

Name: _____

Date: _____

Walt Disney Concert Hall Case Study

Why does the surface of an object change how light reflects off of it?

The issue

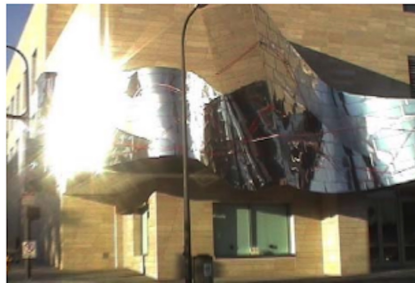
In 2003, the Walt Disney Concert Hall in Los Angeles opened to the public. The concert hall is made from stainless steel and put together to form smooth curving walls. Soon after the concert hall opened, people who lived in nearby neighborhoods started to complain about the glare coming off the building. Drivers also reported that they were being blinded by light reflecting off the building.



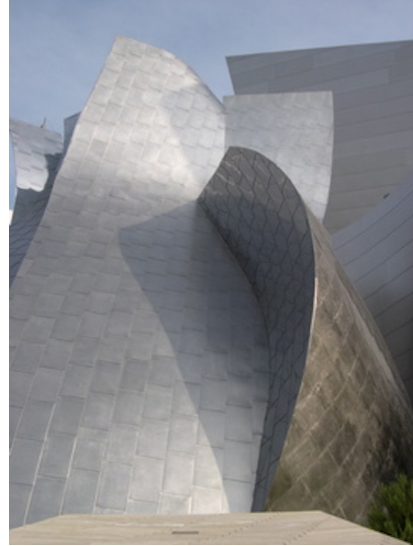
The solution

The architects identified that the parts of the building causing the glare were coated in polished stainless steel. The rest of the building used brushed steel. To fix the problem, they considered multiple options. The best option was to sand blast the surface of the polished stainless steel parts of the building to make it more dull and rough. Before the sanding, the workers could see their reflections when they looked at the polished stainless steel parts of the building. After the sanding, the building looked dull gray, like the non-shiny side of aluminum foil. The sandblasting solved the problem and the Walt Disney Concert Hall received no more complaints about glare and blinding light.

Images of the building before sanding



Images of the building after sanding

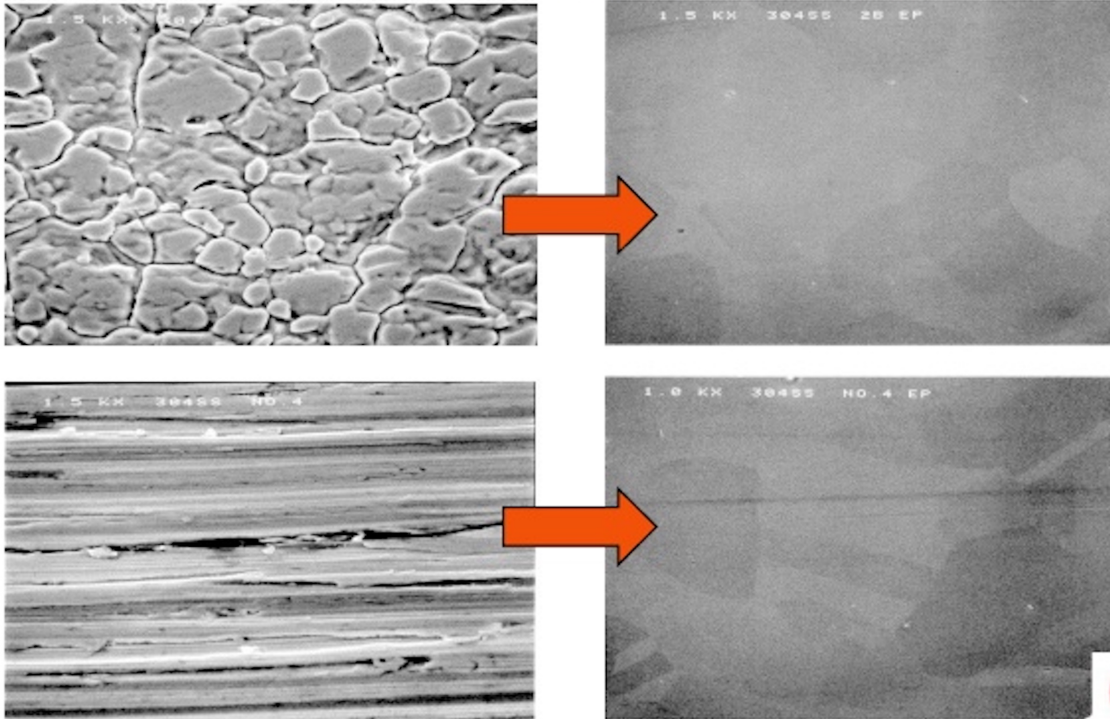


Why did sanding the surface of the building reduce the glare?

We need to zoom in to a smaller scale to answer this question. These close-up images of stainless steel were taken using a microscope. Observe the images of polished stainless steel and brushed steel, and note how the surface is similar or different.

Brushed stainless steel

Polished stainless steel



What do you notice about the different surfaces?

While we can see some differences with our eyes, looking under a microscope reveals a new phenomenon. Before sanding, the surface of the polished stainless steel was very smooth. After sanding, the surface may still look smooth to our eyes, but when we look closer, the surface is actually bumpy and rough.

When light shines on any surface, it always reflects off that surface in a V shape. If the surface of an object is very smooth, all of the light will reflect in the same direction. This is why you see a glare, or are blinded by the light, when it shines on really polished materials. If the surface is bumpy, light will reflect in all different directions. This is a type of reflection called **scattering**. Many objects that appear smooth at first glance actually have bumpy surfaces when you zoom in closely to

look at the surface. This is why you do not see a glare coming off most unpolished objects. Look around the classroom. If you shined your flashlight on different objects that are more or less smooth, what would you expect to see?

