$t2=2b2= (P_{ubmax}*t2)/P_{uLB2}= 37.384x10^3x0.75)/ (49.364x10^3)$ =0.5678 in

Therefore, the same value of P_{uLBmax} would be obtained if the thickness of lug and link reduced to above balanced widths which their thickness reduces to the current geometry.

3.4 Joint Strength

$P_{all}=P_{ubmax}=37.384x10^3$ lbs

Material	*Inconel718-Waspaloy -stellite6-Inconel718*	*2024T351 plate-7075T651plate-Mg bronze-4130 steel*	*2024T351 plate-7075T651plate-Mg bronze- Inconel718*
Load in lbs	37384	37900	37900

3.5 Lug Strength under transverse

$F_{bevl}=K_{tex}*F_{tx}$

$h_{av}=6/(3/n_1+1/n_2+1/n_3+1/n_4)=6/(3/0.110 +1/0.0825+1/0.110+1/0.0825) =0.099$

$n_{av}/D =0.099/1*N=0.99$

$K_{rev}=0.51$

2024T351 plate-7075T651plate-stellite6 -4130 steel	*2024T351 plate-2024T351plate-Mg bronze-4130 steel*	*Inconel718-Waspaloy -Mg Bronze - Inconel718*
26848.84	37900	36056

$F_{bw}=K_{rev}xF_{tx}=0.51x160x10^3=81.6x10^3$ psi

$F_{bey}=Kt_{ey}*F_{ty}=0.51x134x10^3=68.34x10^3$ psi

$P_{twl}=1.304*F_{beyl}*D*T=1.304x68.34x10^3x1x0.5=44.55x10^3$ lbs

3.6) Link Strength under transverse load

$F_{bry}=kt_yxF_{ty}=0.51x101x10^3=51.51x10^3$

$P_{tex}=1.304*Ft_y*D*t=51.51x1.304x1.Nx0.75x10^3=50.37x10^3$ lbs

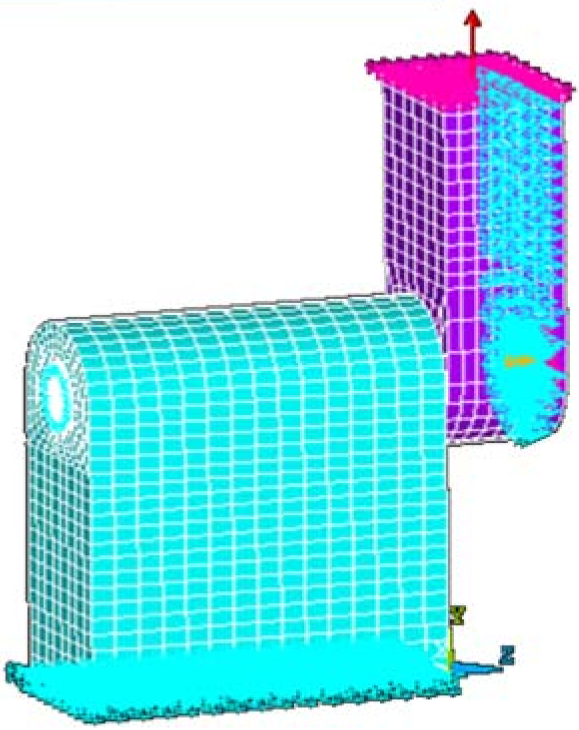

Figure 3: FEA model of LUG JOINT after applying boundary conditions

4. Results &Discussions

From the calculations the following results are obtained

Table-a Allowable Limiting Load of Lug-Link-Bush-Pin

From the above table it is observed that Allowable limiting load of the Double shear Lug joint is 37900 lbs. and all the values for the different combinations are almost nearer values except one combination .i.e. (2024T351 plate-2024T351plate-Mg bronze-4130 steel).It is observed that the values for the three combinations are same even though changing of material in lug and link happened also that is just because of not changing material combination of bush and pin. The following are the vonamises stresses of Inconel718-Waspaloy -stellite6- Inconel718 for limiting load 166292N

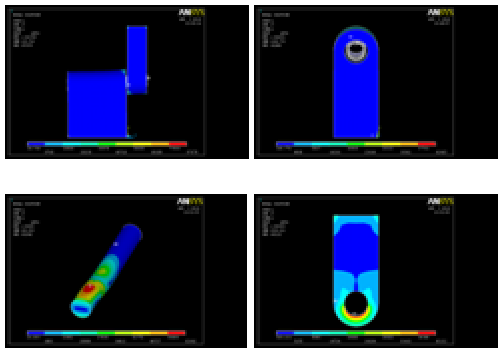

Figure 4: Vonmises stress of double shear lug joint, Lug,Pin,Link

From the above figure it was understood that different colours show the range of stress distribution across the sections of Lug joint. Blue colour indicates minimum stress and Red colour indicates maximum stress. Induced stress is less than allowable stress at Limiting load . So the design is safe. The follwing are the vonamises stresses of 2024T351 plate-7075T651plate-Mg bronze-4130 steel for limiting load 168587 N

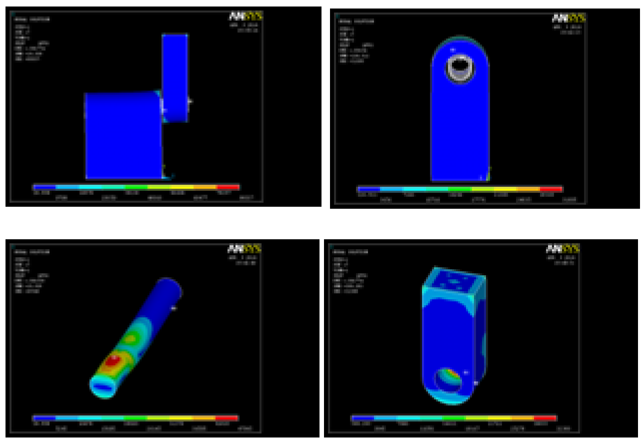

Figure 5: Vonmises stress of double shear lug joint, Lug,Pin,Link

From the above figure it was understood that different colours show the range of stress distribution across the sections of Lug joint. Blue colour indicates minimum stress and Red colour indicates maximum stress. Induced stress is less than allowable stress at Limiting load. So the design is safe. The following are the vonamises stresses 2024T351 plate-7075T651plate-Mg bronze- Inconel718for limiting load 168587 N

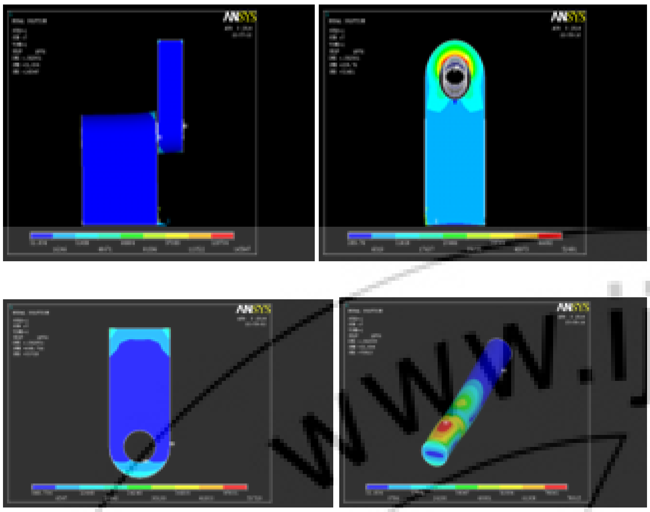

Figure 6: Vonmises stress of double shear lug joint, Lug,Pin,Link

From the above figure it was understood that different colours show the range of stress distribution across the sections of Lug joint. Blue colour indicates minimum stress and Red colour indicates maximum stress. Induced stress is less than allowable stress at Limiting load. So the design is safe. The following are the vonamises stresses of Inconel718- Waspaloy -Mg Bronze -Inconel718 for limiting load 160385 N

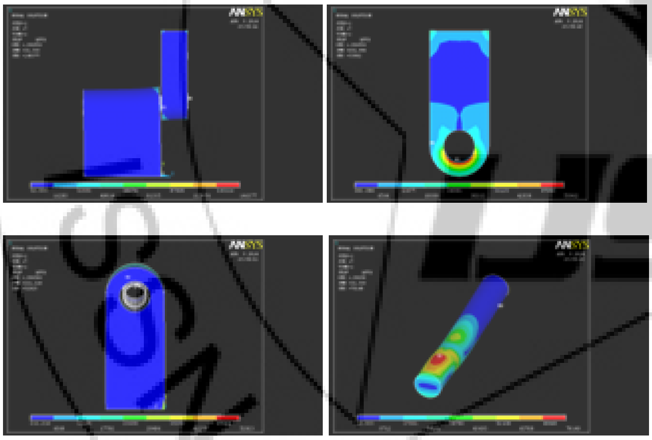

Figure 7: Vonmises stress of double shear lug joint, Lug,Pin,Link

From the above figure it was understood that different colours show the range of stress distribution across the sections of Lug joint. Blue colour indicates minimum stress and Red colour indicates maximum stress. Induced stress is less than allowable stress at Limiting load. So the design is safe. The following are the vonamises stresses of 2024T351 plate-2024T351plate-Mg bronze-4130 steel for limiting load 168587 N

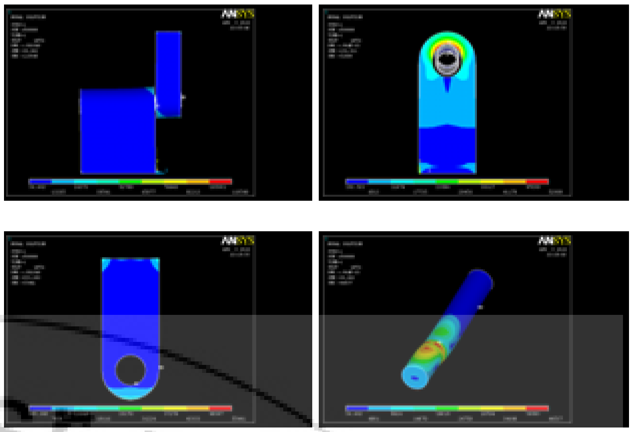

Figure 8: Vonmises stress of double shear lug joint, Lug,Pin,Link

From the above figure it was understood that different colours show the range of stress distribution across the sections of Lug joint. Blue colour indicates minimum stress and Red colour indicates maximum stress. Induced stress is less than allowable stress at Limiting load . So the design is safe. The following are the vonamises stresses of Inconel718- Waspaloy -Mg Bronze -Inconel718 for limiting load 160385 N

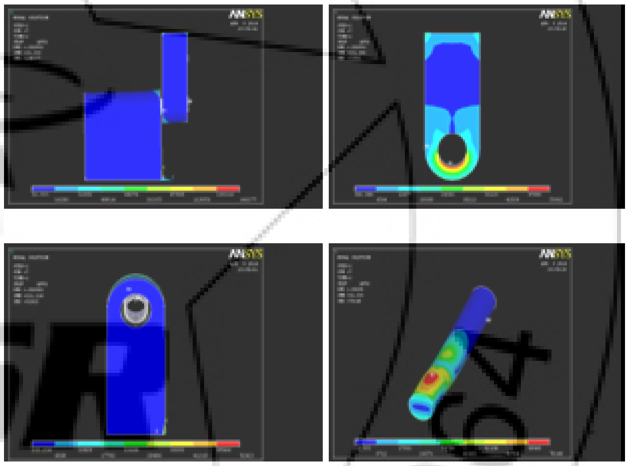

Figure 9: Vonmises stress of double shear lug joint, Lug,Pin,Link

From the above figure it was understood that different colours show the range of stress distribution across the sections of Lug joint. Blue colour indicates minimum stress and Red colour indicates maximum stress. Induced stress is less than allowable stress at Limiting load. So the design is safe

5. Conclusions

1) From the results it is observed that the limiting load is same even though changing of material in lug and link happened also that is just because of not changing material combination of bush and pin, by changing the material combinations of pin and bush the limiting load varying depends on the material properties .So choosing more strength material for pin and bush than lug and link.
2) 2)The allowable limiting load for three combinations is maximum i.e. (2024T351 plate-7075T651plate-Mg bronze-4130 steel),(2024T351 plate-7075T651plate-Mg bronze- Inconel718),(2024T351 plate-2024T351plate-Mg bronze-4130 steel) is 37900lbs.On cost basis Inconel718

and 7075T651 is high than 2024T351,So this combination is better suit for 2024T351 plate-2024T351plate-Mg bronze-4130 steel is better suit for the geometry in strength wise as well as cost wise.

6. Acknowledgment

The authors are thankful Friends and Family members who support, guide and encouraged us for completion of work.

7. Nomenclature

Fbeu = Lug Ultimate Bearing Stress (psi)
Fbey = Lug Yield Bearing Stress (psi)
Ftu = Ultimate Tensile Strength (psi)
Fty = Yield Tensile Strength (psi)
Fbeu = Allowable Ultimate Bearing Stress (psi)
Fbey = Allowable Yield Bearing Stress (psi)
Ftu = Ultimate Tensile Stress (psi)
Fnu = Allowable Lug Net-Section Tensile Ultimate Stress (psi)
Fny = Allowable Lug Net-Section Tensile Yield Stress (psi)
Fbey = Allowable Bearing Yield Stress for Bushings (psi)
Fcyb, = Bushing Compressive Yield Stress (psi)
Fbeub, = Allowable Bearing Ultimate Stress for Bushings (psi)
Fsu,p = Ultimate Shear Stress of Pin Material
Ftu,p = Pin Ultimate Tensile Strength (psi)
Pnu = Allowable Lug Net-Section Ultimate Load (lb)
Pu,B = Allowable Bushing Ultimate Load (lb)
Pu,LB = Allowable Lug/Bushing Ultimate Load (lb)
Pus,p = Pin Ultimate Shear Load (lb)
Pub,p = Pin Ultimate Bending Load (lb)
Pub,p,max = Balanced Design Pin Ultimate Bending Load (lb)
Pall = Allowable Joint Ultimate Load (lb)
K_1 = Allowable Load Coefficient
Kn = Net-Section Stress Coefficient
kbp = Plastic Bending Coefficient for the Pin
a = Distance from the Edge of the Hole to the edge of the Lug (in)
b = Effective bearing Width (in)
D = Hole Diameter (in)
Dp = Pin Diameter (in)
E = Modulus of Elasticity (psi)
e = Edge Distance (in)
g = Gap between Lug and Link (in)
h1..h4 = Edge Distances in Transversely Loaded Lug (in)
hav = Effective Edge Distance in Transversely Loaded Lug (in)
tlug = Lug Thickness (in)
tlink = Link Thickness (in)
wlug = Lug Width (in)
wlink = Link Width (in)
ε = Strain (in/in)

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