

Failure

What failure mode is happening to the rock in this picture? How can you tell?

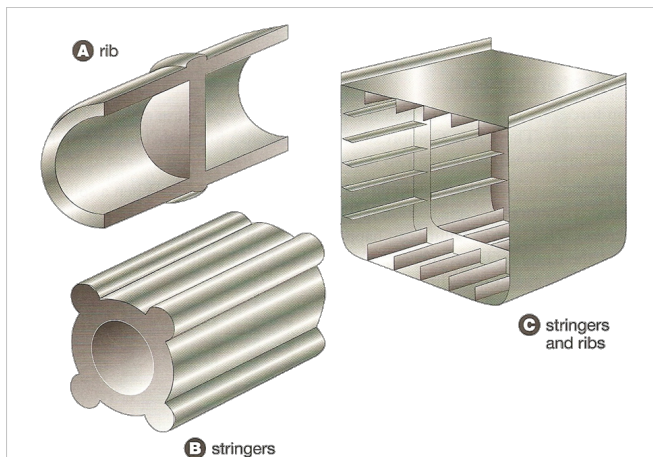
Shear



Failure

So, now that we know that objects can fail due to internal forces, what can be done?

As we discussed earlier in the unit, the shape used to make an object is one way to provide strength. The images below show another option. By adding additional pieces to the materials making the object, you can strengthen the object at the appropriate locations to help improve the strength needed to resist the forces.





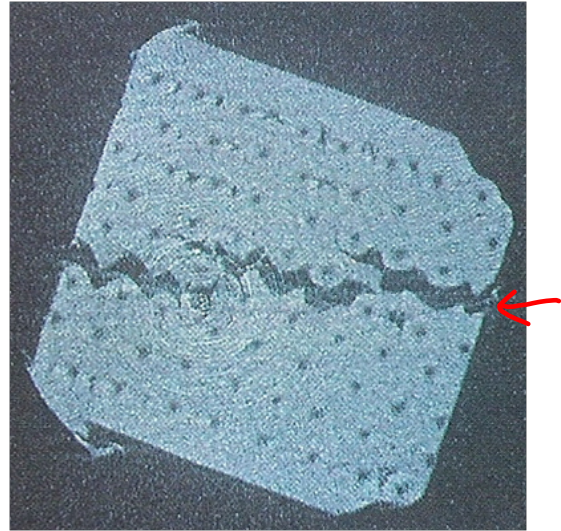
Fatigue

What does the word fatigue mean to you?

Tired

Just like extensive exercising can make us tired, repeated (or cyclic) forces can make a material "tired."

- When you apply a force to a material the particles move.
- When the particles are forced to move, the bonds between them can break.
- When bonds start breaking, the material becomes weaker.
- Eventually there are not enough bonds to hold the material together and a crack forms.
- The material then fails under continued force.



Fatigue



Failure

Is failure always a bad thing?

No

Engineers will design some things to fail on purpose. Look at the two images below. What part of them has been designed to fail?



Bumper



Shear Pin