

Fiber Section Description

FSEC

as many lines as required for each fiber section as specified below
 terminate FSEC block with blank line

For each fiber section

SectID

Npatch, OrigShft

MatID, ShapePatch, Mgrid, Ngrid, Mprop, Nprop

y1, z1 or yC, zC

y2, z2 or R1, R2

y3, z3 or ϕ 1, ϕ 2

y4, z4 or not used

repeat Npatch times, if Npatch > 0

fiby, fibz, fibA, MatID

repeat |Npatch| times, if Npatch < 0

Nlayer

StlID, ShapeLayer, NoBars, SizeBar, AreaBar

yL1, zL1 or yLC, zLC

yL2, zL2 or RL

not used or ϕ L1, ϕ L2

repeat Nlayer times

Nsensor

snry, snrz, snrmat

repeat Nsensor times

blank line terminates FSEC block

Definitions:

SectID	Fiber Section ID ¹
Npatch	Number of quadrilateral or circular fiber patches for cross section description (Npatch > 0) OR Number of individual fibers (Npatch > 0) ²
OrigShft	= 0 : reference axis of the cross section is the geometric centroid = 1 : reference axis of the cross section is the coordinate system used in the input
MatID	material ID for all fibers in the patch ³
ShapePatch	= 1 : quadrilateral patch = 2 : circular patch
Mgrid	Fiber mesh subdivision for side of quadrilateral connecting points 1 and 2 or 3 and 4 OR Fiber mesh subdivision in radial direction for circular patch
Ngrid	Fiber mesh subdivision for side of quadrilateral connecting points 2 and 3 or 1 and 4 OR Fiber mesh subdivision in angular direction for circular patch
Mprop	Proportional growth of fiber dimension from point 1 to point 2 for quadrilateral patch. Proportional growth of fiber dimension from radius $R1$ to radius $R2$ for circular patch. A negative number indicates proportional growth from points 1 and 2 of the quadrilateral patch towards the middle
Nprop	Proportional growth of fiber dimension from point 2 to point 3 for quadrilateral patch. Proportional growth of fiber dimension from angle $\phi1$ to angle $\phi2$ for circular patch. A negative number indicates proportional growth from points 2 and 3 of the quadrilateral patch towards the middle
y1, z1	y- and z-coordinate of point 1 of quadrilateral patch ⁴
y2, z2	y- and z-coordinate of point 2 of quadrilateral patch
y3, z3	y- and z-coordinate of point 3 of quadrilateral patch
y4, z4	y- and z-coordinate of point 4 of quadrilateral patch
yC, zC	y- and z-coordinate of center of rotation for circular patch
R1, R2	Radius 1 and 2 for circular patch ⁵
$\phi1, \phi2$	Angle 1 and 2 for circular patch. Positive angle measurement is counterclockwise from the positive y-axis of the cross section ⁶
Nlayer	Number of straight or circular reinforcing steel layers in section. If $Nlayer=0$ the following input line is not necessary
StID	Material ID of reinforcing layer
ShapeLayer	= 1 : straight reinforcing steel layer = 2 : circular reinforcing steel layer
NoBars	Number of equally spaced bars in reinforcing layer in linear or circular arrangement
Sizebar	U.S. standard size of reinforcing bar. If left blank, the reinforcing bar area is to be specified
AreaBar	Area of reinforcing bar. If left blank, the U.S. standard bar size needs to be specified
yL1, zL1	y- and z-coordinate at starting point of straight reinforcing layer
yL2, zL2	y- and z-coordinate at end point of straight reinforcing layer
yLC, zLC	y- and z-coordinate of center of rotation for circular reinforcing layer
RL	radius of circular reinforcing layer
$\phi L1, \phi L2$	angle to starting and end point of circular reinforcing layer. Positive angle

	measurement is counterclockwise from the positive y-axis of the cross section
Nsensor	Number of sensors in cross section
snry, snrz,	y- and z-coordinate of sensor location. This need not be exact, in which case the sensor monitors the fiber closest to the specified coordinates
snrmat	material ID of the fiber to monitor: if this is specified, the sensor monitors the fiber closest to the specified coordinates with material ID equal to snrmat

Notes:

1. SectID needs to be a unique number, smaller than the maximum number of cross sections allowed by the program. SectID need not be specified in sequence.
2. If Npatch is greater than zero, patch and fiber mesh discretization descriptions follow. If Npatch is smaller than zero, individual fibers can be specified.
3. It is possible to generate “inverse fiber patches” (presently not implemented in FEDEAS).
4. Coordinates of points 1, 2, 3 and 4 of the quadrilateral patch need to be specified in counterclockwise sequence.
5. Radius R1 need not be less than R2. The order should be specified with Mprop in mind, since the proportional fiber growth takes place from radius R1 to radius R2.
6. Angle ϕ_1 need not be less than ϕ_2 . The order should be specified with Nprop in mind, since the proportional fiber growth takes place from angle ϕ_1 to angle ϕ_2 .
7. Sensors are identified in numerical sequence from 1 to Nsensr. The sensor coordinate defaults to the closest fiber coordinate, unless snrmat is supplied in the following line of input, in which case the sensor monitors the closest fiber of snrmat material type.

The maximum number of fiber sections is presently limited to 25. The total number of fibers per section is also presently limited to 200.