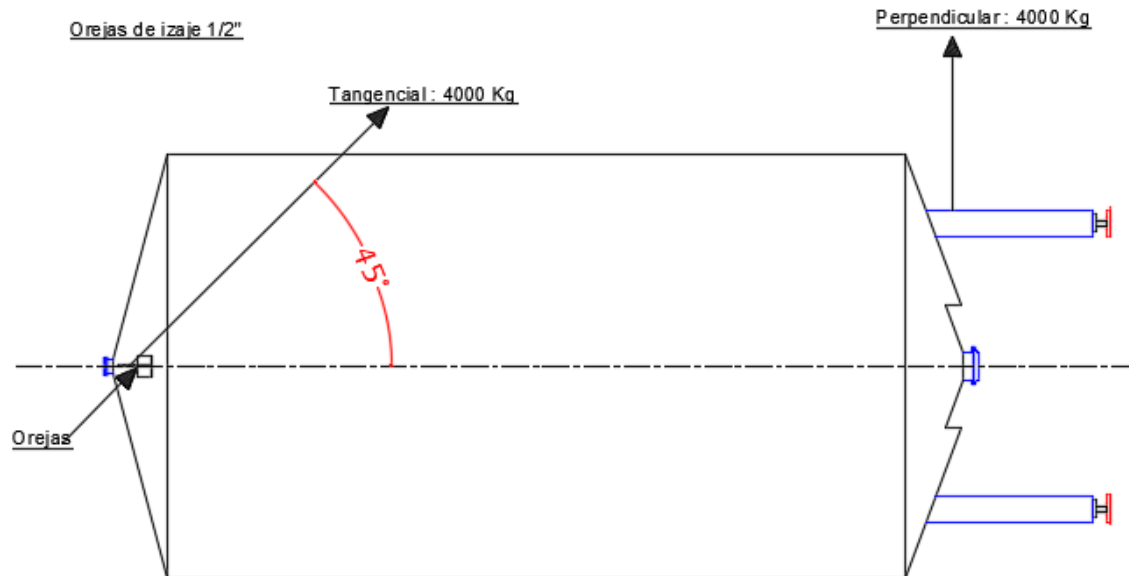


Report: Lifting lugs

1.- Project 8347 Alfa Laval – CCH-32

The objective of this report is to review and analyze mechanically the behavior of the lifting lugs of the CCH-32 equipment on the cladding, to perform the lifting of the tank, taking it out of its horizontal packaging and lifting it to its vertical position.



- Considered load = 4,000 Kg / 1/2" Lifting lug
- Hoist Positions: 45°

The results are shown below.

2.- Analysis

Lifting at 45°C is the most stressful iteration, so all analyses are performed only under this angle of inclination for the lugs.

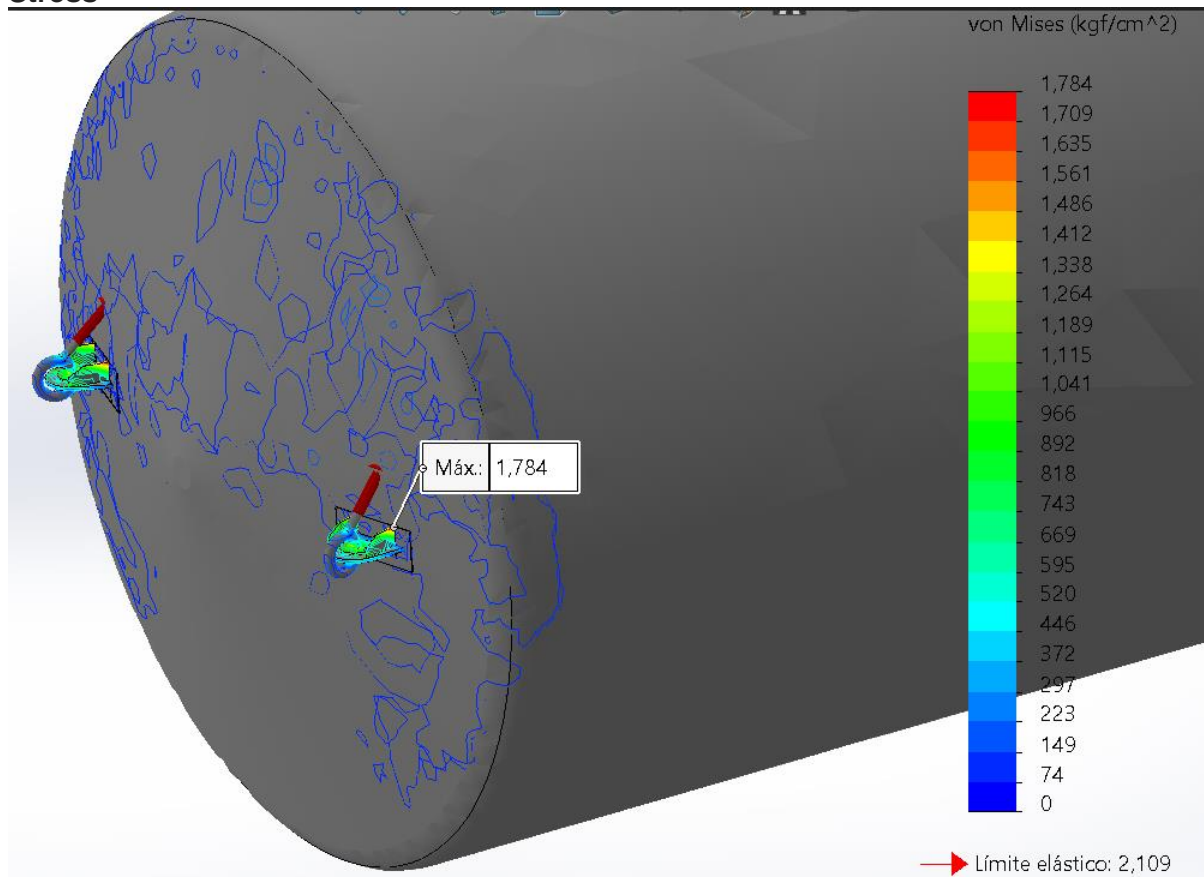
It is proposed to reinforce the lifting lugs according to the following:

Place two vertical reinforcements on the cladding and a circular reinforcement over the loading hole.
The vertical reinforcements are to be placed in a 3/16" thickness in stainless steel plate.
The reinforcement for the hoisting hole is considered to be 3/16" thickness in stainless steel plate.

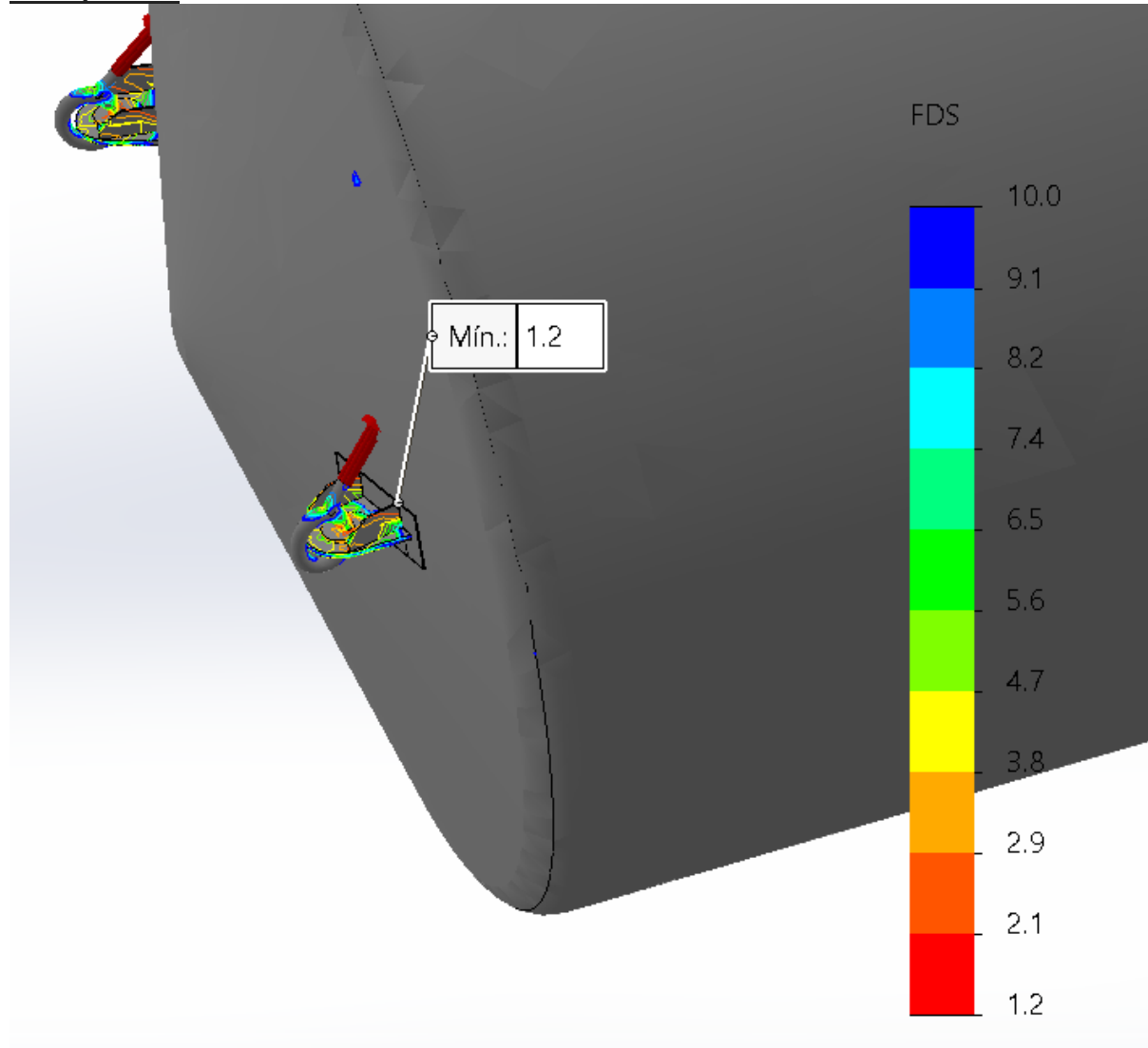
Lifting at 45° (critical lifting point):

1/2" Lifting lug

Stress



Safety factor



Results

1/2" Lifting lug

Safety factor: 1.2

Tangential load: 4,000 Kg

Tensile strength: 2,109 Kg/cm²

Maximum stress: 1,784 Kg/cm²

Considering the lifting at 45° of inclination with structural reinforcement as proposed, the lifting lugs will present stresses below the tensile strength; they do not present deformation.

Sponsoring:

The load on the vessel supporting 4,000 kg was applied considering that this is the maximum value in weight among the manufactured vessels.

The stress value recorded is below the tensile strength so that the supports do not show any deformation among themselves or any real deformation on the body of the vessel.

Lifting of the vessel:

A first tangential lifting is considered for this simulation to lift the vessel.

3.- Results:

Comparative

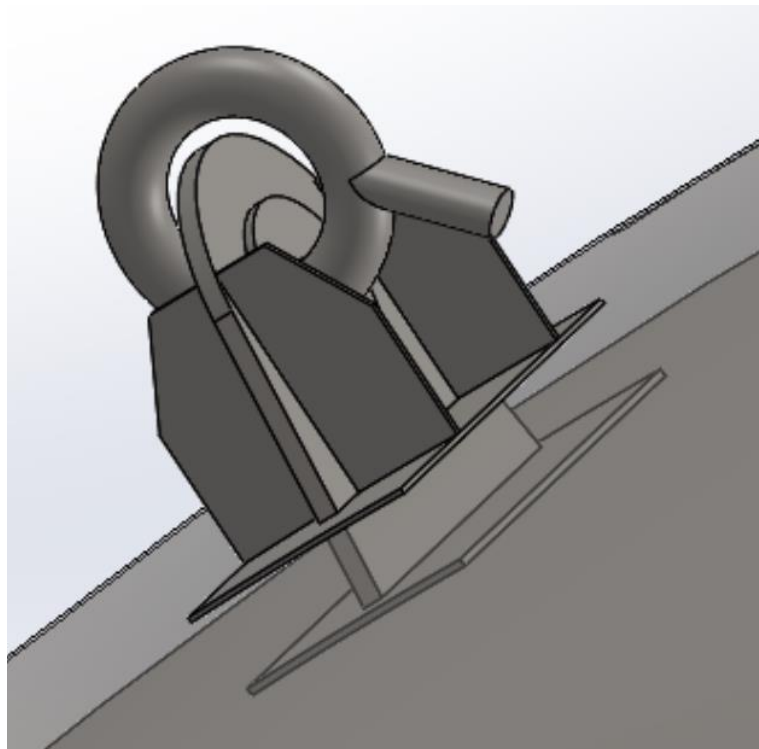
	Ears 1/2"
Tensile strength SA-240 TP304	2,109 Kgf/cm ²
Tangential load	4000 Kg
S.D. w/ reinforcement	1.4
Max stress with reinforcement	1,784 Kgf/cm ²

4.- Conclusions

According to the information shown in previous images, the vessels require that the ears be reinforced on the cladding in accordance with the material specifications already indicated to avoid deformations that may hinder the positioning or lifting of the vessels.

The reinforced lugs resist the lifting load both in combined efforts and in individual efforts while the container supports the lifting without deformation or fatigue.

For reinforcement dimensions, a fabrication drawing is shared, SEE "ACU-8347-REF.LIFTING".



The arrangement shall be as indicated in the image.

The simulation was performed considering a 1 1/2" diameter shackle.

Important:

It is requested to perform the hoisting in the section closest to the bottom of the vessel as considered in this analysis.