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# Investigation on the Fatigue under Multiple Repeated Stresses in Two Stress Levels on Large Specimens with Press Fitted Flange

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The purpose of the present study is to determine the influence of the stress under the endurance limit on the fatigue strength.

The cumulative fatigue test was carried out by using large mild steel specimens of 140 mm diameter under the multiple repeated stresses in two stress levels,  $\sigma_h$  higher and  $\sigma_l$  lower and the former was varied and the latter was remained constant 6 kg/mm<sup>2</sup>. The repeated number's ratio  $\sigma_h : \sigma_l$  of one ratio is 1 : 1. And the test for 1 : 7 is being proceeded. The test concerning  $\sigma_h = 10$  kg/mm<sup>2</sup> has finished.

The author drew *S-N* curves with respect to the total number of cycles by  $\sigma_h$  only neglecting that by  $\sigma_l$ . As the results the following remarkable conclusions were found ;

1. Press-fitted specimens have two different endurance limits within the regions of larger and smaller stresses respectively : that is 11kg/mm<sup>2</sup> and 9kg/mm<sup>2</sup>, where the latter agrees with the endurance limit of the fatigue test under the constant stress.

2. The fatigue life for the region of  $\sigma_h \geq 11$  kg/mm<sup>2</sup> increased, while that for the region of  $11 \text{ kg/mm}^2 > \sigma_h \geq 9 \text{ kg/mm}^2$  decreased.

3. The fracture of specimens of which the fatigue life increased occurred inside of the flange, but that of which decreased did at the entrance of the flange.

4. The result for repeated number's ratio for 1 : 7 fell down on the *S-N* curve for the ratio 1 : 1.

5. As these results it is found that the mechanism in the region of  $\sigma_h \geq 11$  kg/mm<sup>2</sup> is different from that in the region of  $11 \text{ kg/mm}^2 > \sigma_h \geq 9 \text{ kg/mm}^2$ .

Whereas the author made the stress analysis at the press fitted part with the photoelastic model of epoxy resin sandwiched by acrylite by using immersion method.

These results are summarized as follows ;

1. The stress concentration factor amounts about 1.3—1.5 at compression side of press-fitted part. The stress at tension side is not so concentrated and decreases proportionally from the entrance to the end of press fitted part.

2. When there exists a slight space between the flange and the specimen at the entrance of press fitted part, the stress concentrated location moves inside of the flange.

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