Level 1a: Using the equation from the first page of the Wind Study,

$$Working\ Load\ Limit = \frac{minimum\ breaking\ strength}{safety\ factor}$$

We can take our given data from the question and plug that data into the equation.

$$\text{Working Load Limit} = 55{,}000 \text{ lbs. (vertical)}$$

$$\text{Safety factor} = 5$$

$$\text{Maximum Breaking Strength} = ?$$

$$\text{WLL} = \frac{\text{MBS}}{5}$$

$$\text{MBS} = 275{,}000 \text{ (vertical)}$$

Using the values for the choker and basket, we find the answers to be:

$$\text{MBS} = 220{,}000 \text{ lbs. (choker)}$$

$$\text{MBS} = 550{,}000 \text{ lbs. (basket)}$$

Level 1b: Because a cube has equal length, width, and height on each side, we can find the volume of the cube with this equation:

Volume = Length*Width*Height In a cube, Length=Width=Height

Volume = 4.5ft x 4.5ft x 4.5ft

Volume = 91.125 ft^3

Looking at the Common Materials table that was given to us, we can see that concrete is 150 lbs/ft^3. By multiplying our volume with this value, we get the weight.

Weight = 91.125 ft^3 x 150 lbs/ft^3

= 13,668.75 lbs.

Now, referring to the previous question, we can see that this weight is well below the working load limit of our strap in the vertical hitch position.

Level 2: Using the same volume formula from above we can find the volume of our cube.

Volume = Length*Width*Height In a cube, Length=Width=Height

Volume = 10ft x 10ft x 10ft

Volume = 1,000 ft^3

Using this volume, we can multiply it by all the unit weights for our possible materials to see what our equipment can handle.

Steel: 1,000 lbs. x 490lbs/ft^3 = 490,000 lbs.

Aluminum: 1,000 lbs. x 165lbs/ft^3 = 165,000 lbs.

Concrete: 1,000 lbs. x 150lbs/ft^3 = 150,000 lbs.

Wood: 1,000 lbs. x 50lbs/ft^3 = 50,000 lbs.

Sand/ Gravel: 1,000 lbs. x 120lbs/ft^3 = 120,000 lbs.

Copper: 1,000 lbs. x 560lbs/ft^3 = 560,000 lbs.

We can then find which of these values are less than our equipment's WLL of 200,000 lbs. These materials are Aluminum, Concrete, Wood, and Sand/ Gravel.