

The Triad of Strength

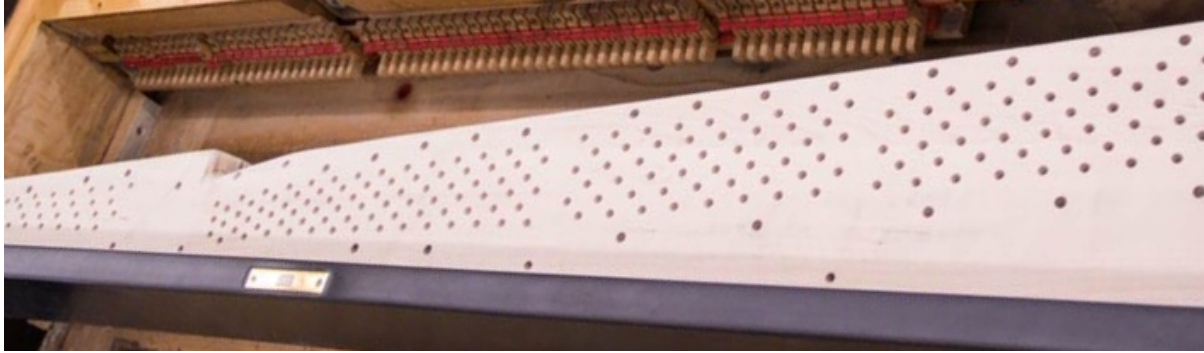


Pianos contain around 230-240 individually tunable strings each holding from 150lbs-190lbs of tension. When considering the instrument as a whole, it equals around 38,000lbs-40,000lbs of string tension.

To the average person, the piano is not an astounding feat of structural engineering. A grand piano appears to be a fancy table with a weird shape and not enough legs. An upright may look like some sort of cabinet with a shelf that's slightly angled and hard to put things on. Either way, they are both way too heavy. But why are they so heavy? what's the purpose?

Pianos are heavy (~300lbs for a small upright to over 1,000lbs for a concert grand) mostly because of a large piece of iron, nestled inside all the wood. This piece of iron is called the "plate" or "harp". It is directly responsible for holding the tension of the strings. Pianos contain around 230-240 individually tunable strings each holding from 150lbs-190lbs of tension. When considering the instrument as a whole, it equals around 38,000lbs-40,000lbs of string tension. An average adult elephant weighs around 13,000lbs. That means the piano holds as much tension as the weight of 3 elephants! If there is a crack in one of the support struts of this large cast iron plate, it is possible that

the metal will slip and the piano will implode. Luckily this is an extremely rare occurrence and is probably not something you need to worry about happening to your piano. As a plus, the plate is not the only thing holding all that tension. The rest of the wood surrounding the plate plays a vital role in holding the tension as well.



On a grand piano, the curvy wood part that creates the shape of the instrument is not only for show. This curve is made of multiple layers of hardwood veneer soaked in glue and bent to form the shape. A large machine, known as the “rim press”, clamps the wood into the right shape and is left for a few days to dry. Besides the many layers of hardwood, a curve is one of the strongest structural shapes that we know of, giving the rim of the piano a direct roll in keeping the instrument strong and well contained. Not only that, but there are large, thick beams inside the piano shape that help support and strengthen the rim even more. In an upright piano, the plate is attached to large posts that mimic the beams in the grand. The sides are also made of hardwood contributing to the structure.

Once the pinblock is secured to the rim and plate, it is more than ready to handle the significant amount of string tension.

In this triad of strength, being the plate/harp, the rim and posts/beams, and the final piece is the layered block of wood, known as the “pinblock”. It is a piece not readily visible that holds all the pins used to tune the instrument. It can be five to ten layers of hard-rock maple (you can guess how it got its name) glued together and attached directly to the plate. This hunk of designed wood is so strong, you will break your fingernail if you try to make an indent in it. Once the pinblock is secured to the rim and plate, it is more than ready to handle the significant amount of string tension.

Because of all the feats of engineering contained within a piano, the structure is actually stronger than it needs to be to make extra sure this great amount of tension is well contained. In a situation like a piano, it is far better to be safe than sorry.

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