Fatigue Life Simulation and Experiment of 2024 Aluminum Joints with Multi-fasteners Interference fit

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Using ABAQUS software, a three-dimensional finite element model of 2024-T351 aluminum hi-bolted joint was established. Hi-bolts installation and pre-tightening force applied were simulated, then distal alternating load on middle plate of the joint. Fatigue life were were predicted with FE-SAFE soft, and verified by experiment. The simulation results show that the middle plate is the weakest plane in the plates of joint. Fatigue life is longer with 0.08-0.11mm interference than others,and the longest with 0.11mm interference. While fatigue test results show that failure origins from the middle plate and the fatigue life is higher with 0.08-0.14mm interference. The highest fatigue life is with 0.11mm interference. The curve trend of fatigue life is the same from simulation and test.

Keywords: hi-bolt,interference,bolt joint,2024-T351,pre-tightening force,fatigue life,failure

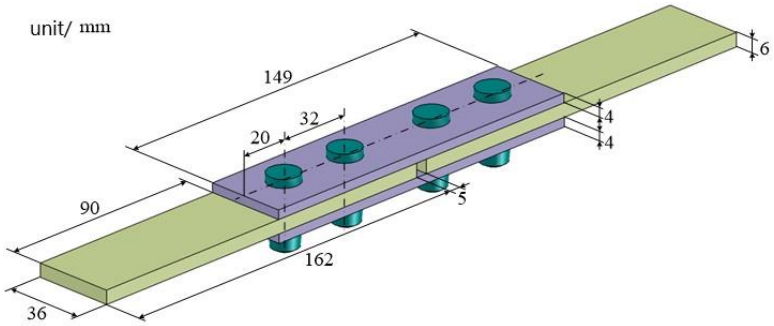

Figure 1. Double lap joints with 4 plates and 4 hi-bolts.

Table 1. Interferences with hole diameter.

No.	Hole diameter/mm	Interference/mm
1	7.925	0
2	7.875	0.05
3	7.845	0.08
4	7.815	0.11
5	7.785	0.14

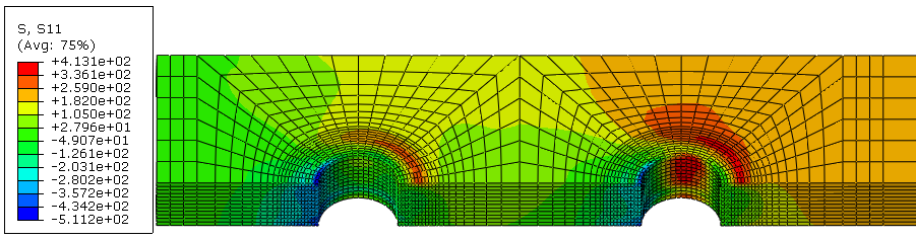

Figure 2. Stress distribution of middle plate.

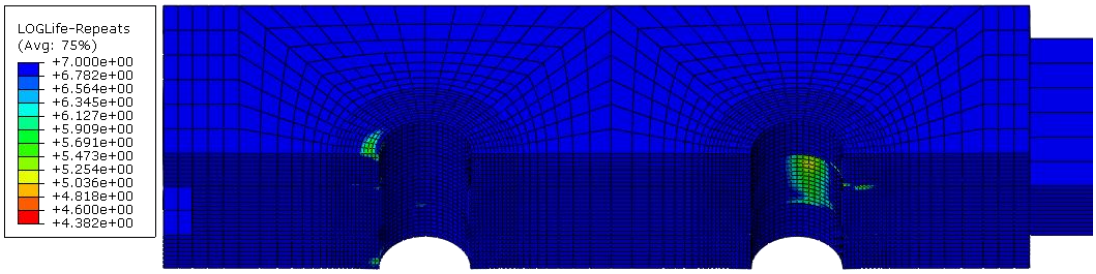

Figure 3. Fatigue nephogram with 0.11mm interference.