

水塔案例分析



專案概況

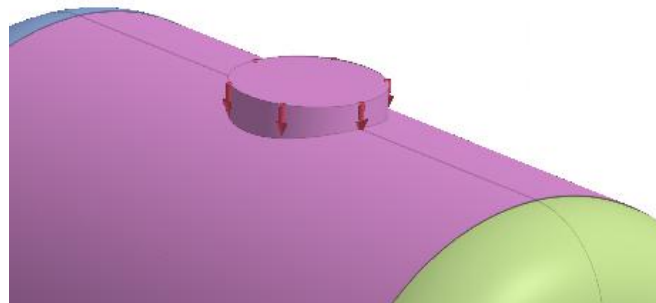
水塔材料: SUS304

水箱內容物: 水

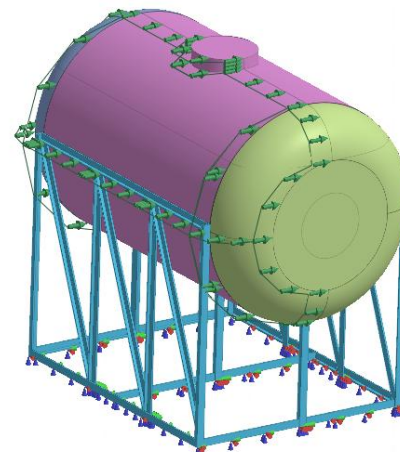
邊界條件：固定端約束

腳架材質：SUS304

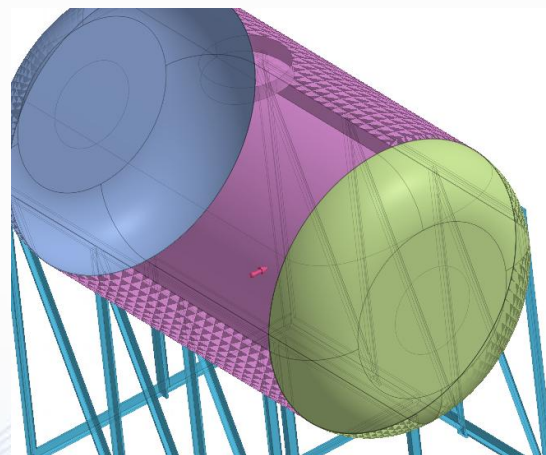
活載重



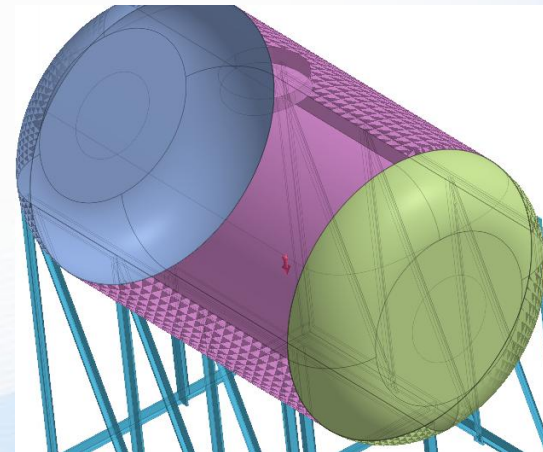
風載重



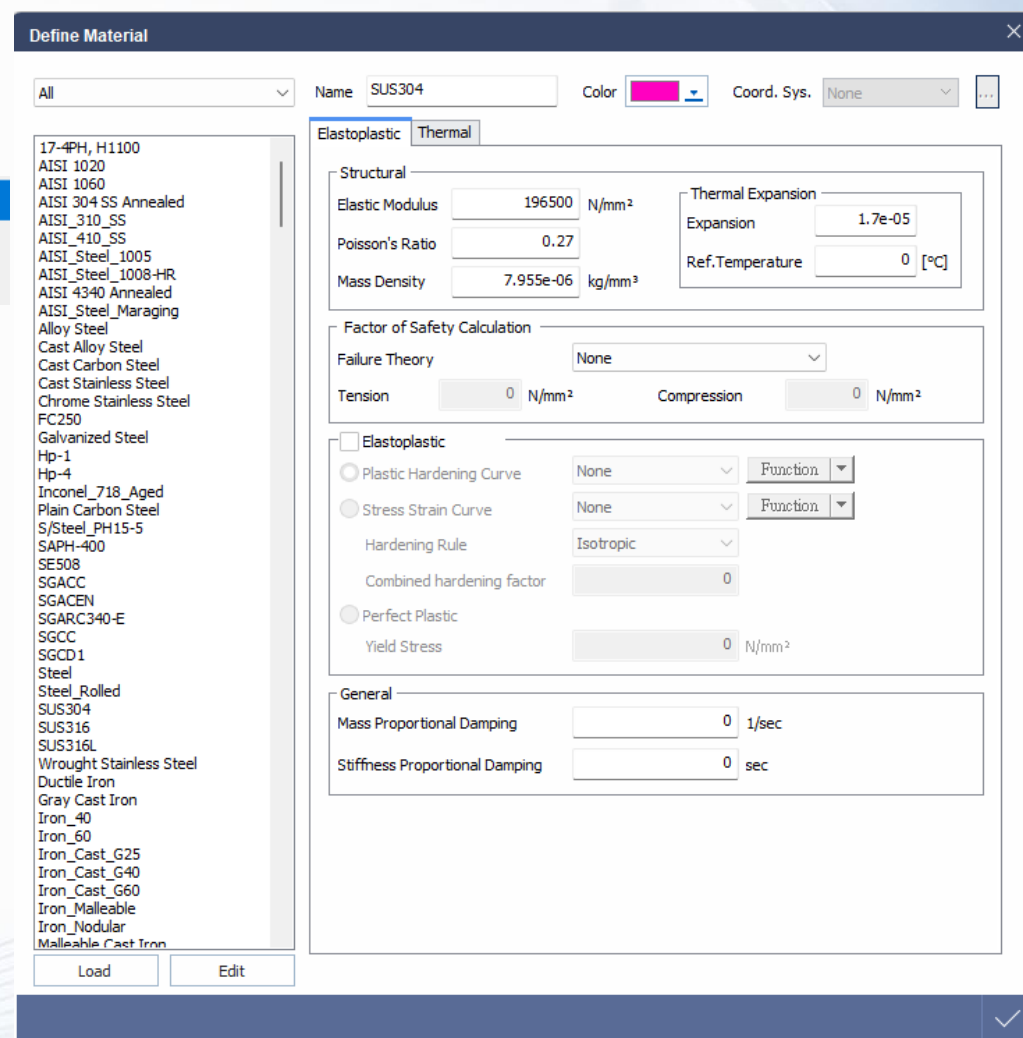
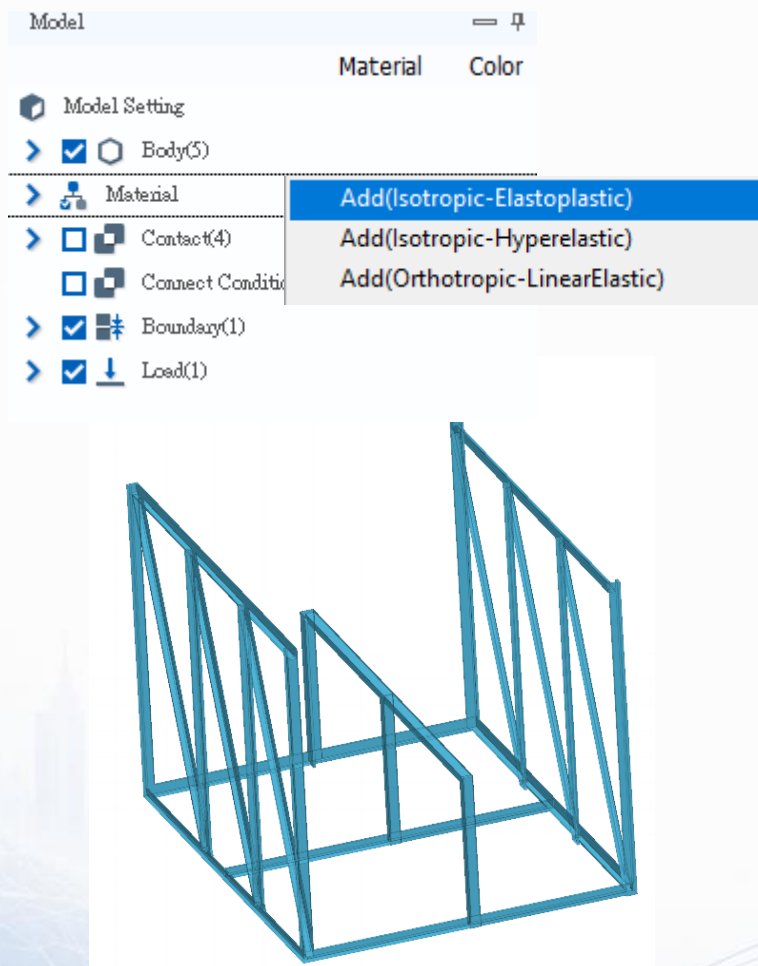
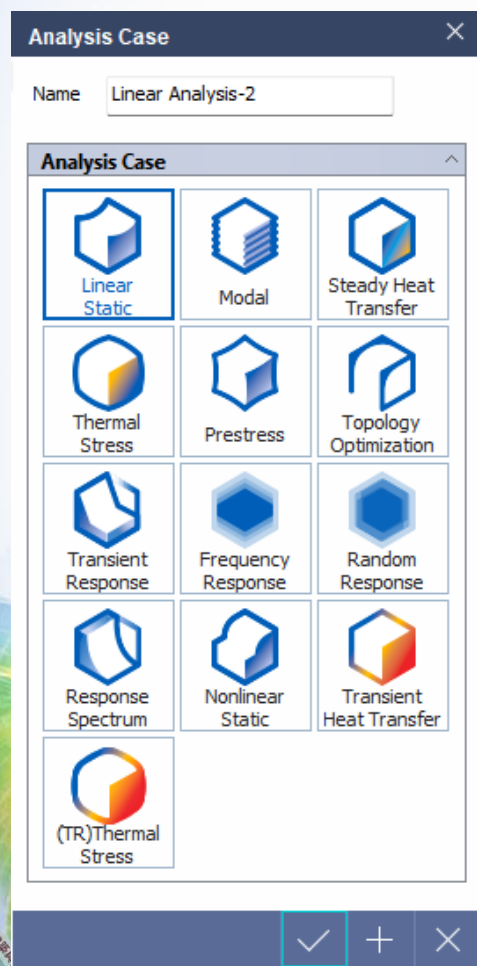
地震載重



重力載重



幾何模型 – 分析案例與材料 (SUS304)



幾何模型 – 分析案例與材料 (SUS304)

Define Material

All Name SUS304 Color  Coord. Sys. None

17-4PH, H1100
AISI 1020
AISI 1060
AISI 304 SS Annealed
AISI_310_SS
AISI_410_SS
AISI_Steel_1005
AISI_Steel_1008-HR
AISI 4340 Annealed
AISI_Steel_Maraging
Alloy Steel
Cast Alloy Steel
Cast Carbon Steel
Cast Stainless Steel
Chrome Stainless Steel
FC250
Galvanized Steel
Hp-1
Hp-4
Inconel_718_Aged
Plain Carbon Steel
S/Steel_PH15-5
SAPH-400
SE508
SGACC
SGACEN
SGARC340-E
SGCC
SGCD1
Steel
Steel_Rolled
SUS304
SUS316
SUS316L
Wrought Stainless Steel
Ductile Iron
Gray Cast Iron
Iron_40
Iron_60
Iron_Cast_G25
Iron_Cast_G40
Iron_Cast_G60
Iron_Malleable
Iron_Nodular
Malleable Cast Iron

Elastoplastic Thermal

Structural

Elastic Modulus 196500 N/mm²

Poisson's Ratio 0.27

Mass Density 7.955e-06 kg/mm³

Thermal Expansion

Expansion 1.7e-05

Ref. Temperature 0 [°C]

Factor of Safety Calculation

Failure Theory None

Tension 0 N/mm² Compression 0 N/mm²

Elastoplastic

Plastic Hardening Curve None Function

Stress Strain Curve None Function

Hardening Rule Isotropic

Combined hardening factor 0

Perfect Plastic

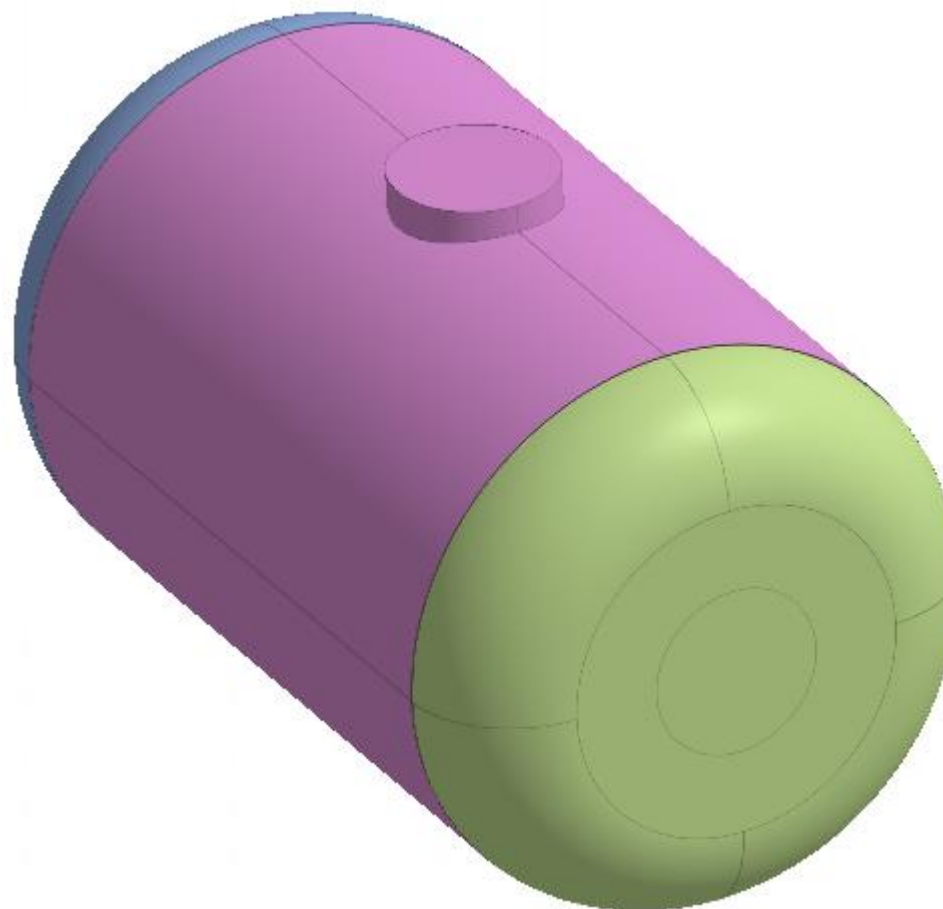
Yield Stress 0 N/mm²

General

Mass Proportional Damping 0 1/sec

Stiffness Proportional Damping 0 sec

Load Edit



幾何模型 – 分析案例與材料 (水)

Define Material

All Name Water Color Coord. Sys. None

17-4PH, H1100
AISI 1020
AISI 1060
AISI 304 SS Annealed
AISI_310_SS
AISI_410_SS
AISI_Steel_1005
AISI_Steel_1008-HR
AISI 4340 Annealed
AISI_Steel_Maraging
Alloy Steel
Cast Alloy Steel
Cast Carbon Steel
Cast Stainless Steel
Chrome Stainless Steel
FC250
Galvanized Steel
Hp-1
Hp-4
Inconel_718_Aged
Plain Carbon Steel
S/Steel_PH15-5
SAPH-400
SE508
SGACC
SGACEN
SGARC340-E
SGCC
SGCD1
Steel
Steel_Rolled
SUS304
SUS316
SUS316L
Wrought Stainless Steel
Ductile Iron
Gray Cast Iron
Iron_40
Iron_60
Iron_Cast_G25
Iron_Cast_G40
Iron_Cast_G60
Iron_Malleable
Iron_Nodular
Malleable Cast Iron

Elastoplastic Thermal

Structural

Elastic Modulus 10 N/mm²

Poisson's Ratio 0.45

Mass Density 1e-06 kg/mm³

Thermal Expansion

Expansion 0

Ref. Temperature 0 [°C]

Factor of Safety Calculation

Failure Theory None

Tension 0 N/mm² Compression 0 N/mm²

Elastoplastic

Plastic Hardening Curve None Function

Stress Strain Curve None Function

Hardening Rule Isotropic

Combined hardening factor 0

Perfect Plastic

Yield Stress 0 N/mm²

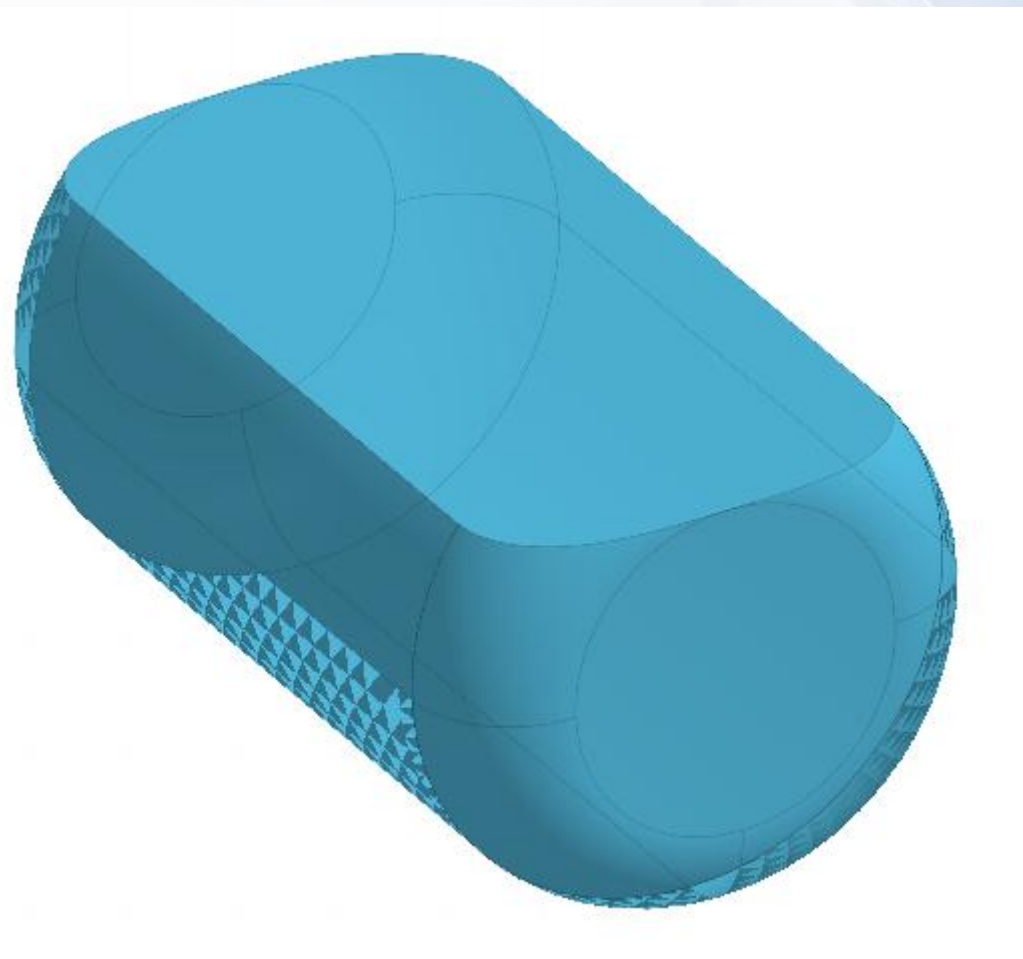
General

Mass Proportional Damping 0 1/sec

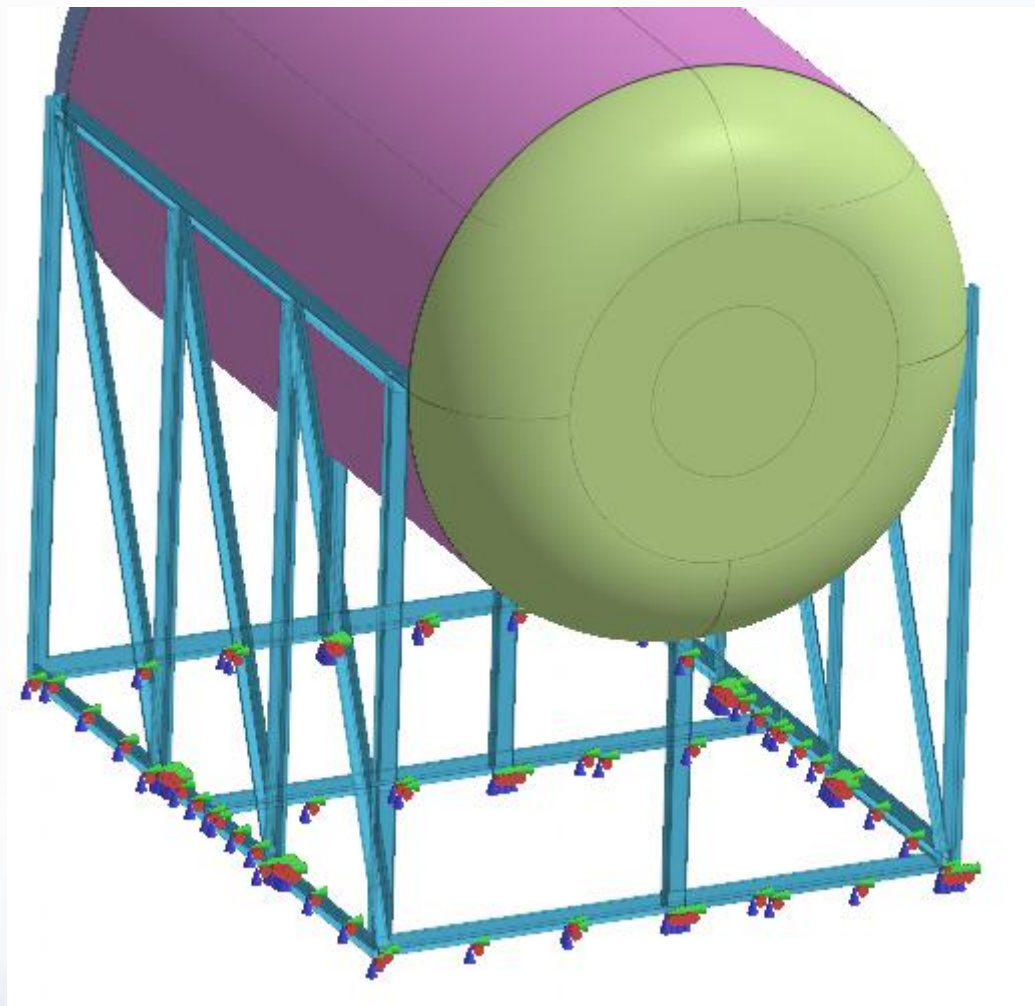
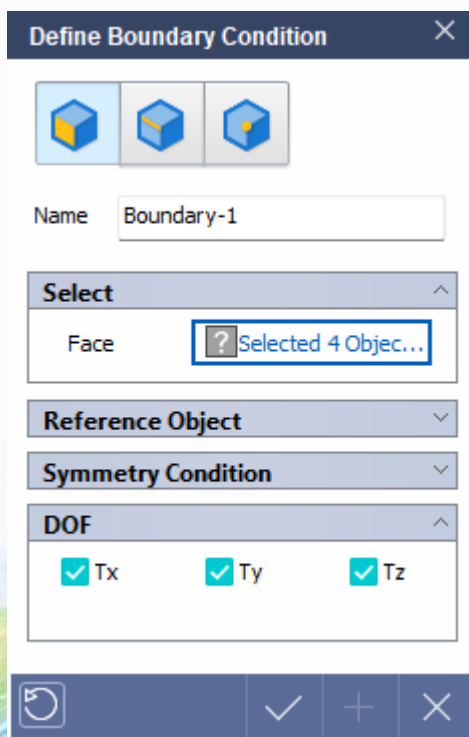
Stiffness Proportional Damping 0 sec

Load Edit

Manual Input



分析工況 | 約束條件



分析工況 | 活載重



Define Force

Name

Force-1

Load Category

Load Type

Force

Total

Individual

Selected 1 Object(s)

Reference Object

Type

Global Coordinate System

Direction

X

0

N

Y

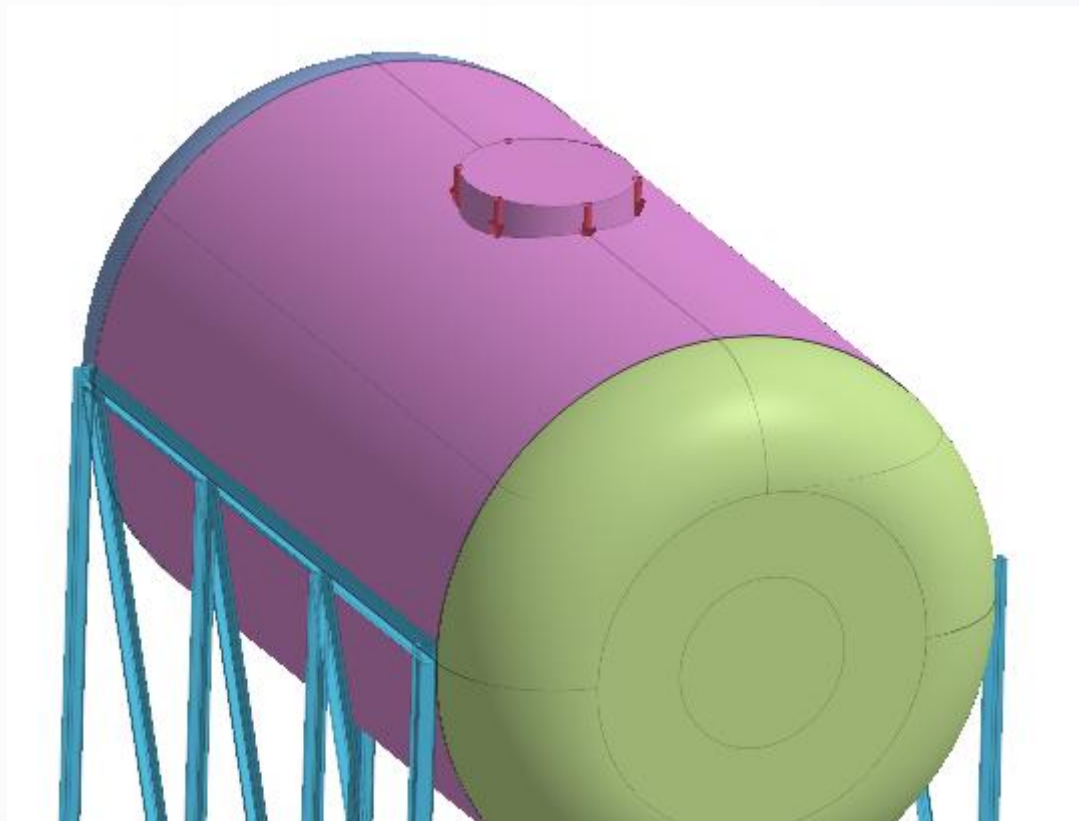
0

N

Z

-4000

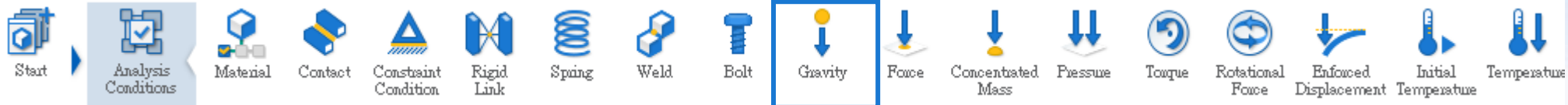
N



Conservative force of a human weight and tools to maintain the tank.



分析工況 | 重力載重



Define Gravity

Name

Gravity-1

Value

Gx

0

mm/sec²

Gy

0

mm/sec²

Gz

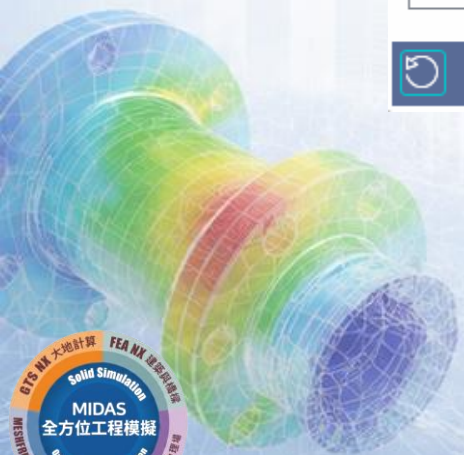
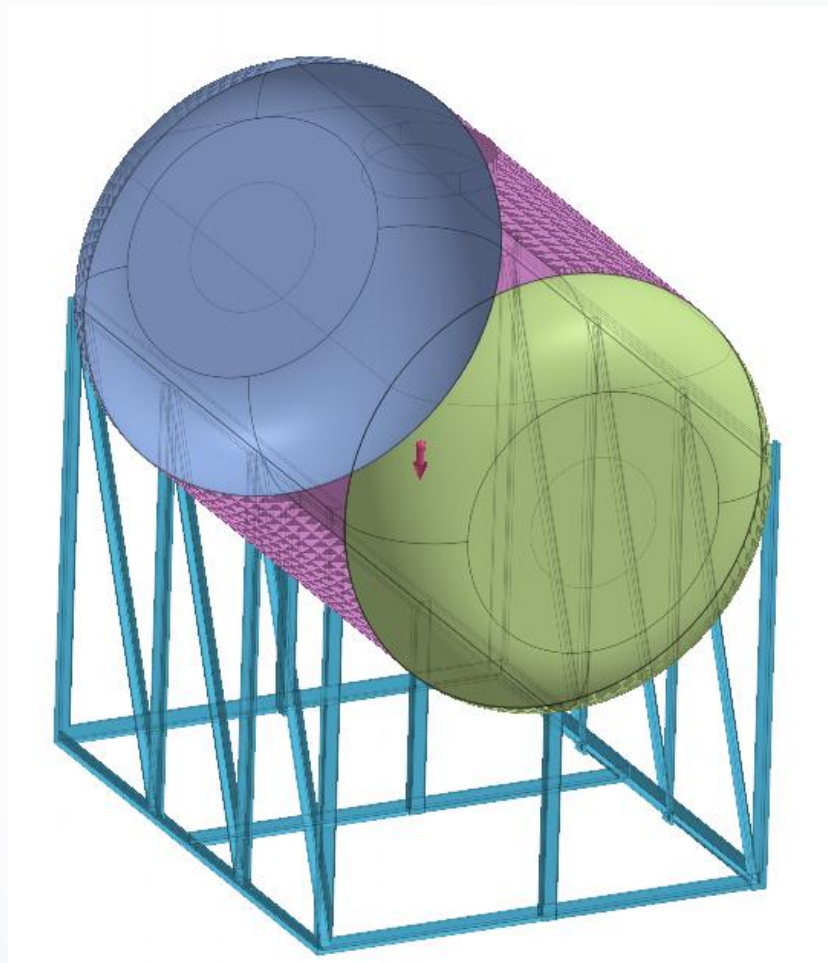
-9806

mm/sec²

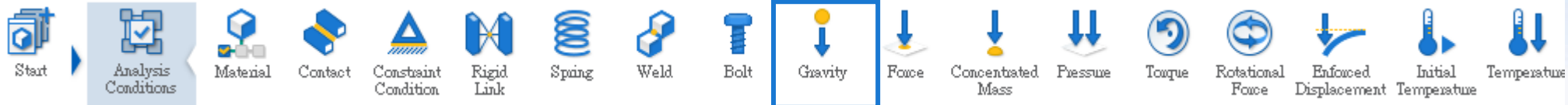
✓

+

×



分析工況 | 地震載重



Define Gravity

Name

EQy

Value

Gx

0

mm/sec²

Gy

-9806*0.30

mm/sec²

Gz

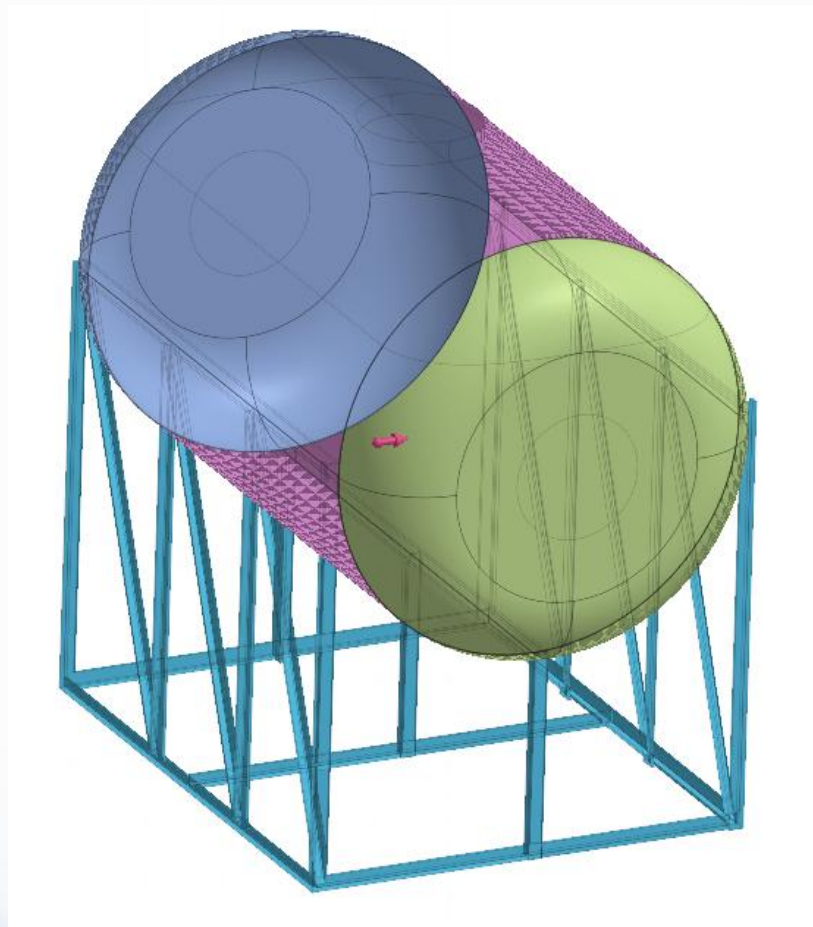
0

mm/sec²

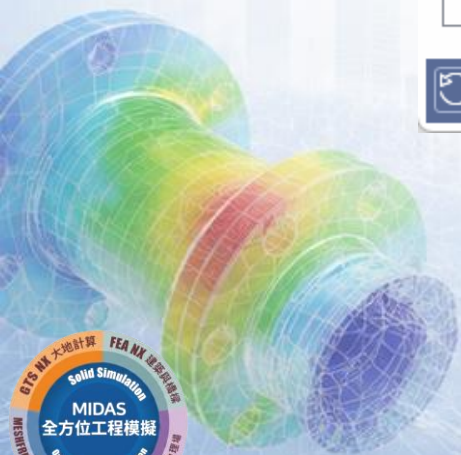
✓

+

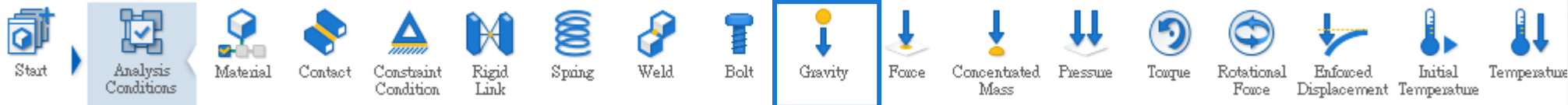
×



Simplified earthquake load using the weight of the tank system



分析工況 | 重力載重



Define Gravity

Name

EQz

Value

Gx

0

mm/sec²

Gy

0

mm/sec²

Gz

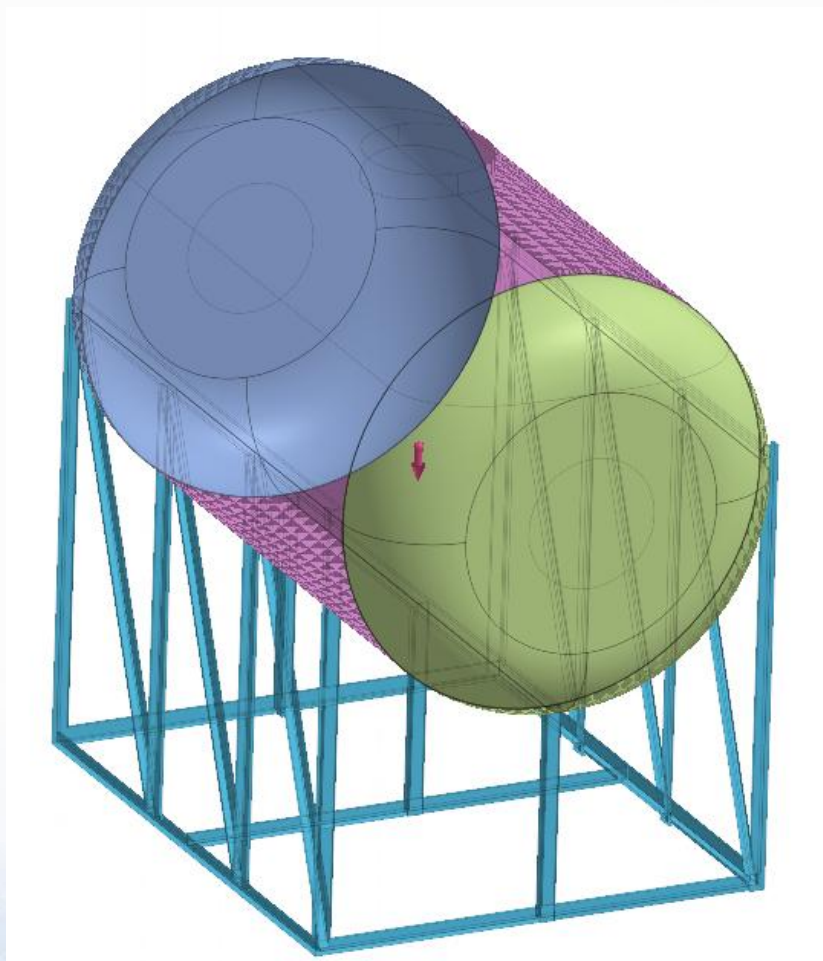
-9.806×0.15

mm/sec²

✓

+

×



Simplified earthquake load using the weight of the tank system



分析工況 | 風載重



Define Pressure

Name

Selected 7 Object(s)

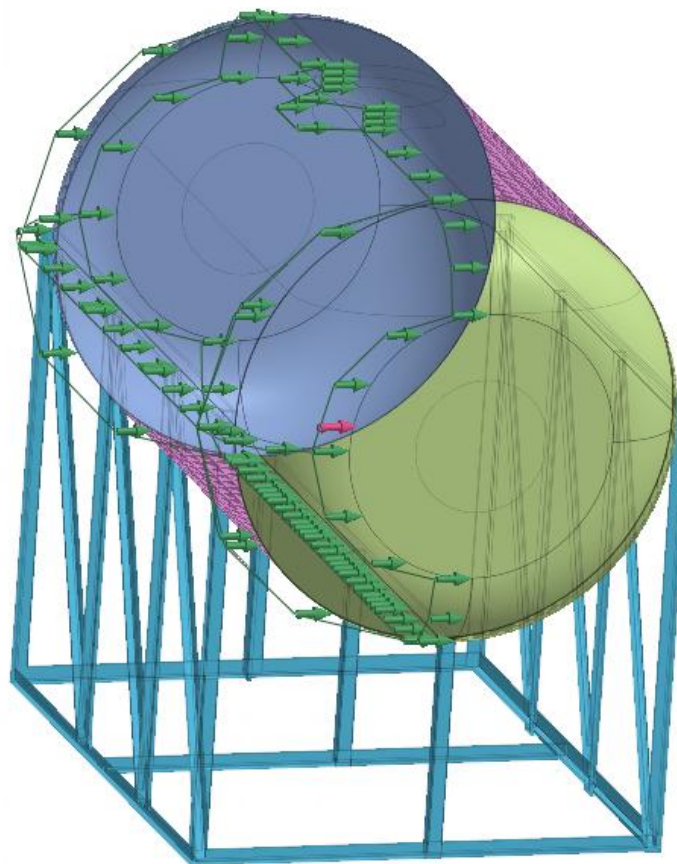
Direction

Pressure

P N/mm²

Follower Force

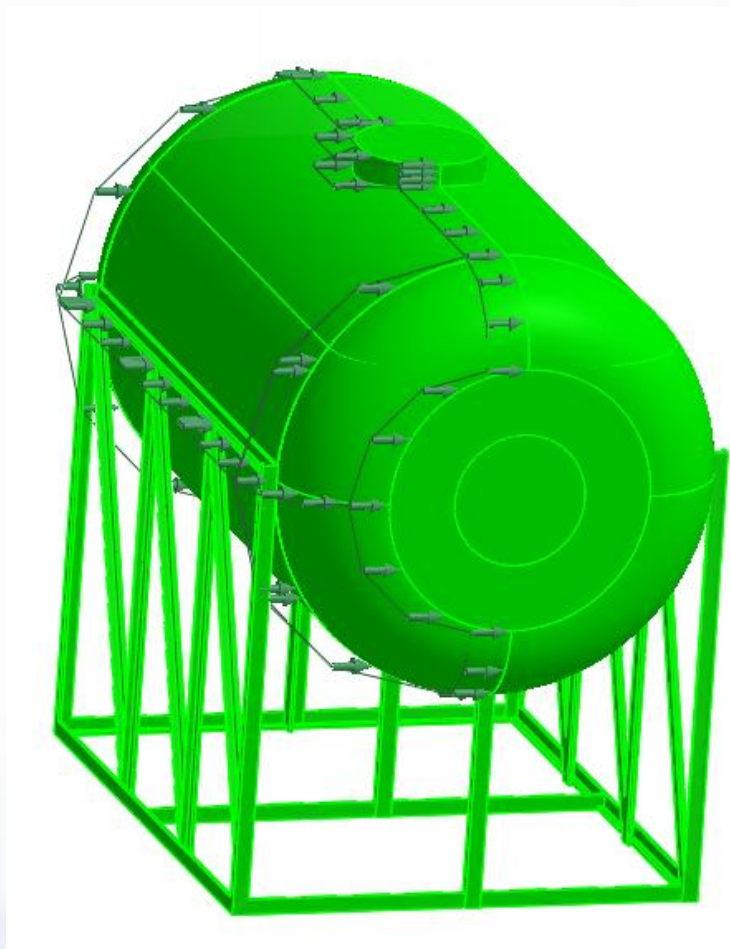
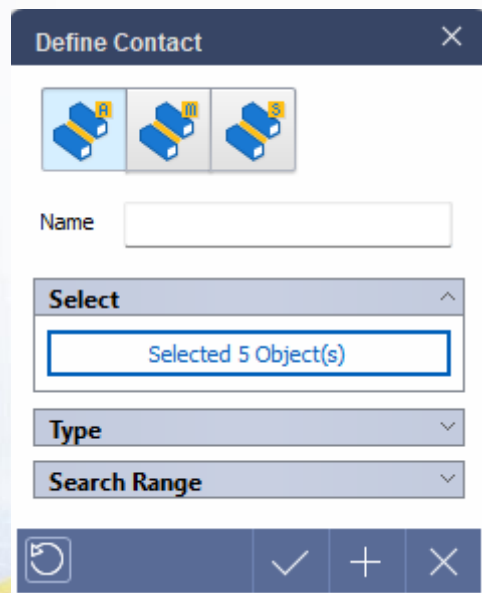
☒ Use Follower Force in Geometrically Nonlinear Analysis



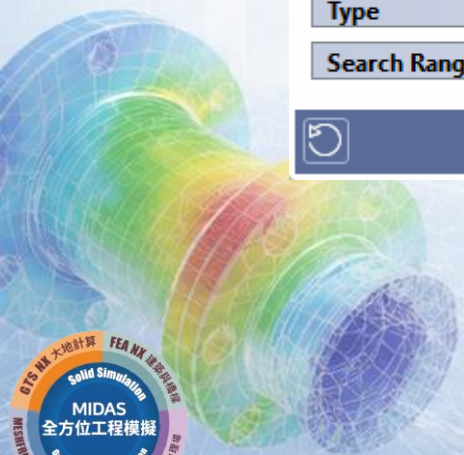
Wind Load:

1. Computed from a mid-to-high-rise roof.
2. Tank is not big enough to produce a varying wind load based on height.
3. To analyze the most critical combination, wind load direction should align with the EQx.

分析工況 | 接觸條件



- ✓ ☐ Contact(9)
 - ☐ tank 3(2)(1)-tan. Welded
 - ☐ tank 3(2)(1)-tan. Welded
 - ☐ Bracket-tank 1.. Welded
 - ☐ Bracket-tank 1.. Welded
 - ☐ Bracket-tank 3.. Welded
 - ☐ Water-tank 1(2).. Welded
 - ☐ Water-tank 1(2).. Welded
 - ☐ Water-tank 3(2).. Welded
 - ☐ Water-Bracket Welded



分析工況

Analysis Case

Linear Analysis-1

Analysis Control

Model(5)

Water

Bracket

tank 3(2)(1)

tank 1(2)

tank 1(2)(1)

Contact(9)

Connect Condition

Boundary(1)

Boundary-1

Load(5)

Gravity-1

Force-1

Pressure-1

EQy

Gravity-3

Define Grid

Geometry

Water

Value

☐ Automatic - Relative Grid Density

☐ High

☐ Medium

☐ Low

☐ User Defined (Number of Divisions)

X 35

Y 20

Z 16

☒ User Defined (Grid Size)

Length 50 mm

☐ Relative Geometric Feature Size
(0.1 : Refined, 10. : Rough)

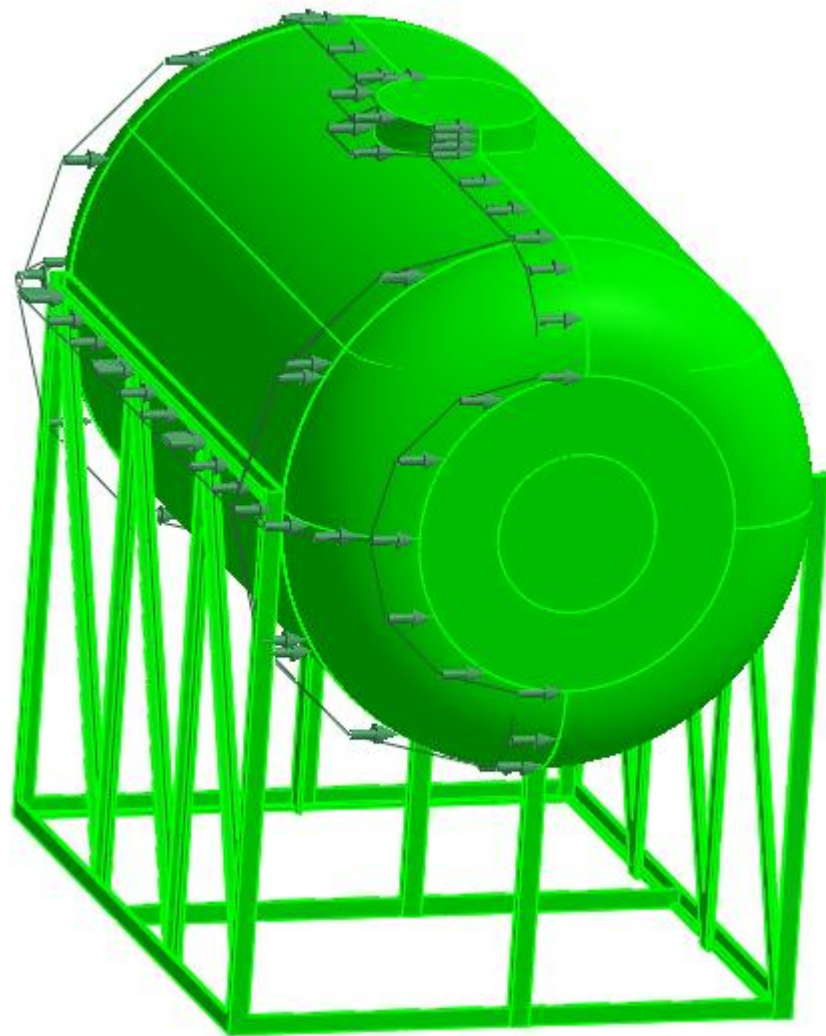
(0.1~10) 1

☐ Stabilization for Hyperelastic material
(0.001 : Accurate, 3. : Robust)

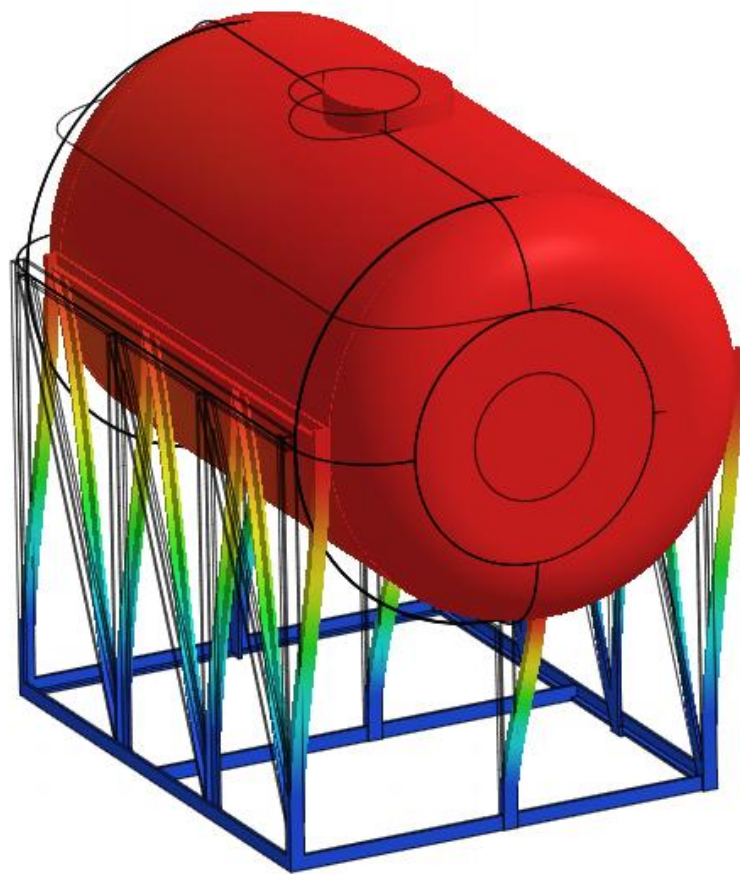
(0.001 ~ 3.) 0.003

☐ Adapt Grid Orientation to Shape

☐ Increased Integration Accuracy

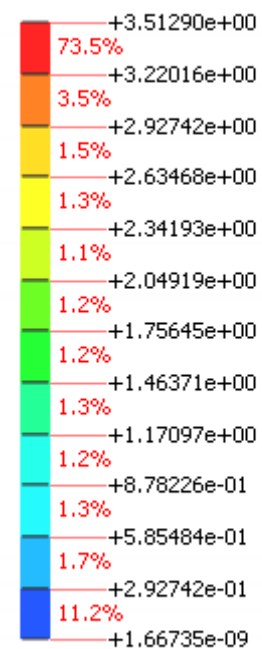


分析結果 | 變形



Deformations

DISPLACEMENT-XYZ

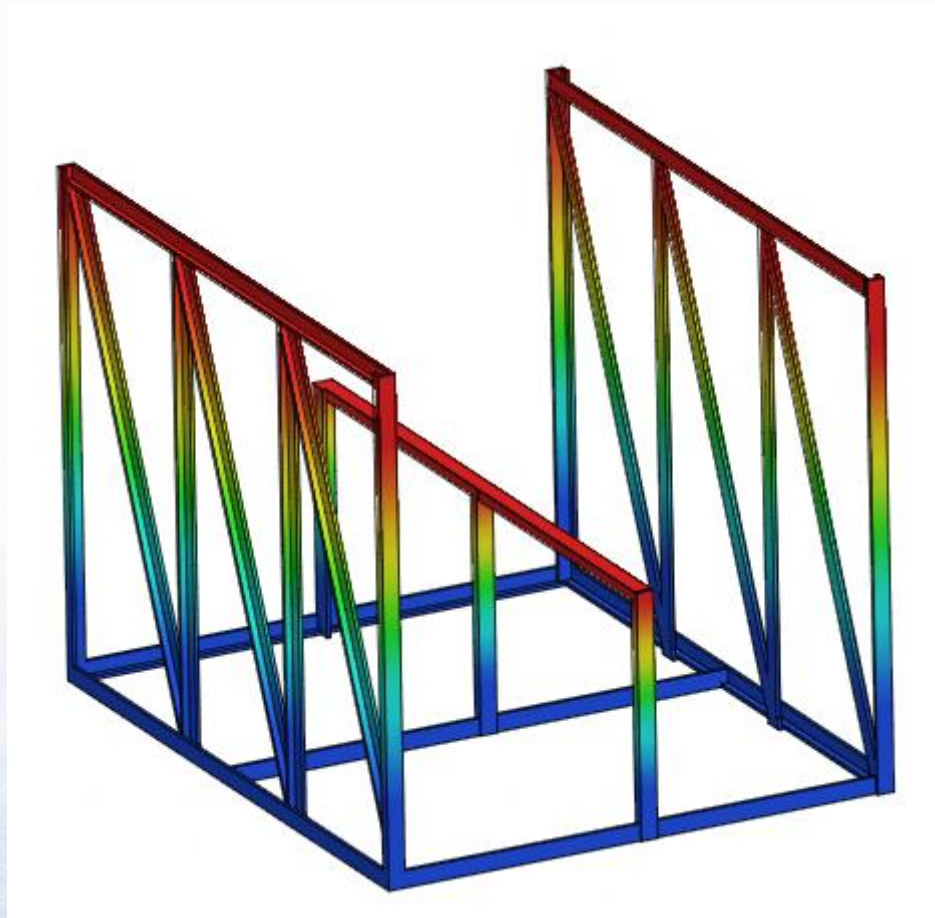


Linear Analysis-1

Linear Static

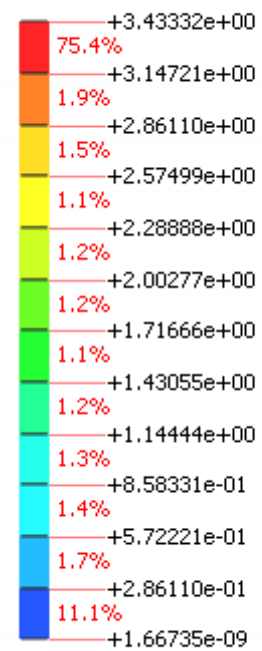
Unit : mm

分析結果 | 變形



Deformations

DISPLACEMENT-XYZ

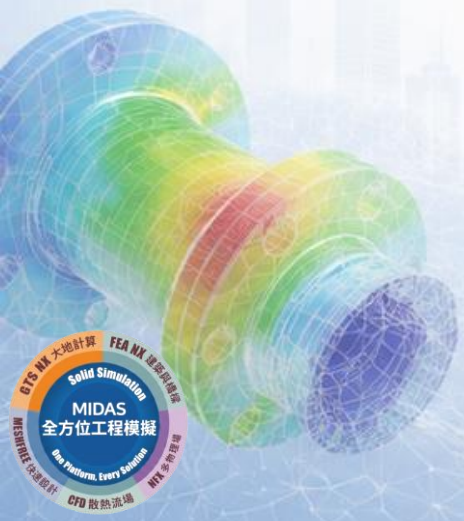
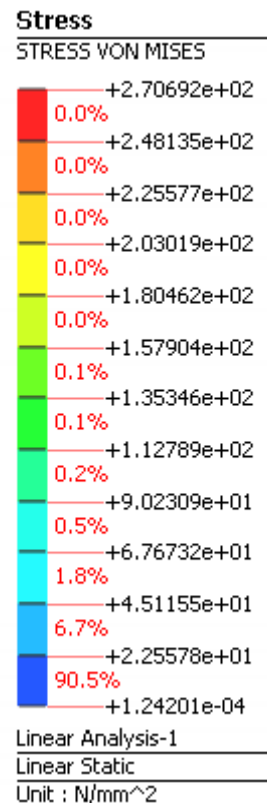
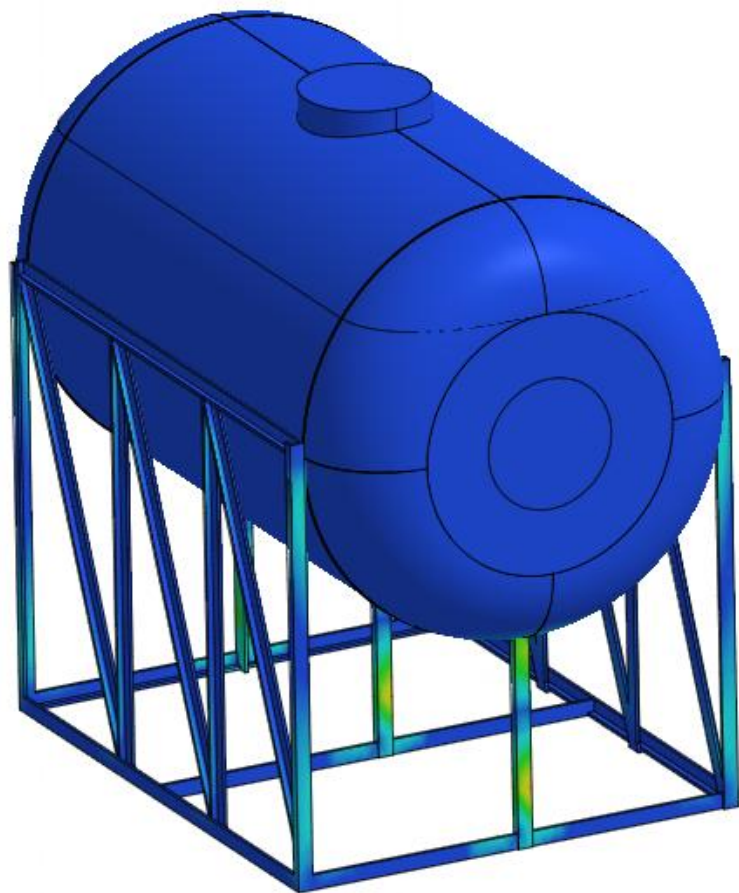


Linear Analysis-1

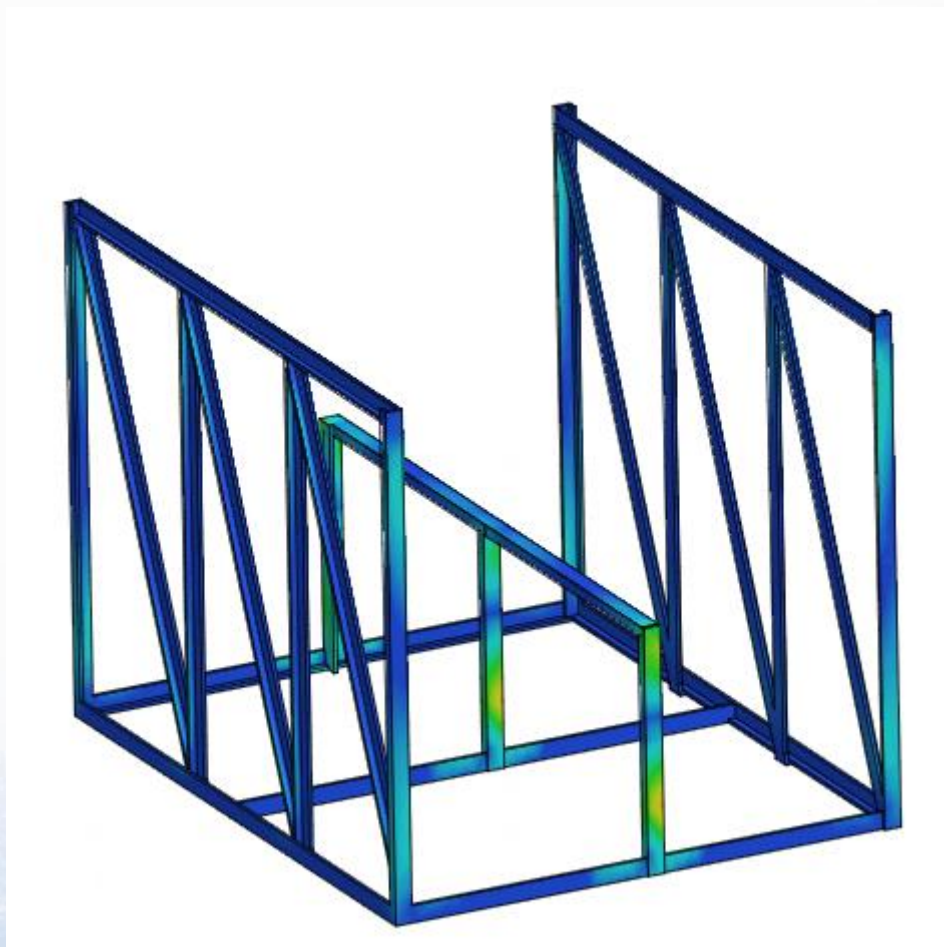
Linear Static

Unit : mm

分析結果 | STRESS VON MISES

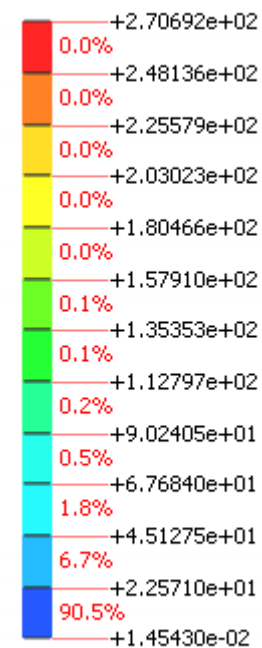


分析結果 | STRESS VON MISES



Stress

STRESS VON MISES



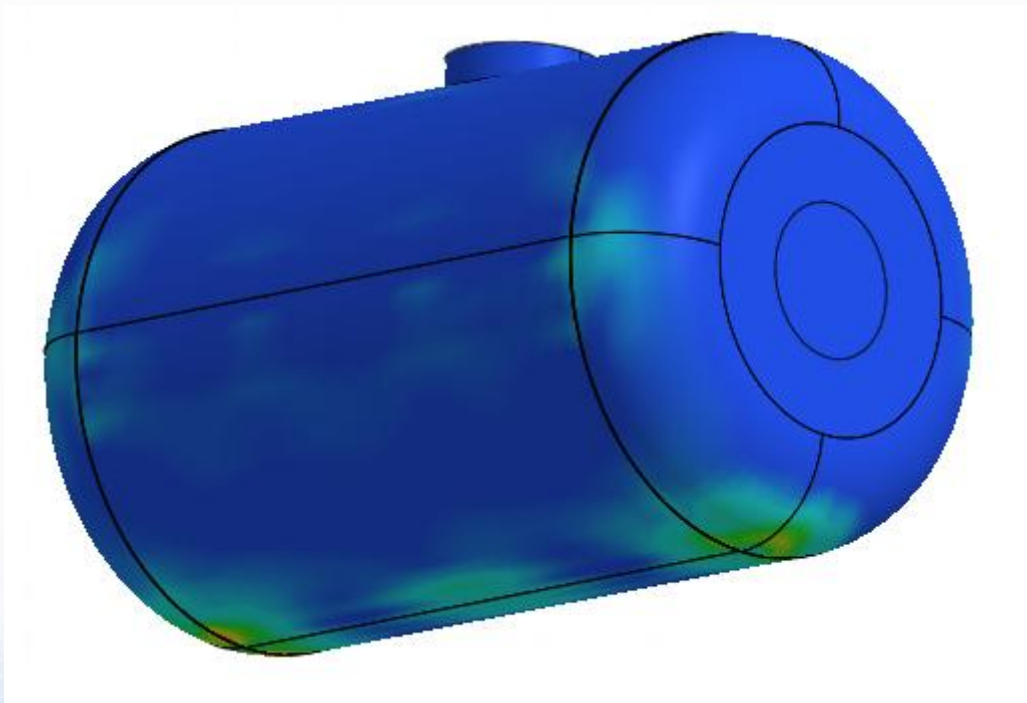
Linear Analysis-1

Linear Static

Unit : N/mm²

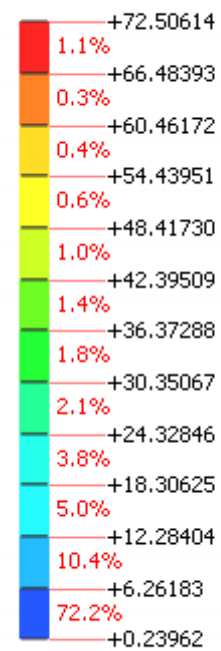


分析結果 | STRESS VON MISES



Stress

STRESS VON MISES

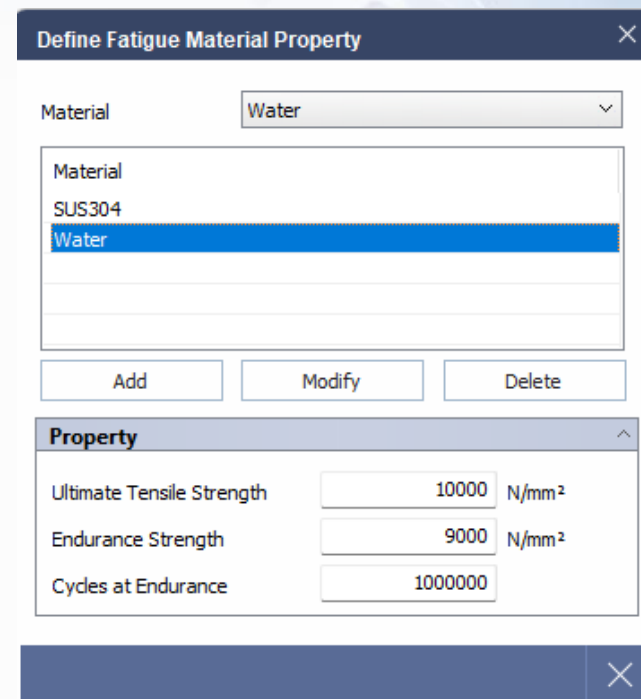
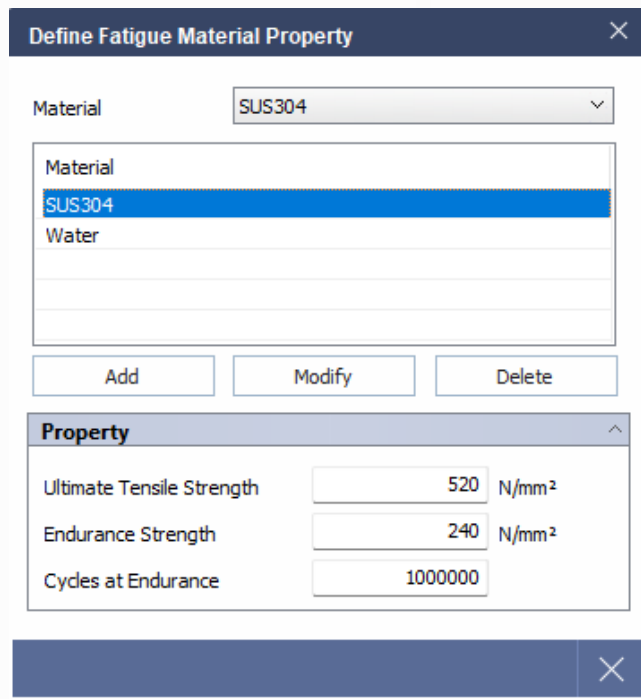
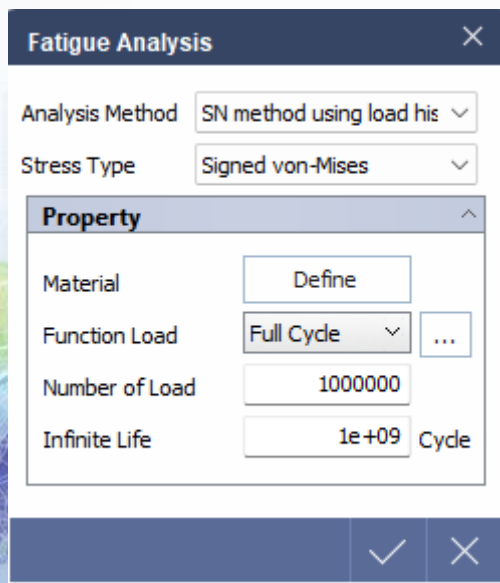
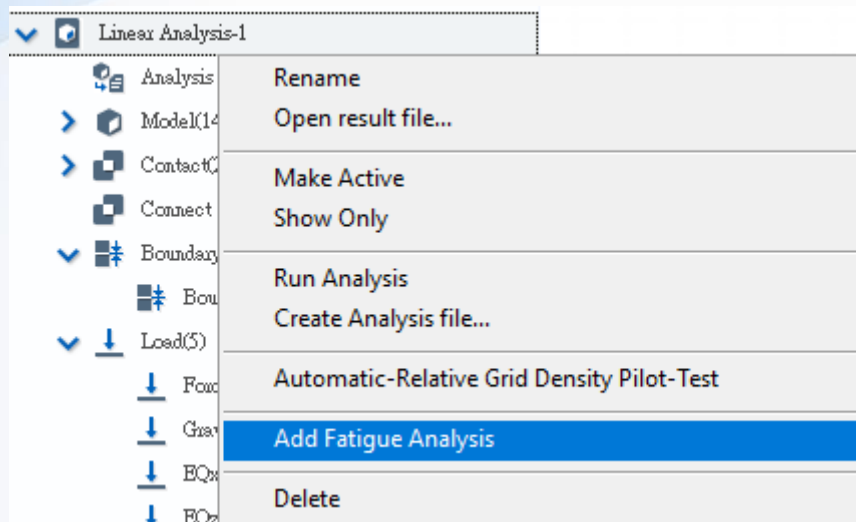


Linear Analysis-1

Linear Static

Unit : N/mm²

疲勞分析

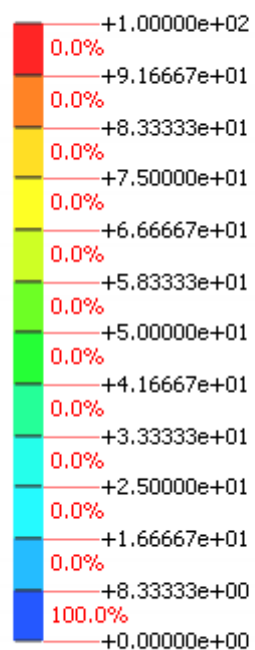


Note: Water parameters are dummy parameters.

疲勞分析

Misc.

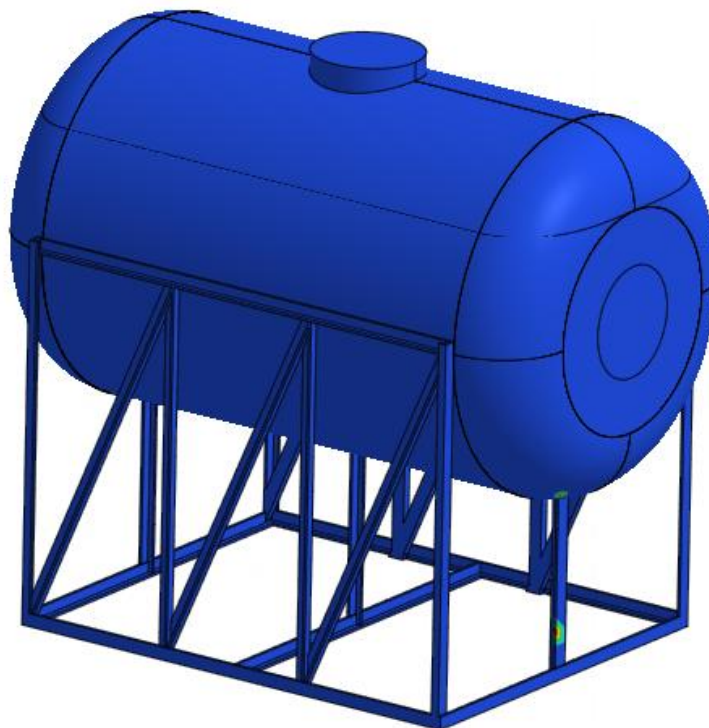
DAMAGE



Linear Analysis-1_Fatigue Result-1

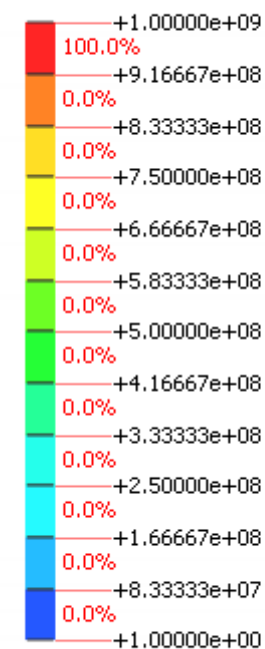
Linear Static

Unit : None



Misc.

LIFE CYCLE



Linear Analysis-1_Fatigue Result-1

Linear Static

Unit : None

