

CHAPTER 8: FATIGUE

8.1 GENERAL

It shall be in accordance with JSCE Standard Specification (Design), 8.1.

[COMMENT]: As with steel reinforcement, CFRM requires verification of fatigue sustained due to repeated tensile stress. Unlike steel, however, CFRM shows significant loss of strength due to secondary stress, and this point must be properly allowed for in examining the fatigue limit state. Tensile or shear reinforcement at intersections with shear cracks is more liable to undergo fatigue failure. Loss of fatigue strength in tensile reinforcement is not normally considered in conventional steel reinforced concrete members, but it must be allowed for in CFRM.

8.2 VERIFICATION OF FATIGUE

It shall be in accordance with JSCE Standard Specification (Design), 8.2.

[COMMENT]: As with steel reinforcement, verification relating to fatigue in CFRM is done by comparing design fatigue strength and design variable stress.

8.3 DESIGN VARIABLE SECTION FORCE AND EQUIVALENT NUMBER OF CYCLES

It shall be in accordance with JSCE Standard Specification (Design), 8.3.

[COMMENT]: Miner's hypothesis is thought to be applicable to CFRM as to steel, therefore the number of cycles equivalent to the design variable section force may be calculated in the same manner as for steel. In this case, though, the $S-N$ curve for the fatigue strength of the CFRM is needed.

8.4 CALCULATION OF STRESS DUE TO VARIABLE LOAD

(1) Tensile stress in CFRM used for tensile reinforcement may be calculated according to section 7.2.

(2) Stress in CFRM used for shear reinforcement may be calculated following JSCE Standard Specification (Design), 8.4(3) for steel shear reinforcement. The shear capacity V_{cd} of concrete without shear reinforcement shall be calculated according to Eq. (6.3.2) of the present recommendation.

(3) Stress of steel and concrete shall be calculated according to JSCE Standard Specification (Design), 8.4.

[COMMENTS]: (1), (2) Stress in CFRM may be calculated in the same way as for steel reinforcement,

although the shear capacity V_{cd} of concrete without shear reinforcement, which is required for the calculation of stress in shear reinforcement, must be calculated according to Eq. (6.3.2) of the present recommendation, as the calculations differ from those for steel.

8.5 DESIGN SHEAR FATIGUE CAPACITY OF MEMBERS WITHOUT SHEAR REINFORCEMENT

Design shear fatigue capacity of flexurally reinforced members without shear reinforcement may be calculated following the provisions for steel reinforced concrete members given in JSCE Standard Specification (Design), 8.5, where V_{cd} and V_{pcd} shall be calculated according to Eqs. (6.3.2) and (6.3.8) of the present recommendation respectively.

[COMMENT]: Design shear fatigue capacity of members without shear reinforcement may be calculated as for steel reinforced members, although the static shear capacity for these calculations when applied to CFRM must be obtained from the equations given in the present recommendations.