Approximately 24,300 tiles were installed on each space shuttle and each tile was designed to survive 100 trips to space and back. Varying in thickness from one inch (2.54 cm) to five inches (12.7 cm) depending on the heating they will be subjected to, the tiles collectively protected the orbiter from temperatures as high as 2,300 degrees Fahrenheit during its reentry into the Earth's atmosphere.

The silica tile material is referred to as LI-900. They insulate heat so well that tiles can be held bare-handed on one side even while the opposite side is still red hot. Educators can demonstrate that ability in the classroom, substituting a blow torch for the re-entry-generated heating.

LI-900 has a density of 9 pounds per cubic foot (144.2 kg/m^3). It is made from pure silica glass fibers, but 94% of the volume of each tile is pure air, making each tile incredibly light and strong!

Problem 1 – If the dimensions of an average tile are 15cm x 15 cm x 6cm, what is the total volume of the Space Shuttle heat shield provided by the 24,300 tiles in cubic meters?

Problem 2 – About what is the mass, in grams, of one average tile?

Problem 3 – What is the total mass of the Space Shuttle heat shield in

A) kilograms?

B) pounds ? (1 pound = 0.453 kg)

Problem 1 – If the dimensions of an average tile are 15cm x 15 cm x 6cm, what is the total volume of the Space Shuttle heat shield provided by the 24,300 tiles in cubic meters?

Answer: A single average tile has a volume of
V = 0.15 m x 0.15m x 0.06 m
= 0.00135 meters^3,

so the total volume occupied by 24,300 tiles is about

V = 24,300 x 0.00135 = **32.8 cubic meters.**

Problem 2 – About what is the mass, in grams, of one average tile?

Answer: Mass = Volume x Density
= 0.00135 m^3 x 144.2 kg/m^3
= 0.195 kilograms.

Since 1 kilogram = 1000 grams, we have a mass per tile of about **195 grams**.

Problem 3 – What is the total mass of the Space Shuttle heat shield in A) kilograms? B) pounds is 1 pound = 0.453 kg?

Answer: A) Mass = volume x density
= 32.8 cubic meters x 144.2 kg/m^3 = **4,730 kg**.

B) 4,730 kg x (1 pound / 0.453 kg) = 10,441 pounds (or about 5 tons!)

Note to Teachers: **Free Space Shuttle Tiles for your Classroom!**

You can still get your own free NASA tiles from the Space Shuttle program!!! Schools may request a tile at the "NASA Space Programs - Historic Artifacts Prescreening" Web site. **http://gsaxcess.gov/NASAWel.htm**

Once at the site, go to the "NASA Artifacts Prescreening Register" block of information to register and receive your login ID and password.

There is no charge for the Shuttle Tiles and Space Food Kits . However, the recipient is responsible for the shipping and handling fee of $23.40 for Shuttle Tiles and $28.03 for the Space Food Kits. Payment must be made to the shipping agent with a credit card via a web link provided in the module.