Checks for Calculation No: <u>NSTXU-CALC-11-23-00</u>

Revision No: 0

Title: Halo Current Force Restraints for OBD12 Tile Assemblies

Component was checked against latest design

All required load cases are included and current

Discuss method used in the calculation

A simple OBD12 tile block with a pocket on the back is used to simulate the tile key feature with the halo current force restraints. Based on the Brooks spreadsheet data, all the halo force loads are calculated and applied as the surface pressures in an ANSYS APDL model. The max principal stress of tile is still slightly more than the limits, and it can be resolved by changing the roof radius.

Discuss how the calculation was checked (*)

I used Workbench to simulate a whole tile block with two key pockets on the back to check the results of OBD12 halo key submodel. All the halo forces can be applied directly on the tile surfaces. The independent calculations show that both peak compressive and tensile stresses are comparable to the results of calculation form. Please see attached report about Structural Analysis Results of OBD12 Simple Key Model.

List issue identified and how they were resolved The attached report is to verify and confirm the results of calculation form.

Checker's name: Jiarong Fang

Technical Authority:

(sign and date)

(*) independent calculations can be appended

Structural Analysis Results of OBD12 Simple Key Models



Figure 1. Submodel of new simplified key (halo restraints)



Figure 2. Submodel settings (halo restraints)

Figures 1 and 2 show the new simplified key submodel and settings with the halo force loads from Ark Brooks Spreadsheet. The max and min principal stresses are shown in Figures 3 and 4, respectively. The peak compressive stress of -3.3ksi (22.7MPa) is within the limit, but the peak tensile stress of 4ksi (27.5MPa) is about 30% higher than the limit, which can be improved by optimizing the key pocket feature.



Figure 3. Max principal stress of OBD12 tile (halo restraints)



Figure 4. Min principal stress of OBD12 tile (halo restraints)