

FAILURE ANALYSIS OF MUDGUARD USING “FEMFAT”

CONTENT

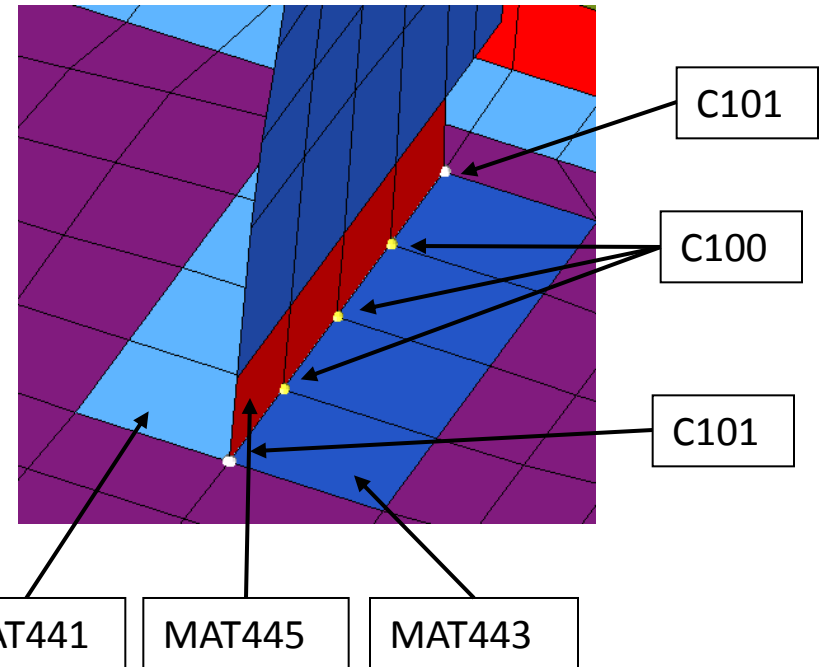
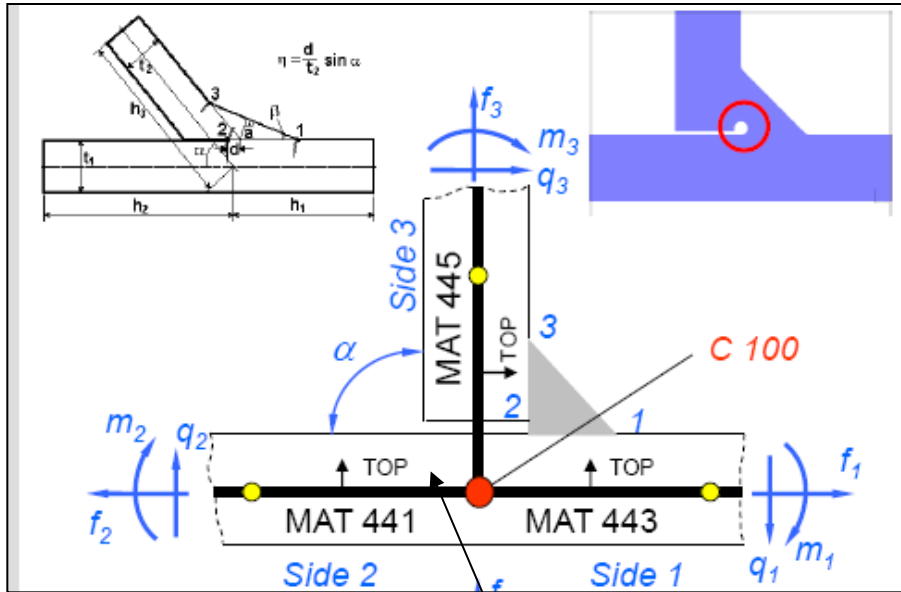
- TRACTOR MUDGUARD DEFINITION AND FUNCTION.
- FIELD APPLICATIONS & % USAGE
- FIELD FAILURE ANALYSIS
- FEA-LAB- FIELD CORRELATION
- FEMFAT GUIDELINES FOR WELD SIMULATION
- FEA METHODOLOGY AND LOADCASES
- STRESS AND LIFE PREDICTION
- CONCLUSION

FUNCTION :

A barrier that surrounds the wheel of a vehicle to block splashing water and mud so that it can not reach to operator.

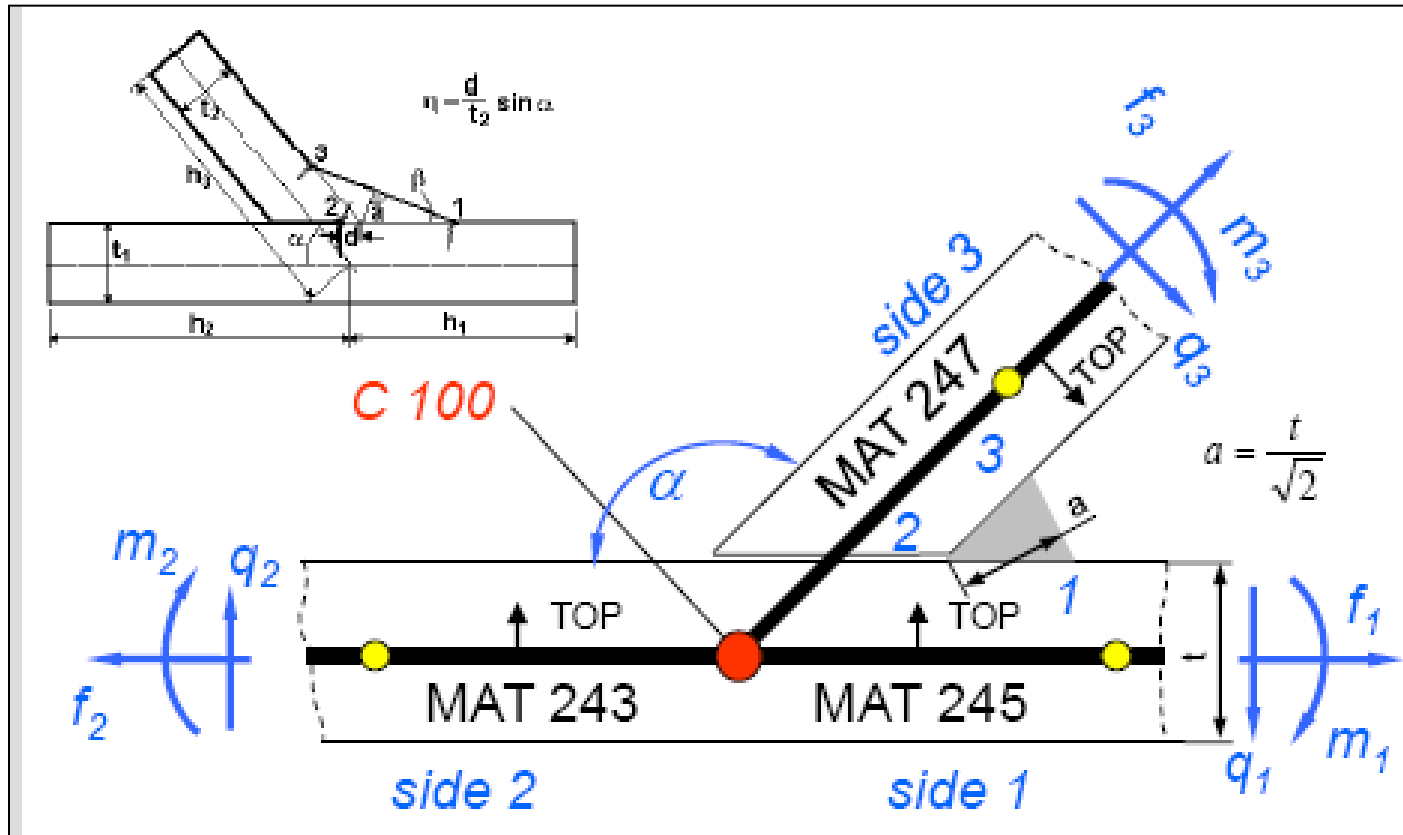


Welding Methodology : T -90°

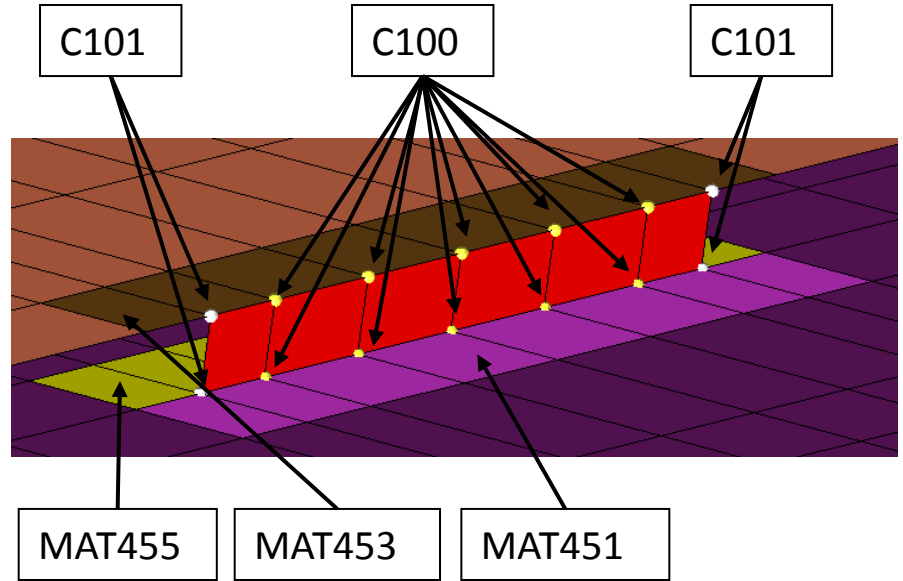
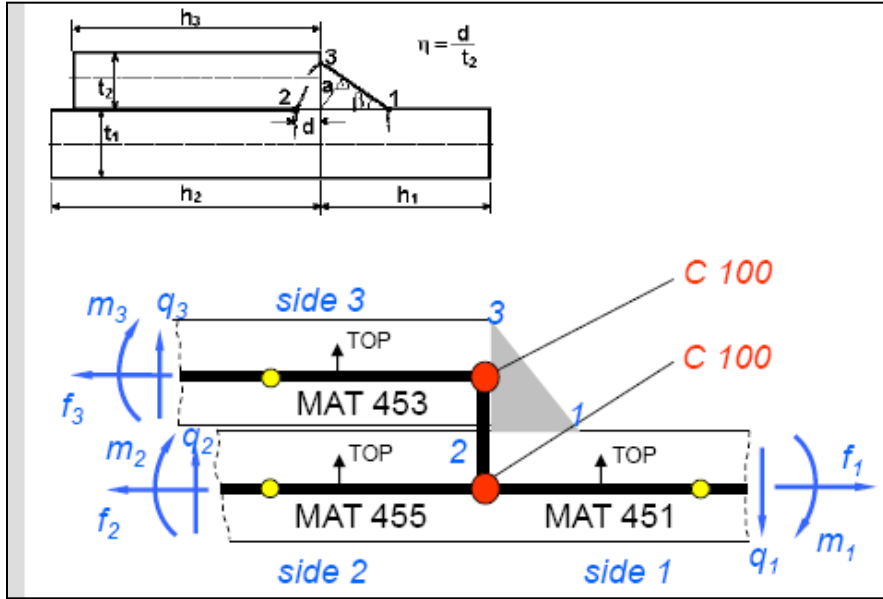


Adjust the direction normal as per the top side shown.

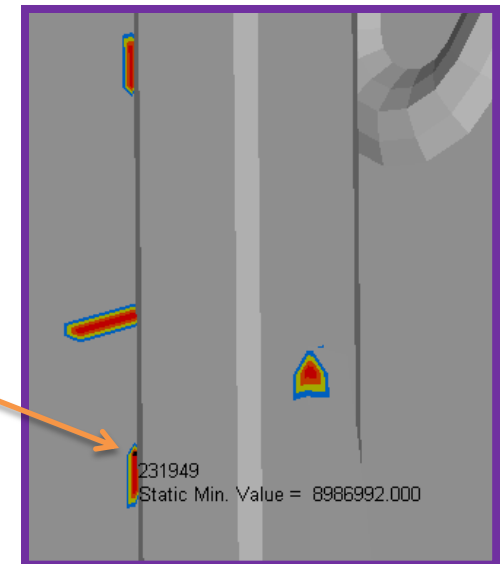
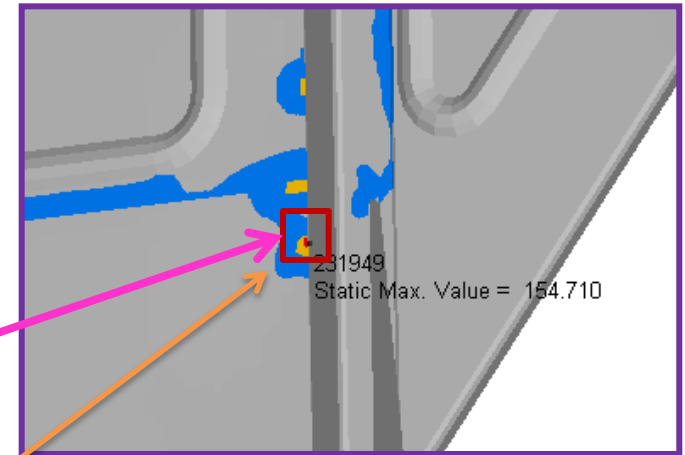
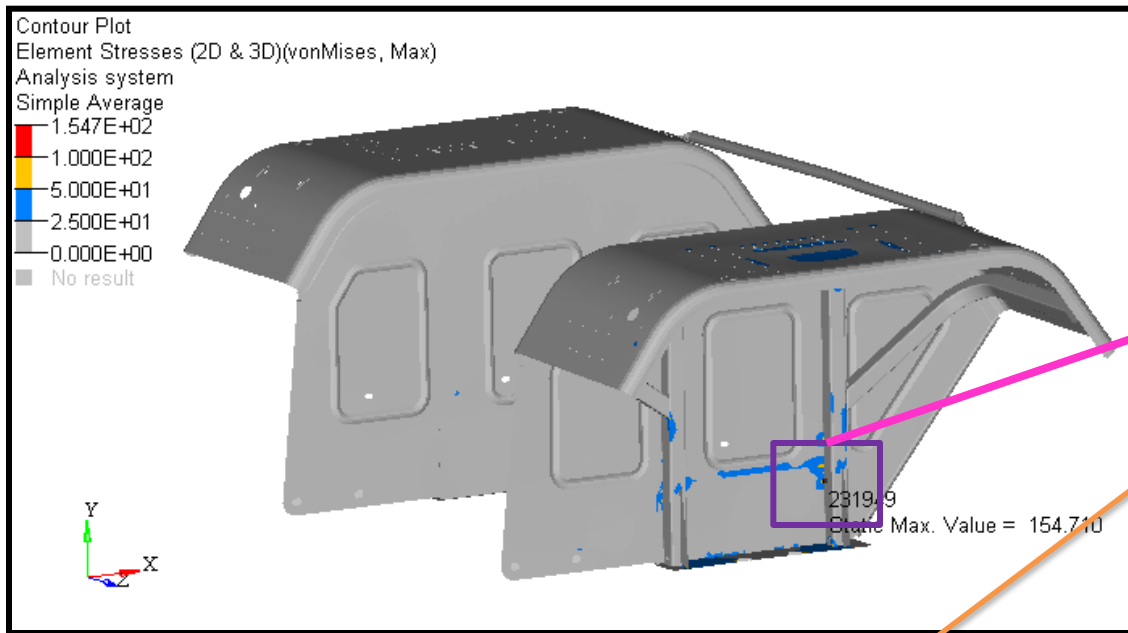
Welding Methodology : T -45°



Welding Methodology : Overlapped weld

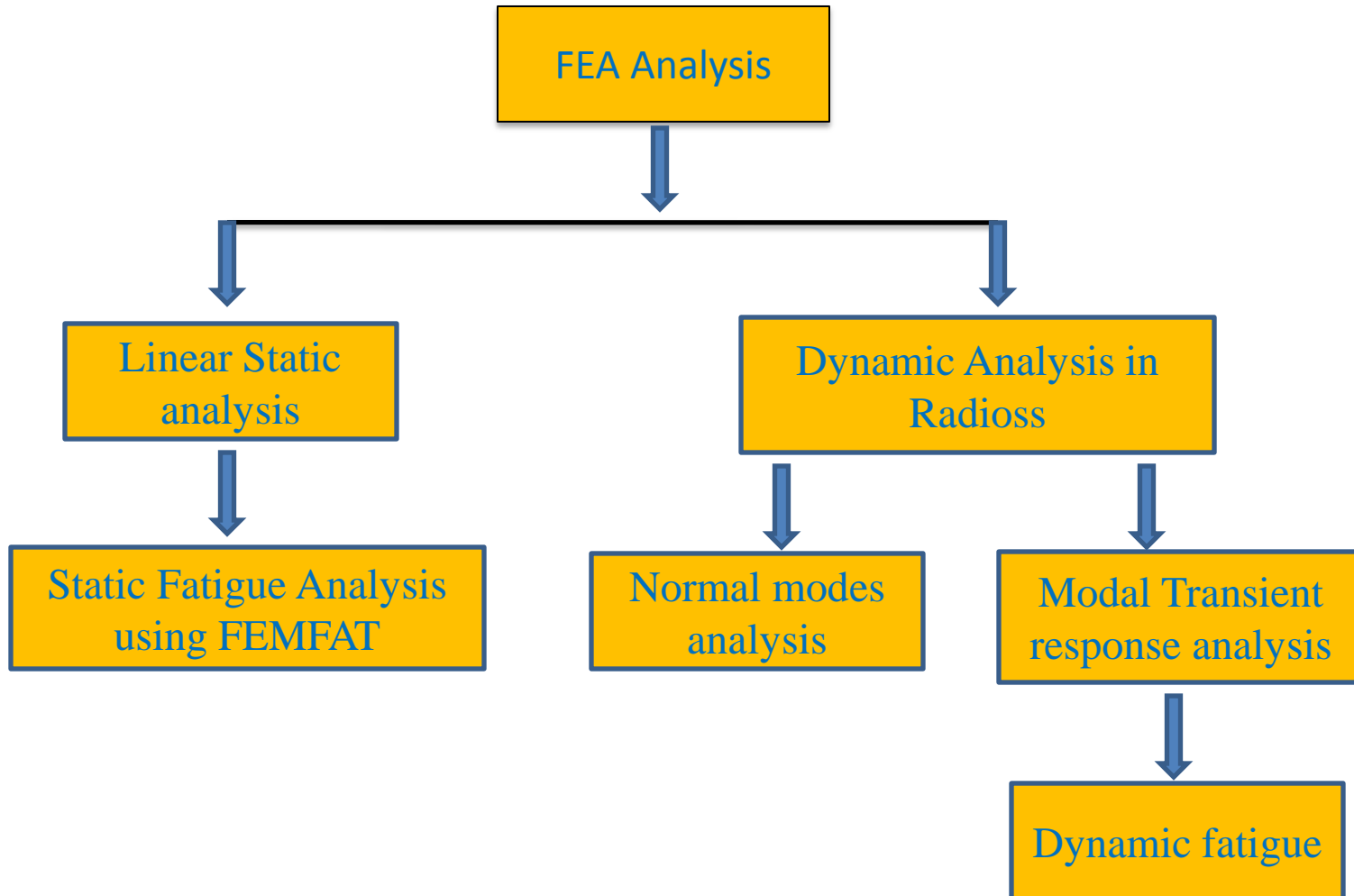


FAILURE ZONE SIMULATED IN FEA



Vertical sheet cracked from weld toe

FEA METHODOLOGY

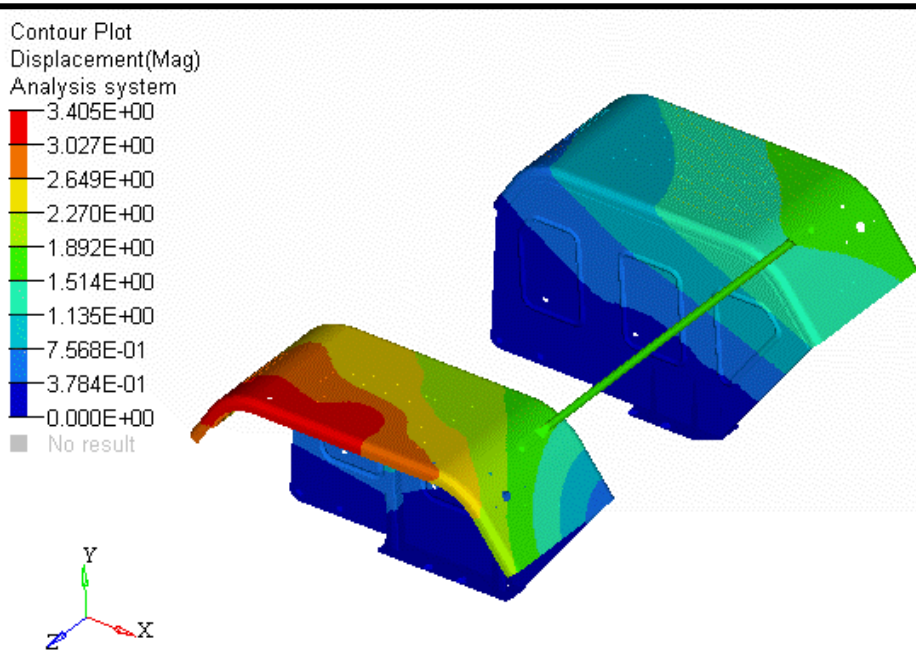


PREPROCESSING

1. Mid surface extraction for Mudguard assy .
2. Shell meshing for Mudguard & connection member
3. Spot welding connections (via beam elements) as per FEMFAT guidelines
4. Arc welding connections (via shell elements) as per FEMFAT guidelines
5. Bolted joint via beam and rigid technique
6. Base plate + base rubber pad + Back rest via hex elements.

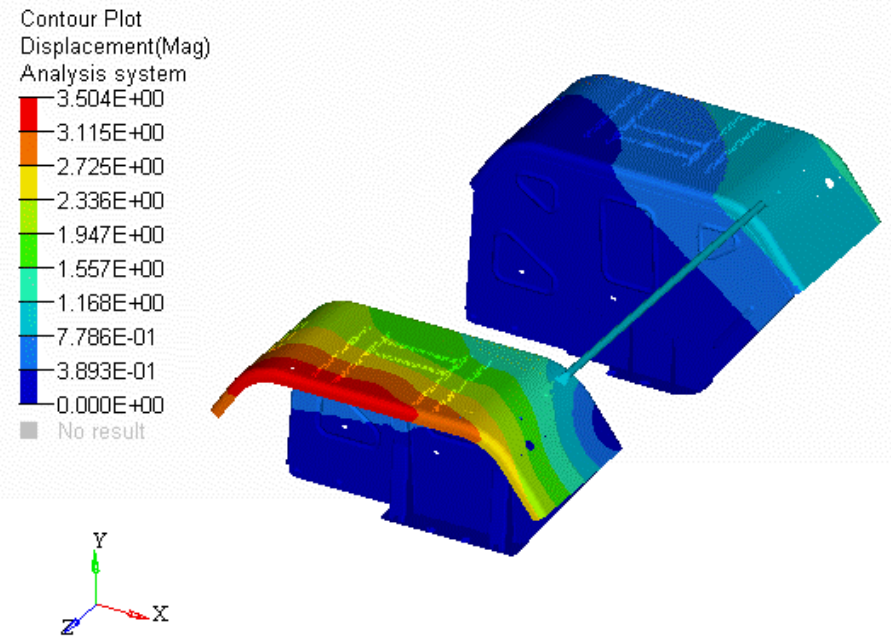
Animation: Load on One Side

Original Design
"Box Stiffener"



Maximum Displacement – 3.40mm

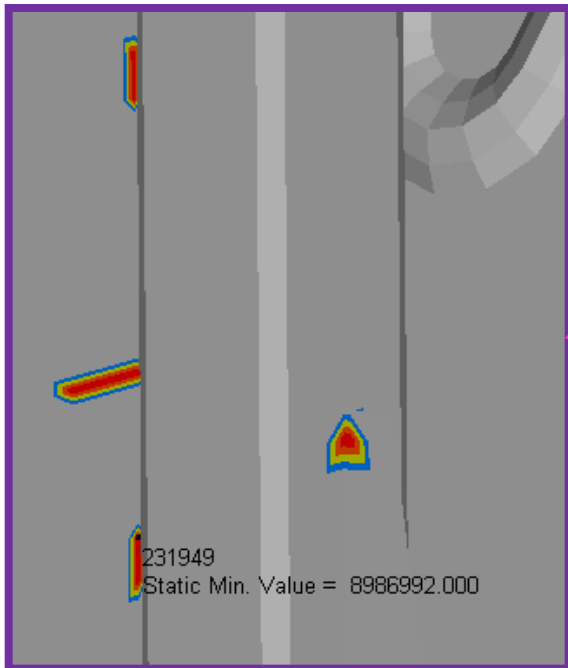
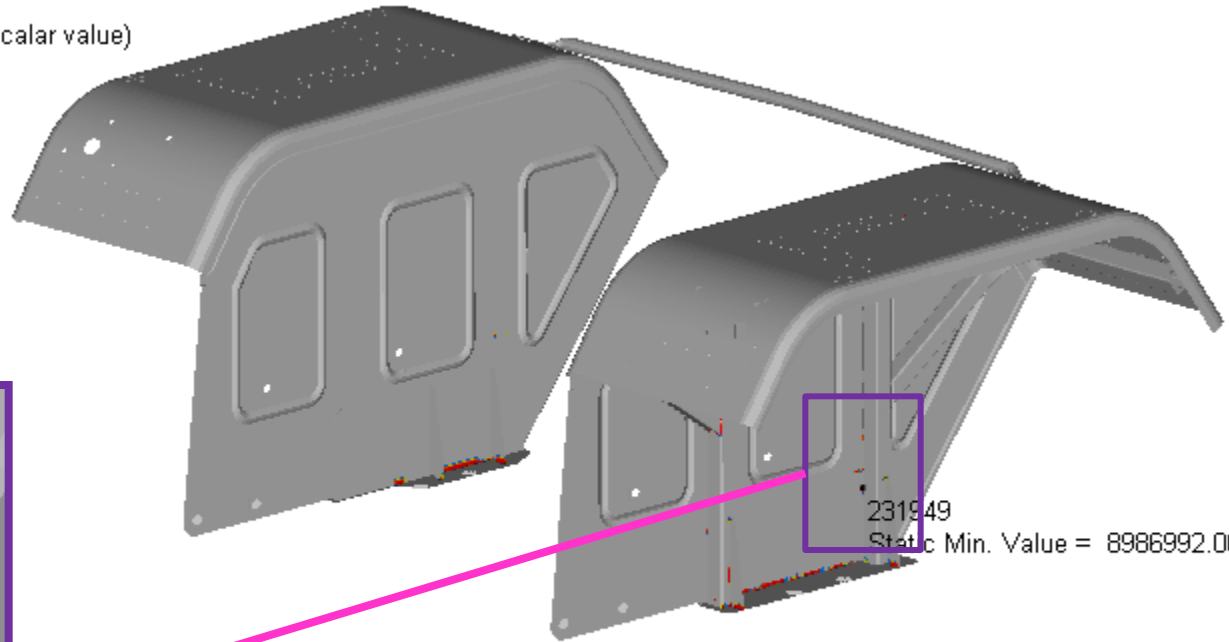
Modified design
"Hat Stiffener"



Maximum Displacement – 3.50mm

Fatigue Life : Original Design (One Side Load) Max. Location 1

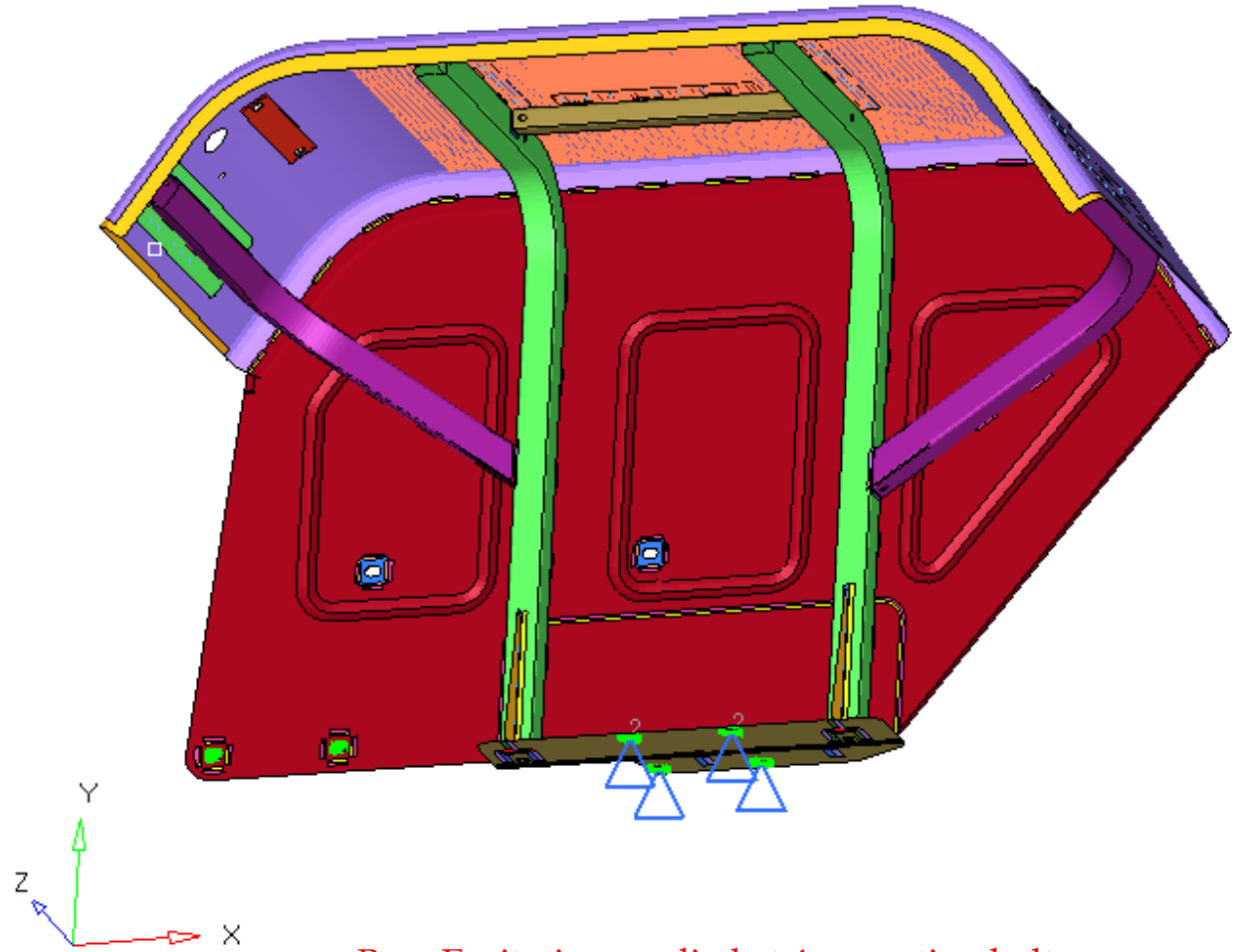
Contour Plot
1. 1/Damage(Scalar value)
8.987E+06
2.000E+19
4.000E+19
6.000E+19
8.000E+19
1.000E+20
No result
Max = 1.000E+20
Min = 8.987E+06



Life - 8.99e+06 cycles

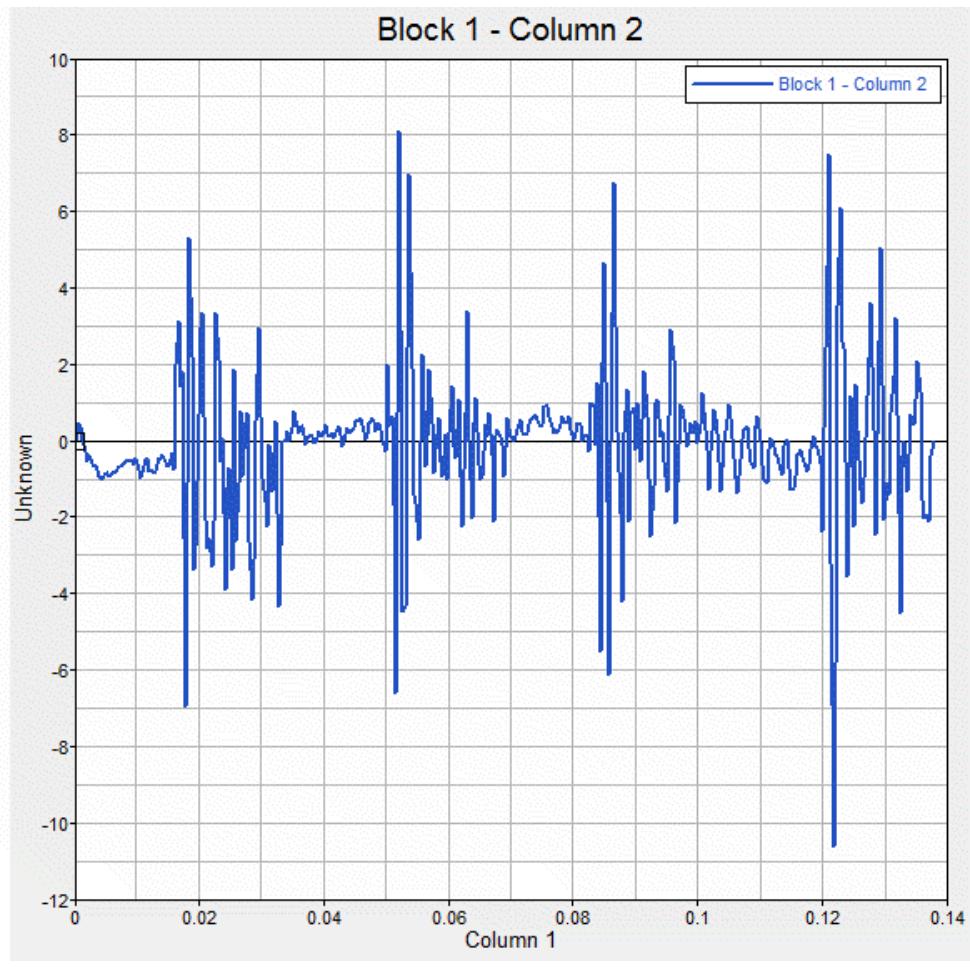
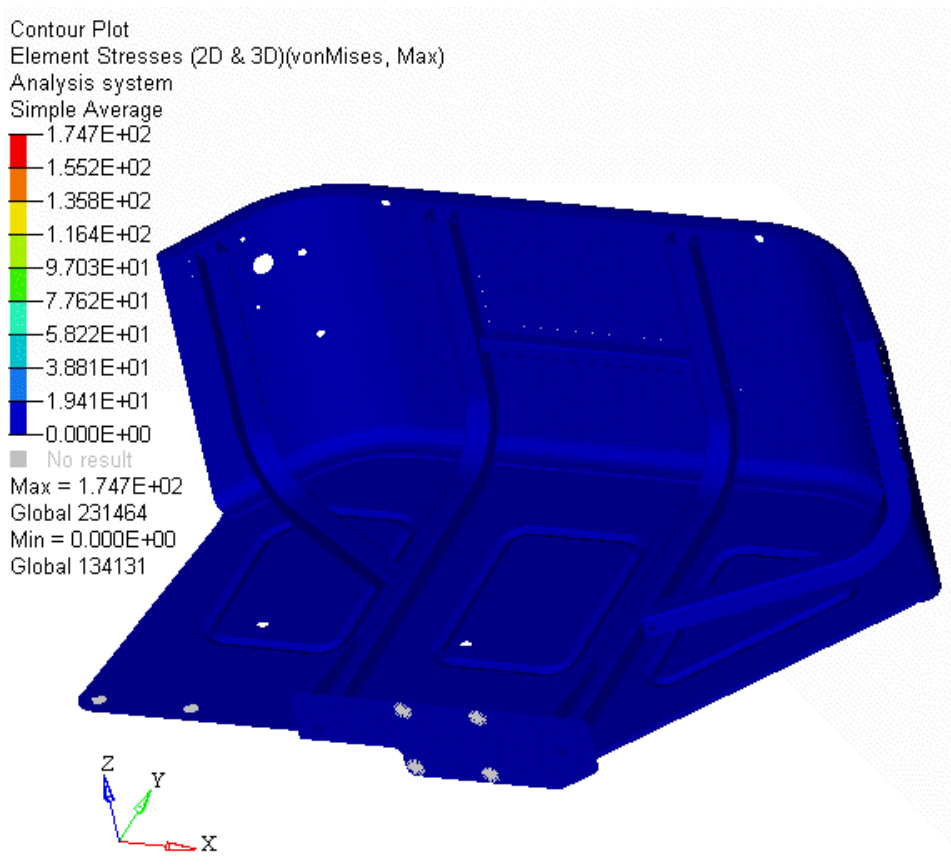
LOAD & BOUNDARY CONDITION – ORIGINAL DESIGN

Load case: 1. $Y = 9810 * \text{Excitation}$



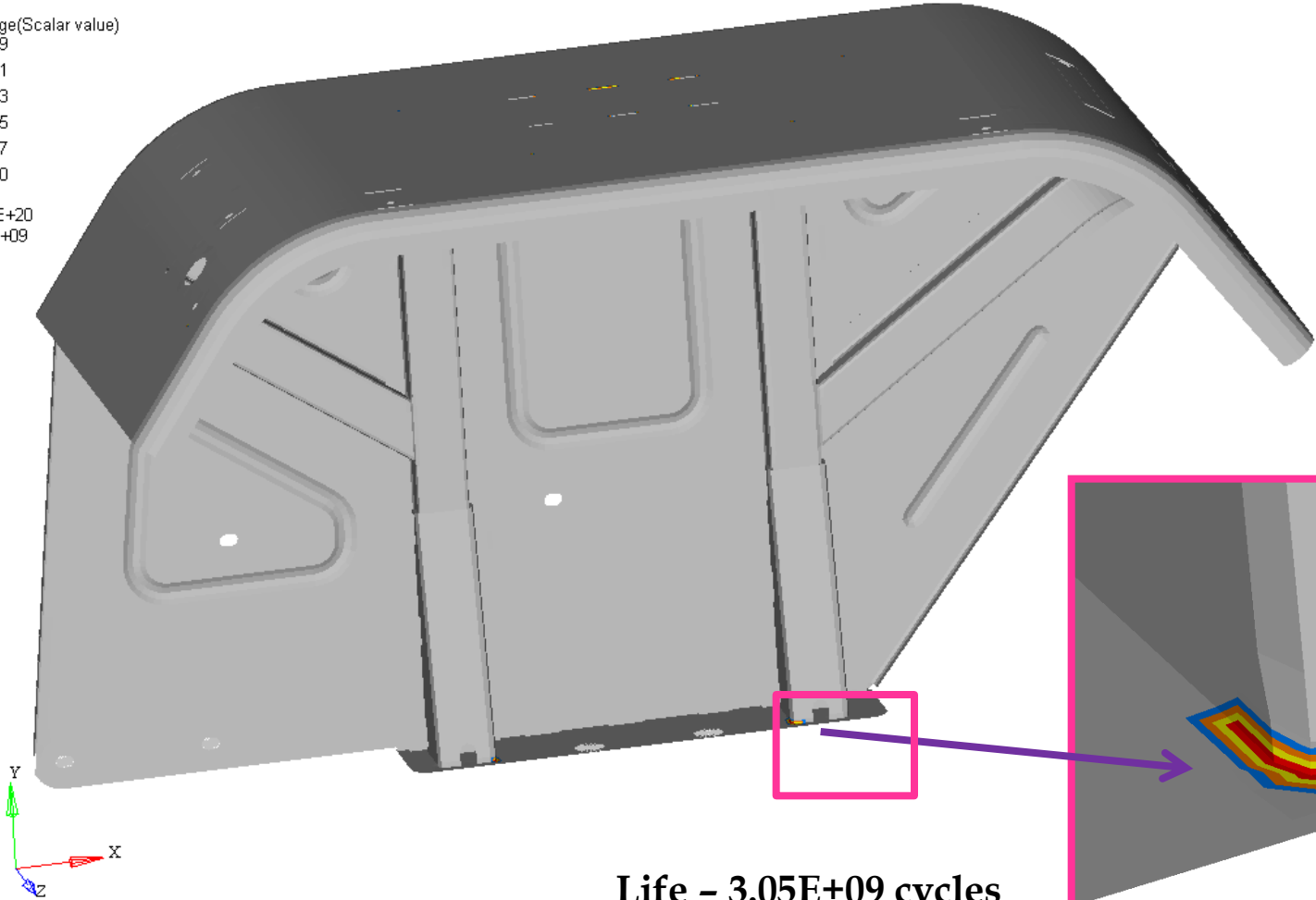
Base Excitation applied at 4 mounting bolts

Dynamic Analysis : Acceleration plot for Original Design model



FATIGUE ANALYSIS : MINIMUM LIFE – NEW MODEL

Contour Plot
1. 1/Damage(Scalar value)
3.047E+09
2.000E+11
2.500E+13
3.333E+15
5.000E+17
1.000E+20
No result
Max = 1.000E+20
Min = 3.047E+09



Life - 3.05E+09 cycles

CONCLUSION

- Due to stress reduction by 25% life increased from E^6 to E^9 .
- As a result of it, modified design is much better than existing one which was validated in shaker.
- We developed & validated a process for sheet metal analysis using FEMFAT.