

ME305 Homework #2-Solution

by Jeonghoon Yoo

* Hypermesh modeling

1. HyperMesh1 - **collectors**

switch the collector type to **mats.** (The create diamond should be toggled on.)

name=steel E=2.99938E+07
 Nu=0.29
 G=1.16255E+07
 Rho=7.317372E-04

click **create**

warning : keep in mind that this is meter,kg unit

switch the collector type to **comps.**

name=plate2(or others you want) T-> does not matter here
material=steel color-> select one

click **create** -> The color of 'name' will be changed what you selected

switch the collector type to **props.**

name=plate2(same name used in comps)
click **create**

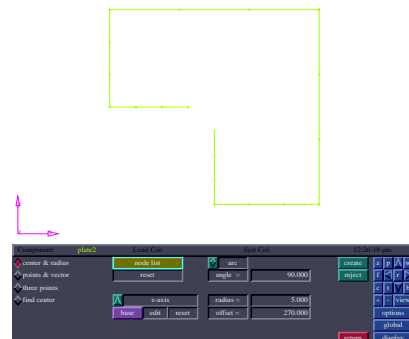
2. HyperMesh1 - **create nodes**

Create nodes at locations

(0.2,0,0), (0.4,0,0), (0.4,40,0), (0,0.4,0),(0,0.2,0),
(0.15,0.2,0), (0.2,0.15,0), (0.15,0.15,0),
(0.25,0.25,0)

3. HyperMesh1 - **lines**

make lines as the figure right.



4. HyperMesh1 -circles

click center & radius

node list -> select the center of arc

choose z-axis option, select center of arc as a base

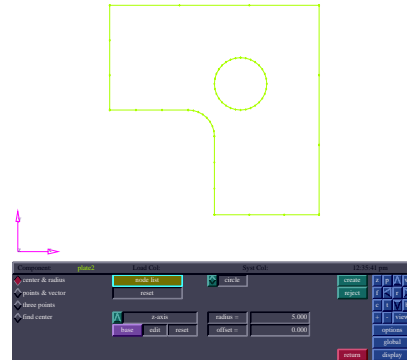
choose arc, angle=90

radius=0.05, offset=270

choose circle

node list --> choose the center of arc

radius=0.05, offset=0



5. HyperMesh1 - temp nodes

Delete all initial temporary nodes

6. HyperMesh2 - planes

click trimmed

choose lines which compose outer figure

choose surface only ---> create

warning : before doing this, go to option menu and check if the tolerance is reasonable, because the unit here is meter. Thus very small values should be used for tolerance.

7. HyperMesh 1 - surface edit

click trim with line

choose surface which is created

choose circle line ---> trim

(This is to make a hole in a plane.)

8. HyperMesh 2 - **automesh**

choose single surface

choose surface ---> mesh

choose element density at each line ---> mesh

9. HyperMesh 2 - **drag**

click drag elems

choose all elements , choose z-axis

delete all plate elements which are on x-y plane. (this is not easy because the thickness is very thin.)

10. HyperMesh 4 - **renumber**

renumber the node and element number

11. HyperMesh 4 - **constraints**

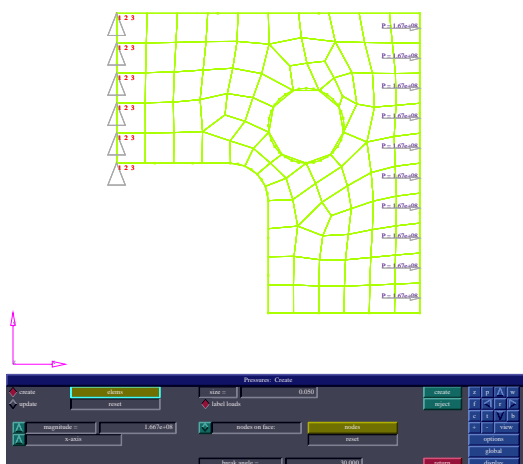
Make constraints along $x=0$ face with $x=0, y=0, z=0$

12. HyperMesh 4 - **pressures**

elems ---> choose elements which are $x=0.4$ plane

magnitude= $1.667e+08$

nodes ----> choose nodes which are $x=0.4$ plane



13. HyperMesh 4 - **export**

export to NASTRAN file

* NASTRAN file

As same as in homework #1, only bulk data is transferred to nastran file, thus execution statement should be added above the bulk data. The data file is as following.

```
$
$ NASTRAN Input Deck generated by HyperMesh version 2.00d
$ template: NASTRAN
$
TIME 5
SOL 101
CEND
TITLE = HOMEWORK #2
ECHO = SORT
DISPLACEMENT (PRINT,PUNCH) = ALL
STRESS (PRINT,PUNCH) = ALL
LOAD = 1
SPC = 1
BEGIN BULK
PARAM BAILOUT -1 :This is the only place which is different from hw#1

PARAM,AUTOSPC,YES
$ CORD Data
$ GRID Data
GRID 1 0.2000000.1500000.0000000
GRID 2 0.1961930.1691340.0000000
GRID 3 0.1853550.1853550.0000000
GRID 4 0.1691340.1961930.0000000
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GRID 63 0.2027550.2002060.0000000
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$ RBE2 Data
$ CELAS1 Data
$ CELAS2 Data
$ CBAR Data
$ CBEAM Data
$ CROD Data
$ CTUBE Data
$ CTRIA3 Data
$ CQUAD4 Data
$ CSHEAR Data
$ CTRIA6 Data
$ CQUAD8 Data
$ CTETRA Data
$ CPENTA Data
$ CHEXA Data
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+E9      0      154      153
CHEXA      2      1      39      54      41      40      158      173+E9      1
+E9      1      160      159
CHEXA      3      1      8      55      10      9      127      174+E9      2
+E9      2      129      128
CHEXA      4      1      13      56      15      14      132      175+E9      3
+E9      3      134      133
CHEXA      5      1      23      57      25      24      142      176+E9      4
+E9      4      144      143
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+E9      5      155      154
CHEXA      7      1      58      59      37      36      177      178+E9      6
+E9      6      156      155
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+E9	7	157	156								
CHEXA		9	1	43	115	61	1	162	234+E9	8	
+E9	8	180	120								
CHEXA		10	1	61	62	2	1	180	181+E9	9	
+E9	9	121	120								
CHEXA		11	1	62	63	3	2	181	182+E9	A	
+E9	A	122	121								
CHEXA		12	1	63	64	4	3	182	183+E9	B	
+E9	B	123	122								
CHEXA		13	1	64	65	5	4	183	184+E9	C	
+E9	C	124	123								
CHEXA		14	1	65	66	6	5	184	185+E9	D	
+E9	D	125	124								
CHEXA		15	1	60	54	39	38	179	173+E9	E	
+E9	E	158	157								
CHEXA		16	1	54	67	42	41	173	186+E9	F	
+E9	F	161	160								
CHEXA		17	1	55	68	11	10	174	187+E9	10	
+E9	10	130	129								
CHEXA		18	1	57	69	26	25	176	188+E9	11	
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CHEXA		19	1	69	70	27	26	188	189+E9	12	
+E9	12	146	145								
CHEXA		20	1	70	71	28	27	189	190+E9	13	
+E9	13	147	146								
CHEXA		21	1	71	72	29	28	190	191+E9	14	
+E9	14	148	147								
CHEXA		22	1	72	73	30	29	191	192+E9	15	
+E9	15	149	148								
CHEXA		23	1	73	74	31	30	192	193+E9	16	
+E9	16	150	149								
CHEXA		24	1	74	75	32	31	193	194+E9	17	
+E9	17	151	150								
CHEXA		25	1	75	53	33	32	194	172+E9	18	
+E9	18	152	151								
CHEXA		26	1	56	76	16	15	175	195+E9	19	
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CHEXA		27	1	76	77	17	16	195	196+E9	1A	
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CHEXA		28	1	77	78	18	17	196	197+E9	1B	
+E9	1B	137	136								
CHEXA		29	1	78	79	19	18	197	198+E9	1C	
+E9	1C	138	137								
CHEXA		30	1	79	80	20	19	198	199+E9	1D	
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CHEXA		31	1	80	109	21	20	199	228+E9	1E	
+E9	1E	140	139								
CHEXA		32	1	109	81	22	21	228	200+E9	1F	
+E9	1F	141	140								
CHEXA		33	1	81	57	23	22	200	176+E9	20	
+E9	20	142	141								
CHEXA		34	1	68	82	12	11	187	201+E9	21	
+E9	21	131	130								
CHEXA		35	1	82	56	13	12	201	175+E9	22	
+E9	22	132	131								
CHEXA		36	1	67	115	43	42	186	234+E9	23	
+E9	23	162	161								
CHEXA		37	1	66	83	7	6	185	202+E9	24	
+E9	24	126	125								
CHEXA		38	1	83	55	8	7	202	174+E9	25	
+E9	25	127	126								
CHEXA		39	1	52	63	62	44	171	182+E9	26	
+E9	26	181	163								
CHEXA		40	1	51	64	63	52	170	183+E9	27	
+E9	27	182	171								
CHEXA		41	1	51	84	65	64	170	203+E9	28	
+E9	28	184	183								
CHEXA		42	1	50	85	84	51	169	204+E9	29	
+E9	29	203	170								
CHEXA		43	1	49	86	85	50	168	205+E9	2A	
+E9	2A	204	169								
CHEXA		44	1	61	87	44	62	180	206+E9	2B	
+E9	2B	163	181								
CHEXA		45	1	87	88	45	44	206	207+E9	2C	
+E9	2C	164	163								
CHEXA		46	1	88	89	46	45	207	208+E9	2D	
+E9	2D	165	164								
CHEXA		47	1	89	90	91	46	208	209+E9	2E	
+E9	2E	210	165								
CHEXA		48	1	91	92	47	46	210	211+E9	2F	
+E9	2F	166	165								
CHEXA		49	1	92	93	48	47	211	212+E9	30	
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CHEXA		50	1	93	94	110	48	212	213+E9	31	
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CHEXA		51	1	110	95	49	48	229	214+E9	32	
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CHEXA		52	1	95	79	86	49	214	198+E9	33	
+E9	33	205	168								
CHEXA		53	1	83	96	68	55	202	215+E9	34	
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CHEXA		54	1	96	97	82	68	215	216+E9	35	
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+E9	36	175	201								
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+E9	39	198	197								
CHEXA		59	1	99	100	85	86	218	219+E9	3A	
+E9	3A	204	205								
CHEXA		60	1	98	101	100	99	217	220+E9	3B	
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CHEXA		61	1	96	101	98	97	215	220+E9	3C	
+E9	3C	217	216								
CHEXA		62	1	100	102	84	85	219	221+E9	3D	
+E9	3D	203	204								

CHEXA	63	1	102	66	65	84	221	185+E9	3E
+E9 3E	184	203							
CHEXA	64	1	101	66	102	100	220	185+E9	3F
+E9 3F	221	219							
CHEXA	65	1	66	101	96	83	185	220+E9	40
+E9 40	215	202							
CHEXA	66	1	81	103	69	57	200	222+E9	41
+E9 41	188	176							
CHEXA	67	1	103	90	70	69	222	209+E9	42
+E9 42	189	188							
CHEXA	68	1	70	90	89	71	189	209+E9	43
+E9 43	208	190							
CHEXA	69	1	103	108	91	90	222	227+E9	44
+E9 44	210	209							
CHEXA	70	1	89	104	72	71	208	223+E9	45
+E9 45	191	190							
CHEXA	71	1	88	105	104	89	207	224+E9	46
+E9 46	223	208							
CHEXA	72	1	104	106	73	72	223	225+E9	47
+E9 47	192	191							
CHEXA	73	1	105	107	106	104	224	226+E9	48
+E9 48	225	223							
CHEXA	74	1	91	108	93	92	210	227+E9	49
+E9 49	212	211							
CHEXA	75	1	81	109	108	103	200	228+E9	4A
+E9 4A	227	222							
CHEXA	76	1	109	94	93	108	228	213+E9	4B
+E9 4B	212	227							
CHEXA	77	1	80	110	94	109	199	229+E9	4C
+E9 4C	213	228							
CHEXA	78	1	95	110	80	79	214	229+E9	4D
+E9 4D	199	198							
CHEXA	79	1	106	111	74	73	225	230+E9	4E
+E9 4E	193	192							
CHEXA	80	1	107	112	111	106	226	231+E9	4F
+E9 4F	230	225							
CHEXA	81	1	87	113	105	88	206	232+E9	50
+E9 50	224	207							
CHEXA	82	1	113	114	107	105	232	233+E9	51
+E9 51	226	224							
CHEXA	83	1	114	116	112	107	233	235+E9	52
+E9 52	231	226							
CHEXA	84	1	61	115	113	87	180	234+E9	53
+E9 53	232	206							
CHEXA	85	1	115	116	114	113	234	235+E9	54
+E9 54	233	232							
CHEXA	86	1	67	117	116	115	186	236+E9	55
+E9 55	235	234							
CHEXA	87	1	60	117	67	54	179	236+E9	56
+E9 56	186	173							
CHEXA	88	1	119	112	116	117	238	231+E9	57
+E9 57	235	236							
CHEXA	89	1	111	118	75	74	230	237+E9	58
+E9 58	194	193							
CHEXA	90	1	112	119	118	111	231	238+E9	59
+E9 59	237	230							
CHEXA	91	1	58	118	119	59	177	237+E9	5A
+E9 5A	238	178							
CHEXA	92	1	118	58	53	75	237	177+E9	5B
+E9 5B	172	194							
CHEXA	93	1	117	60	59	119	236	179+E9	5C
+E9 5C	178	238							
CHEXA	94	1	152	172	154	153	271	291+E9	5D
+E9 5D	273	272							
CHEXA	95	1	158	173	160	159	277	292+E9	5E
+E9 5E	279	278							
CHEXA	96	1	127	174	129	128	246	293+E9	5F
+E9 5F	248	247							
CHEXA	97	1	132	175	134	133	251	294+E9	60
+E9 60	253	252							
CHEXA	98	1	142	176	144	143	261	295+E9	61
+E9 61	263	262							
CHEXA	99	1	172	177	155	154	291	296+E9	62
+E9 62	274	273							
CHEXA	100	1	177	178	156	155	296	297+E9	63
+E9 63	275	274							
CHEXA	101	1	178	179	157	156	297	298+E9	64
+E9 64	276	275							
CHEXA	102	1	162	234	180	120	281	353+E9	65
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CHEXA	103	1	180	181	121	120	299	300+E9	66
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CHEXA	104	1	181	182	122	121	300	301+E9	67
+E9 67	241	240							
CHEXA	105	1	182	183	123	122	301	302+E9	68
+E9 68	242	241							
CHEXA	106	1	183	184	124	123	302	303+E9	69
+E9 69	243	242							
CHEXA	107	1	184	185	125	124	303	304+E9	6A
+E9 6A	244	243							
CHEXA	108	1	179	173	158	157	298	292+E9	6B
+E9 6B	277	276							
CHEXA	109	1	173	186	161	160	292	305+E9	6C
+E9 6C	280	279							
CHEXA	110	1	174	187	130	129	293	306+E9	6D
+E9 6D	249	248							
CHEXA	111	1	176	188	145	144	295	307+E9	6E
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CHEXA	112	1	188	189	146	145	307	308+E9	6F
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CHEXA	113	1	189	190	147	146	308	309+E9	70
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CHEXA	114	1	190	191	148	147	309	310+E9	71
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+E9 73	269	268							
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+E9	7B	259	258								
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CHEXA		126	1	200	176	142	141	319	295+E9	7D	
+E9	7D	261	260								
CHEXA		127	1	187	201	131	130	306	320+E9	7E	
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CHEXA		128	1	201	175	132	131	320	294+E9	7F	
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CHEXA		131	1	202	174	127	126	321	293+E9	82	
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CHEXA		133	1	170	183	182	171	289	302+E9	84	
+E9	84	301	290								
CHEXA		134	1	170	203	184	183	289	322+E9	85	
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CHEXA		135	1	169	204	203	170	288	323+E9	86	
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CHEXA		138	1	206	207	164	163	325	326+E9	89	
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CHEXA		142	1	211	212	167	166	330	331+E9	8D	
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CHEXA		144	1	229	214	168	167	348	333+E9	8F	
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CHEXA		145	1	214	198	205	168	333	317+E9	90	
+E9	90	324	287								
CHEXA		146	1	202	215	187	174	321	334+E9	91	
+E9	91	306	293								
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CHEXA		149	1	216	217	196	195	335	336+E9	94	
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CHEXA		152	1	218	219	204	205	337	338+E9	97	
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CHEXA		155	1	219	221	203	204	338	340+E9	9A	
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CHEXA		156	1	221	185	184	203	340	304+E9	9B	
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CHEXA		157	1	220	185	221	219	339	304+E9	9C	
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CHEXA		158	1	185	220	215	202	304	339+E9	9D	
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CHEXA		159	1	200	222	188	176	319	341+E9	9E	
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CHEXA		160	1	222	209	189	188	341	328+E9	9F	
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CHEXA		162	1	222	227	210	209	341	346+E9	A1	
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CHEXA		164	1	207	224	223	208	326	343+E9	A3	
+E9	A3	342	327								
CHEXA		165	1	223	225	192	191	342	344+E9	A4	
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CHEXA		166	1	224	226	225	223	343	345+E9	A5	
+E9	A5	344	342								
CHEXA		167	1	210	227	212	211	329	346+E9	A6	
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CHEXA		168	1	200	228	227	222	319	347+E9	A7	
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CHEXA		169	1	228	213	212	227	347	332+E9	A8	
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CHEXA		170	1	199	229	213	228	318	348+E9	A9	
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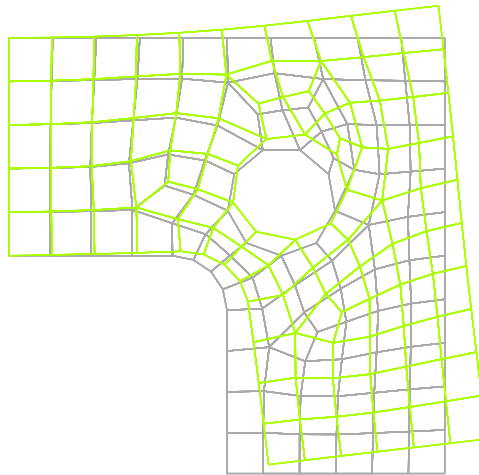
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CHEXA      177      1      180      234      232      206      299      353+E9      B0
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CHEXA      178      1      234      235      233      232      353      354+E9      B1
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CHEXA      179      1      186      236      235      234      305      355+E9      B2
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CHEXA      180      1      179      236      186      173      298      355+E9      B3
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CHEXA      181      1      238      231      235      236      357      350+E9      B4
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CHEXA      183      1      231      238      237      230      350      357+E9      B6
+E9 B6      356      349
CHEXA      184      1      177      237      238      178      296      356+E9      B7
+E9 B7      357      297
CHEXA      185      1      237      177      172      194      356      296+E9      B8
+E9 B8      291      313
CHEXA      186      1      236      179      178      238      355      298+E9      B9
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$ CPENTA Data
$ CHEXA Data
$ PSHELL cards
$ PSHEAR cards
$ PSOLID cards
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PSOLID      1      1      -1
$ PBAR Cards
$ PBEAM Cards
$ PELAS cards
$ PROD Cards
$ PTUBE Cards
$ MAT1 Cards
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MAT1      12.07E+11 7820.0000.2900008.02E+10
$HMNAME LOADCOLS      1      autol
$HMCOLORLOADCOLS      1      1
$ FORCE Data
$ MOMENT Data
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+L1      4      01.0000000.0000000.000000
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+L1      7      01.0000000.0000000.000000
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+L1      9      01.0000000.0000000.000000
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+L1      A      01.0000000.0000000.000000
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+L1      B      01.0000000.0000000.000000
PLOAD4      1      1121.67E+081.67E+081.67E+081.67E+08      146      264+L1      C
+L1      C      01.0000000.0000000.000000
PLOAD4      1      1131.67E+081.67E+081.67E+081.67E+08      147      265+L1      D
+L1      D      01.0000000.0000000.000000
PLOAD4      1      1141.67E+081.67E+081.67E+081.67E+08      148      266+L1      E
+L1      E      01.0000000.0000000.000000
PLOAD4      1      1151.67E+081.67E+081.67E+081.67E+08      149      267+L1      F
+L1      F      01.0000000.0000000.000000
PLOAD4      1      1161.67E+081.67E+081.67E+081.67E+08      150      268+L1      10
+L1      10      01.0000000.0000000.000000
PLOAD4      1      1171.67E+081.67E+081.67E+081.67E+08      151      269+L1      11
+L1      11      01.0000000.0000000.000000
PLOAD4      1      1181.67E+081.67E+081.67E+081.67E+08      152      270+L1      12
+L1      12      01.0000000.0000000.000000

```

```
PLOAD4      1      941.67E+081.67E+081.67E+081.67E+08      153      271+L1      13
+L1      13      01.0000000.0000000.0000000
$ TEMP Data
ENDDATA
```

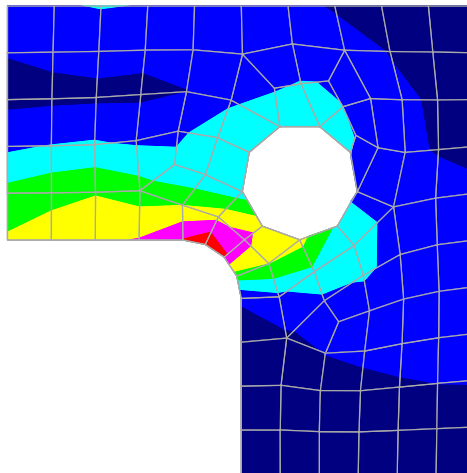
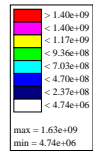
This is a little large file because the model is composed of 186 elements. The result of analysis is as the following figures.

Simulation 1
Displacement



Displacement

Simulation 1
Von Mises (maximum)



Von-Mises stress



