISP.	Y DISP.	Z DISP.	X ROT.	T.	Z ROT.
1	GLOBAL	0.0008289	-0.0086788	-0.1296042	-0.0006376	-0.0000156	-0.0000007
2	GLOBAL	-0.0001772	0.0038473	-0.2572656	-0.0005169	-0.0000065	-0.0000007
3	GLOBAL	-0.0029974	0.0189803	0.4147278	0.0005161	0.0000694	-0.0000008
4	GLOBAL	0.0000623	-0.0006907	0.9897429	0.0008547	0.0001095	-0.0000008
5	GLOBAL	0.0000723	0.0002534	1.0000000	0.0008547	0.0001095	-0.0000008
6	GLOBAL	-0.0033805	0.0140268	-0.0631749	0.0043777	0.0000707	0.0000114
7	GLOBAL	-0.0058093	0.0317774	0.9837996	0.0008651	0.0001062	0.0000083
8	GLOBAL	0.0016199	-0.0224939	-0.2588497	-0.0005246	-0.0000003	0.0000071

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Attachment 1