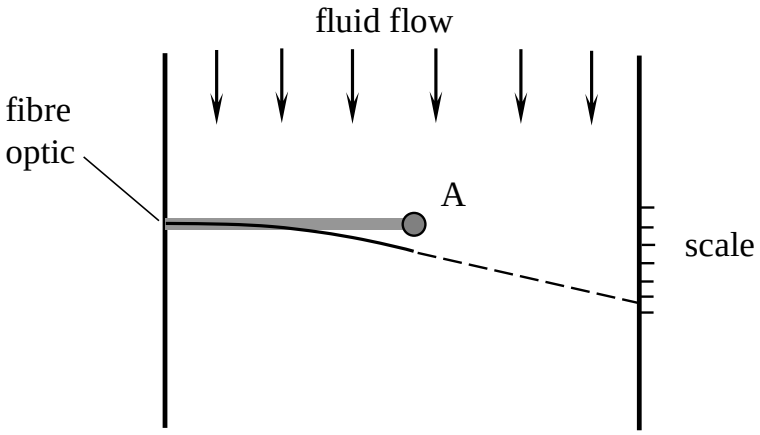
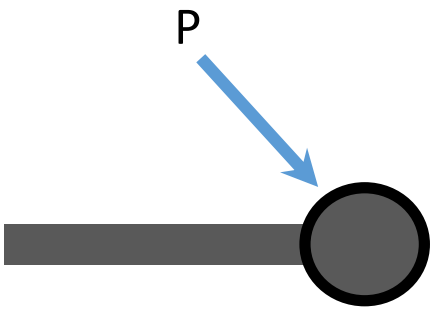
Real problem or a design

An optical fiber 40 mm length and diameter of 3 mm going to installed perpendicular up to the middle of the pipe (position A). Fluid flow causes an optical fibre having distributed load of 2 N/mm. The maximum displacement of the fibre optic is 5 mm. What is the suitable Young's modulus, which can be used for material selection purposes? If the optical beam is used as a measurement tool, what is the distance indicated on the reading skills of the original position before the fluid flow.



At a particular moment, the point A also experience loading P = 5N and twist 10 Nmm as below



Initial information;

Identify the loading, body force, geometries, type of materials, material properties (normally Young Modulus and Poisson ratio).

Other information needed; Maximum strength, Yield stress, Allowable stresses, Safety Factor (SF), stress concentration factor graphs. Other material properties such as thermal expansion coefficient.

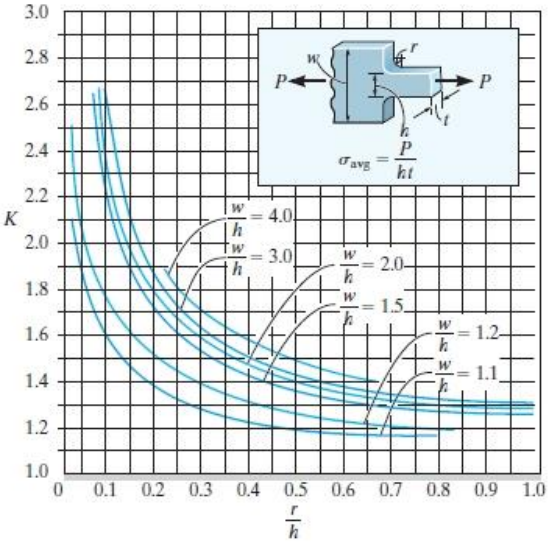


Fig. 4–24

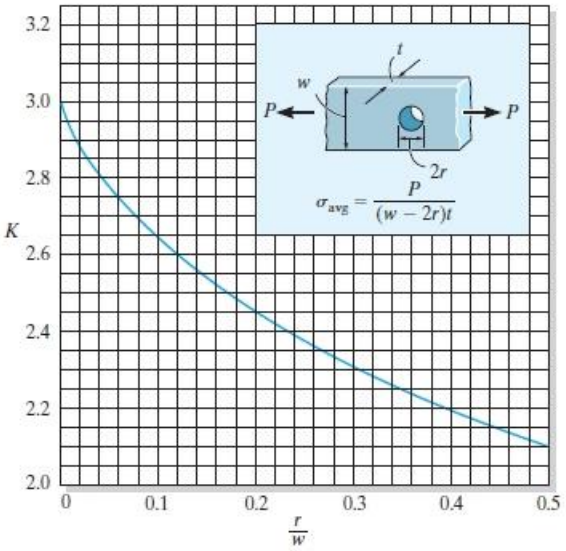


Fig. 4–25

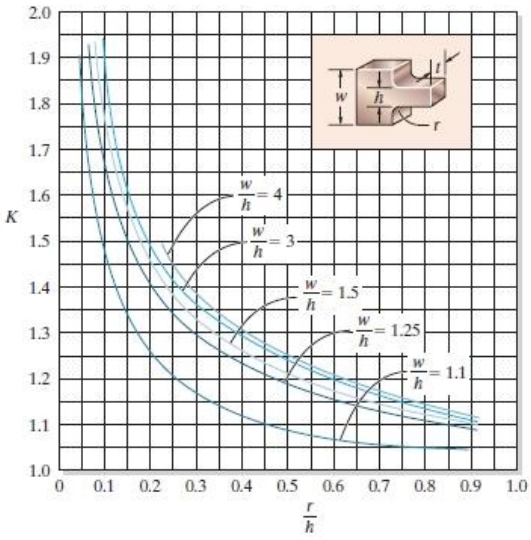


Fig. 6–43

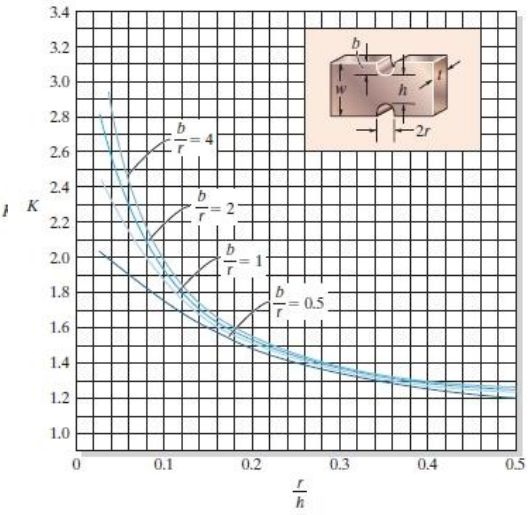


Fig. 6–44

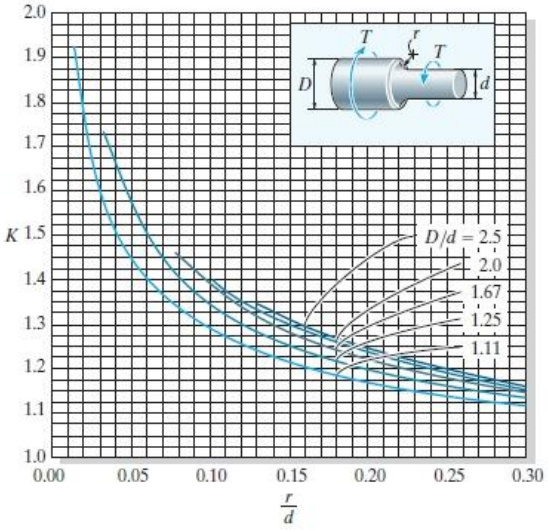


Fig. 5–32

Process of identifying the problem

Define the external load, body force, reaction, internal loading.

Describe the state of stress

Write the important of safety factor.

Convert 200GPa to N/mm^2.

Discuss the important of yielding point

Estimate the Poission ratio of a rubber and a concrete.

Give example of a combined loading

Illustrate the stress concentration of a holes centred rod.

In your own words restate the polar moment of inertia and area moment of inertia.

From your understanding what is composite structures and reinforced concrete beams

Explain the choice of cylindrical and spherical vessels.

Process of calculation, analysis and results

Compute the reaction forces

Prepare the appropriate free body diagram, FBD

Apply the equilibrium equations (balance of forces and balance of moments)

Determine the resultant forces or loading acting on the member of a structure

Compare the internal force, shear force and bending moment.

Correlate the normal or axial stress and shear stress.

Provide the maximum normal stress

Provide the maximum shear stress

Provide the average normal stress, compressive or tension.

Show the displacement or elongation

Determine the normal strain and shear strain.

Discover thermal stress

Discover residual stress

Predict the minimum required diameter, area.

Predict the maximum allowable value of loading.

Determine the required thickness.

Determine the torque applied, shear stress and angle of twist of a rod

Determine the required diameter of a shaft.

Determine the maximum torque and shear stress of a pipe.

Develop the shear and moment diagrams

Establish the Area Moment of Inertia of H structure.

Predict the maximum bending stress

Show the distribution of bending stress

Determine the shear stress during bending

Show the distribution of shear stress

Analyse the circumferential or hoop stress of a pressurised vessel

Analyse the longitudinal or axial stress of a pressurised vessel

Recognise the maximum thickness of a pressure vessel

Distinguish the state of stress at point A

Output, Interpretation and conclusions

Validate the results

Compile the results

Interpret the results

Compare the different

Justifies the input values and calculation results

Anticipate any failure

Plan any safety procedure