International Journal of Research Publication and Reviews

Journal homepage: www.ijrpr.com ISSN 2582-7421

Numerical Study of Steel Fiber Reinforced Concrete

Dnyandip Dhore, Suraj Appalwar, Prachi Tembhurne, Aditya Kuradkar, Abhishek Doifode, Asst.Prof . V.S. Vairagade

Department of Enginerring ,Priyadarshini collge of Engineering ,Nagpur

A B S T R A C T

In this design we're study filaments, effect of filaments in concrete volume of filaments, aspect rate of filaments, we study different types of filaments, we study on sword fiber and rate of sword filaments,, we're calculate the straingth using numerical analysis system in that regreation analysis system calculating different strength using long fiber and short filaments in different portion, calculated from the stress response for 0(control),0.5,0.75, and1.5 SFRC member which served the base for the defined moment- gyration geste and FEA. A many- point bending test was conducted on a two- span ray using a native material model in the FEA software package, ANSYS. The concrete damage malleability(CDP) model was used to conduct a relegation controlled analysis on the completely integrated 3D element. The numerical study revealed that the flexural geste, bending capacity, gyration capacity, and rigidity of the 0,,1.0, and1.5 SFRC shafts were significantly enhanced than the 0 SFRC ray. Still, as sword fiber volume increased, the volume of moment redivision in the SFRC beam dropped. The quantum the ANSYS and experimental results only were estimated. From analysis it's plant that distortion is13.145 mm for 0,11.009 mm for0.5,9.721 mm for1.0, and2.2575 mm for1.5

1.Introduction

Computer perpetration of finite rudiments and result procedures for engineering analysis is addressed. The end product is a general- purpose finite element analysis program. For similar software to be used as an effective CAE tool, the programming should be tackle independent. The chosen finite rudiments and numerical styles must be accurate and dependable.

1.1. Objective

To compare numerical simulation with the experimental data.

To find out stress pattern in circular SFRC block using numerical simulations.

To check impact resistance of concrete against the first crack initiation and final fracture.

1.2. Methodoly

Step 1:: Creation of material

First step in any analysis is to define a material. In this study, material is concrete and steel fiber.

The Concrete properties are given below:

ρ =2300 kg/m^3, young's modulus E= 25 GPa, Poisson's ratio =0.2

The steel fibers properties are given below:

ρ =7800 kg/m^3, young's modulus E= 2 GPa, Poisson's ratio =0.3

author@institute.xxx

Step 2:**Creation of model**

After defining material, two model was created in Ansys Design modeler as per drawing specify in IS 516:1959The drop weight presented in above diagramed was a sphere of stainless steel of diameter 35mm. The self-weight of the material in the drop weight was altered so that the total weight remained the same as for the drop weight used in the experiment. This adjustment is considered to have negligible effects on the result.

Step 3: Calculation for without and with Steel Fiber

Beam of size – 0.15*0.15*0.700 =0.01575mm3

Length of Fiber = 30mm

Weight of Fiber = 0.185kg

Unit weight of concrete =7850kg/m3

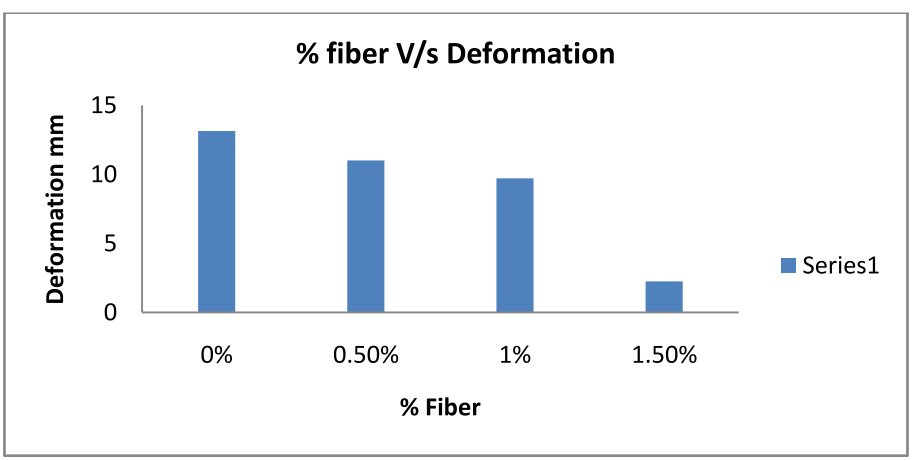
Calculation of without steel fiber (0%)
Steel fiber calculation for 0% =unit wt. of concrete *wt. of fiber *beam of size

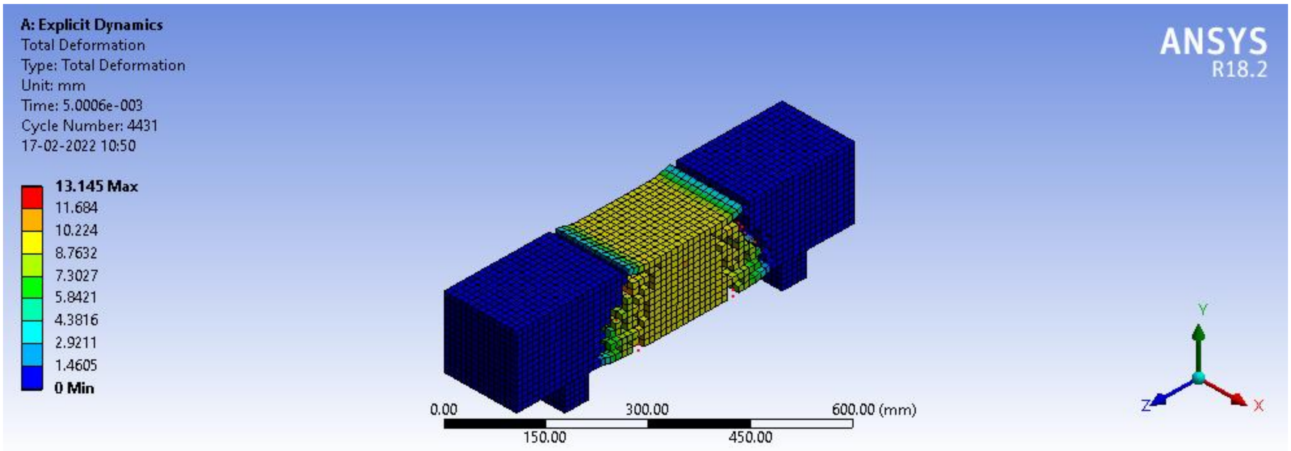
RESULT AND DISUSSIONS

In this chapter, the results from the different analytical models evaluated, compared and discussed. The response of the different analyses could be compared in many different ways, but to get consistency, three different key responses were chosen; the total deformation, Von-mises stresses and crack pattern on top and bottom surface at different time steps and the displacement over the length of the beam at different time steps *u(x)*. Each of these responses is evaluated and discussed in the sections below. Not all analyses could be evaluated for the different key-responses, however. Here the ANSYS and experimental results only were evaluated.

1. Effect of % fiber on deformation

From analysis it is found that deformation was maximum in simple concrete beam whereas minimum in 1.5 % fiber reinforcement concrete.

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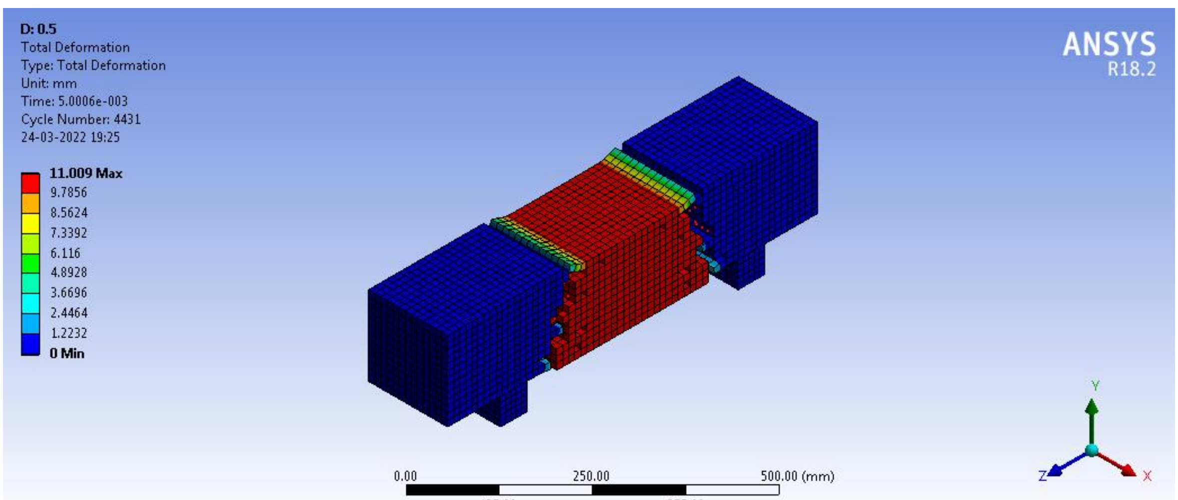
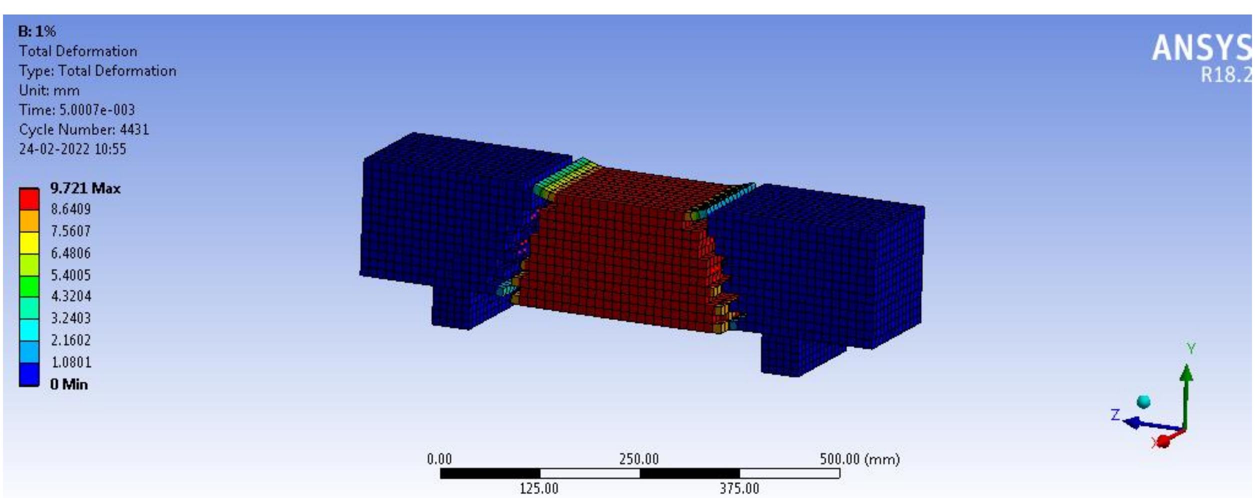
Total Deformation
Type: Total Deformation
Unit: mm
Time: 5.0006e-003
Cycle Number: 4431
17-02-2022 10:50
13.145 Max
11.684
10.224
8.7632
7.3027
5.8421
4.3816
2.9211
1.4605
0 Min
ANSYS
R18.2
0.00
300.00
600.00 (mm)
150.00
450.00
Y
Z
X

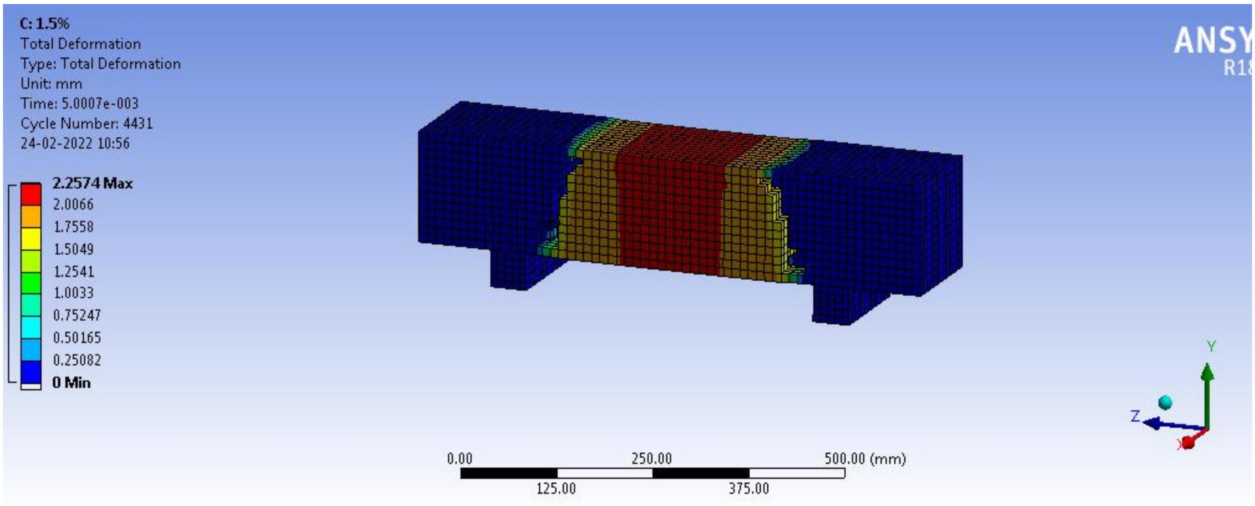
0%


D: 0.5
Total Deformation
Type: Total Deformation
Unit: mm
Time: 5.0006e-003
Cycle Number: 4431
24-03-2022 19:25
11.009 Max
9.7856
8.5624
7.3392
6.116
4.8928
3.6696
2.4464
1.2232
0 Min
ANSYS
R18.2
0.00
250.00
500.00 (mm)
Y
Z
X

0.5 %


B: 1%
Total Deformation
Type: Total Deformation
Unit: mm
Time: 5.0007e-003
Cycle Number: 4431
24-02-2022 10:55
9.721 Max
8.6409
7.5607
6.4806
5.4005
4.3204
3.2403
2.1602
1.0801
0 Min
0.00
250.00
500.00 (mm)
125.00
375.00
Y
Z
X

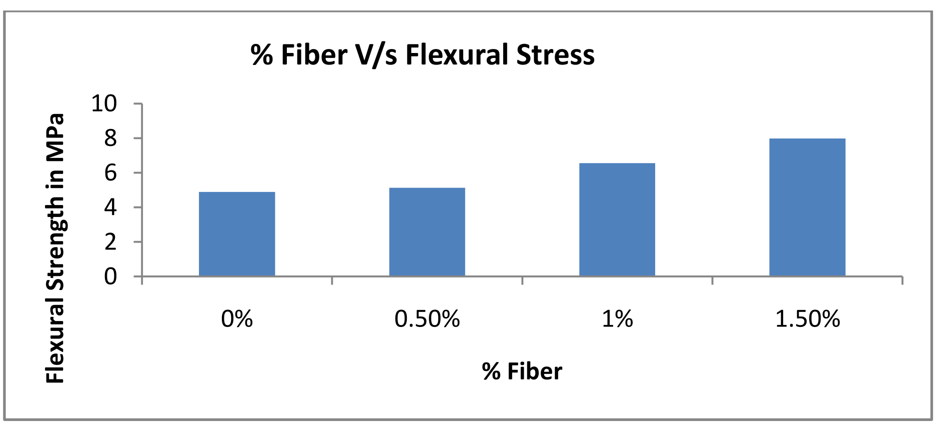
1.0 %

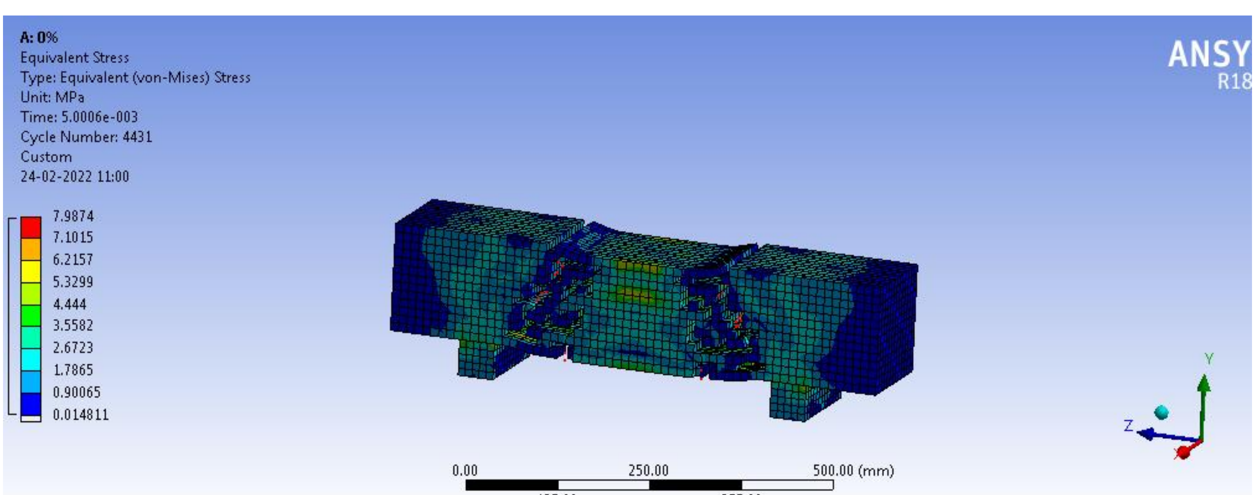


1.5 %

2. Effect of % fiber on Flexural stress

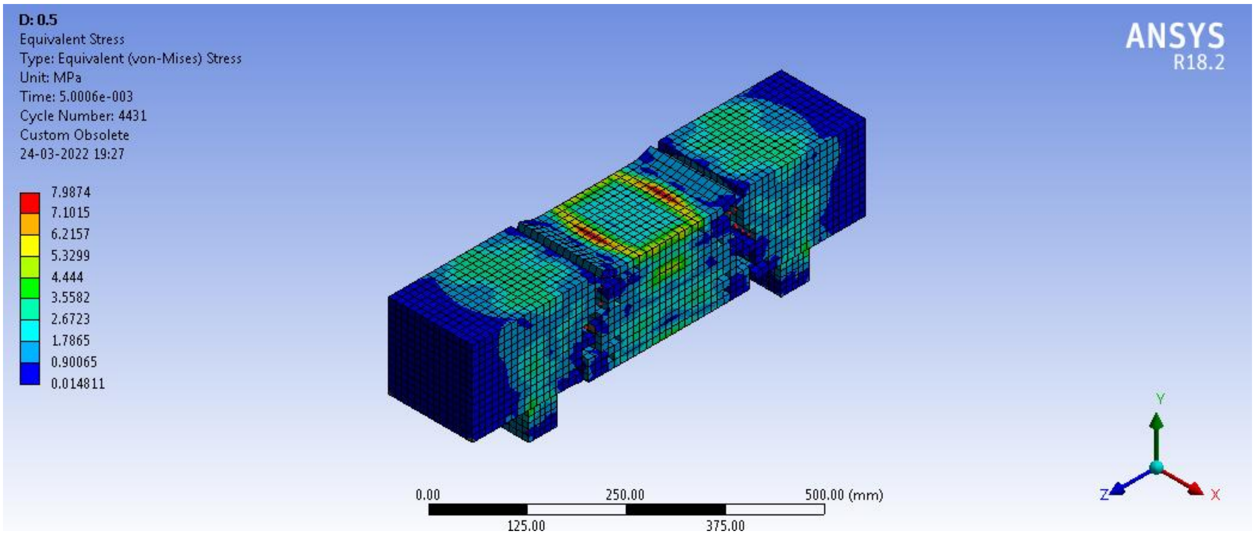
From analysis it is found that flexural strength was minimum in simple concrete beam whereas maximum in 1.5 % fiber reinforcement concrete.



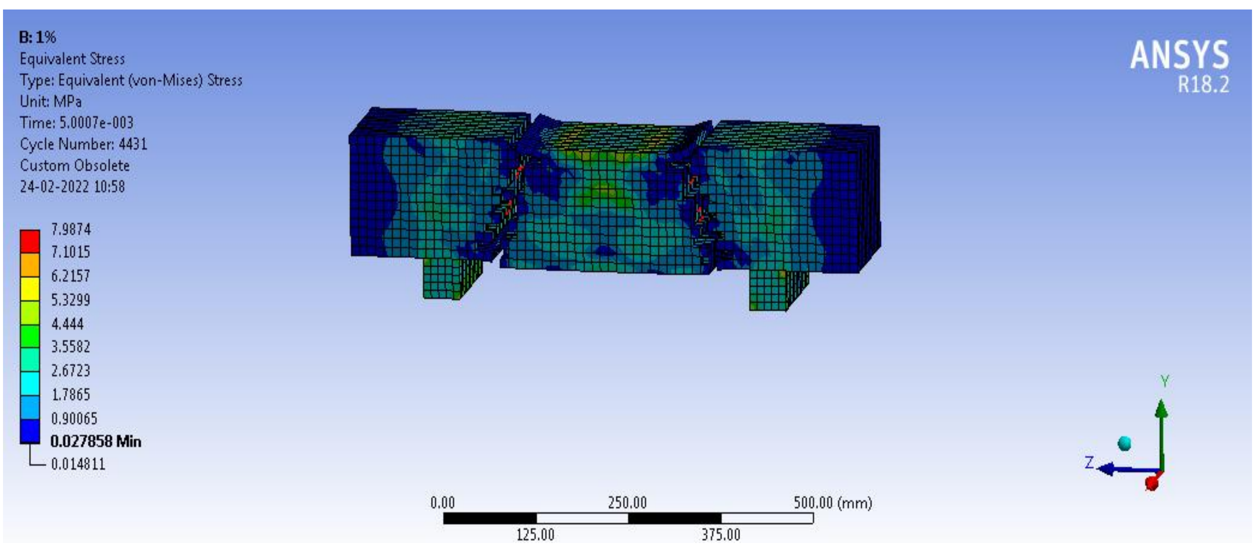


0%

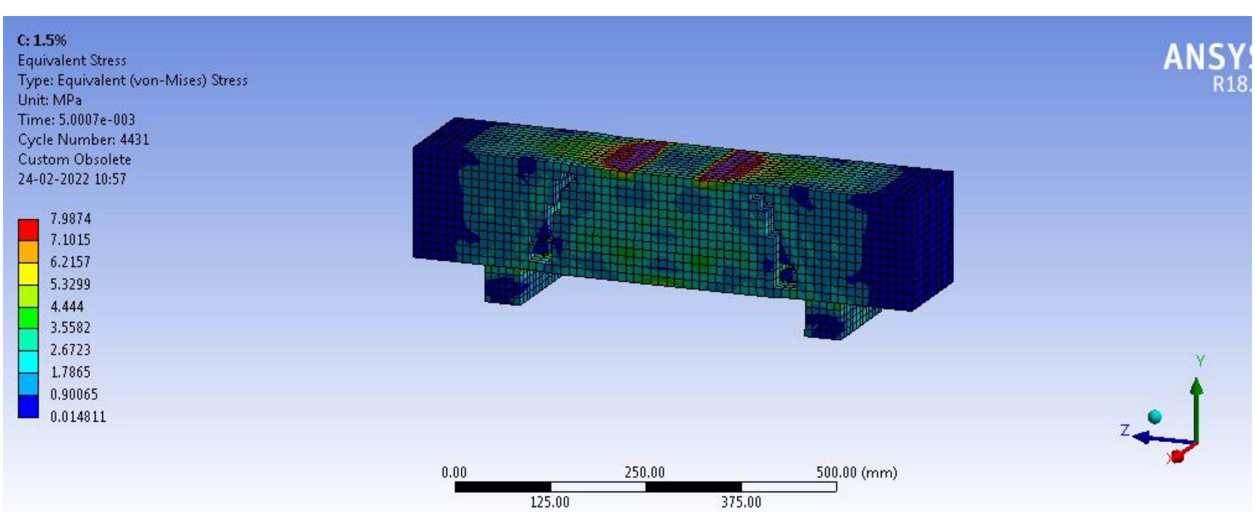
 International Journal of Research Publication and Reviews, Vol 3, no 5, pp 3074-3079, May 2022



0.5 %



1.0 %



1.5 %

CONCLUSION

The sword fibre generation program developed by ANSYS is fast and effective, and the generated sword fibres are slightly and aimlessly distributed within the matrix range, and the entire concrete matrix is covered.

The concrete uses a total strain crack model, which can reflect the mechanical characteristics of concrete, especially the circumstance and development of cracks. The sword fibre is defined as a rebar element, which can realise the automatic coupling between the sword fibre and the concrete substrate.

The bond- slip characteristics of sword fibres are original with an ideal elastoplastic model, which can snappily realise modelling and computation, and can well reflect the mechanical characteristics of SFRC strength and rigidity;

The SFRC meso- scale model can well reflect the stress changes of sword fibres during lading. The structural failure medium can be explained grounded on the changes in sword fibre stress.

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