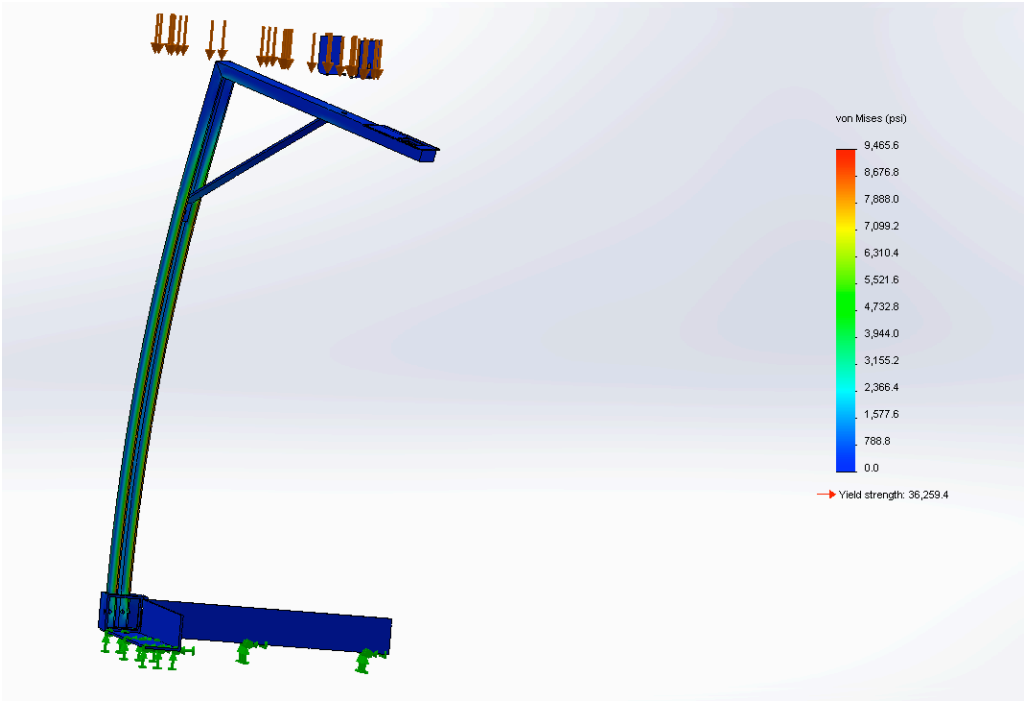
INTRO

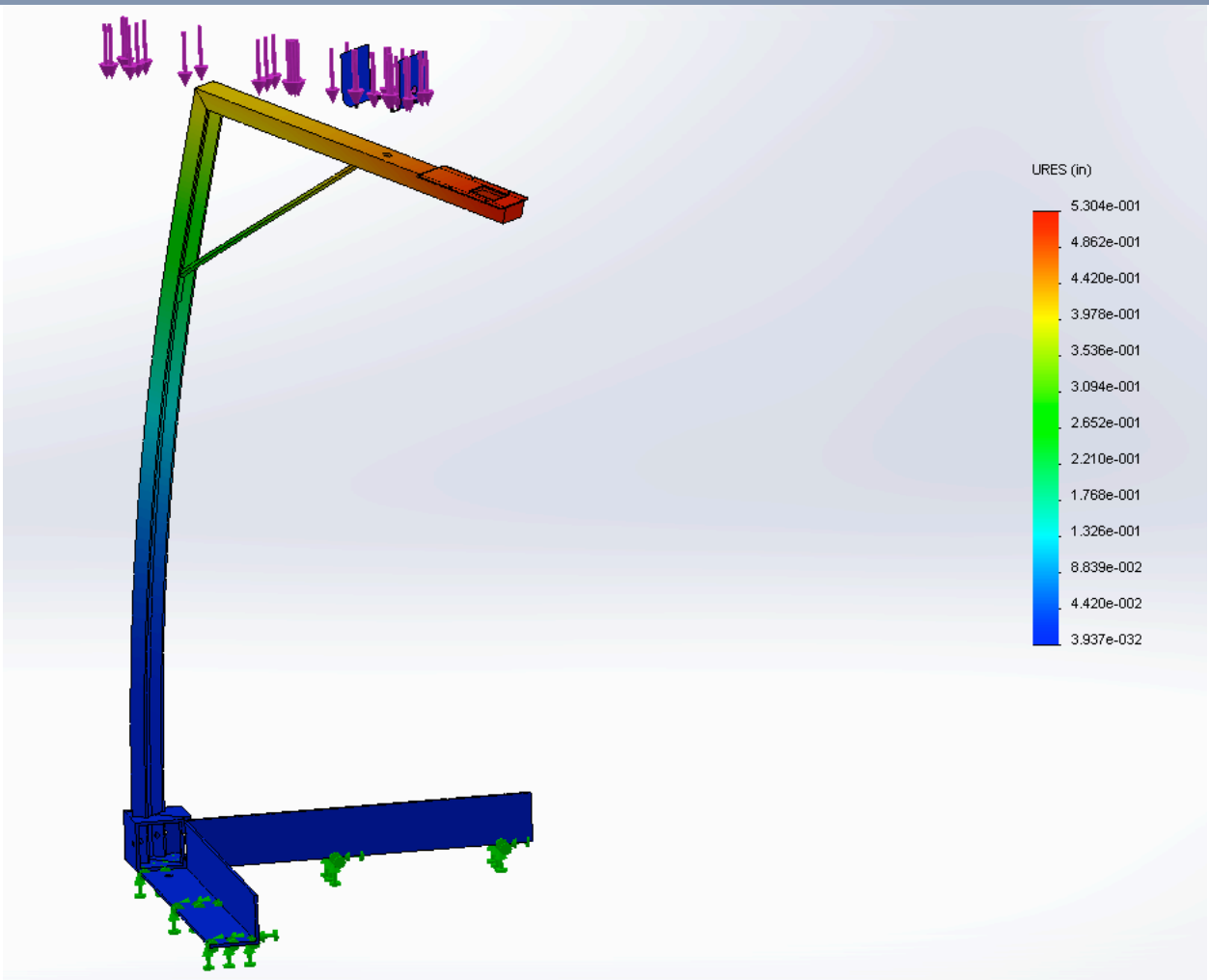
Below are the results of both the stress and displacement tests for our lifting apparatus. We were hoping to do testing on the winch on top as well, but because of the complications involved with the gear contact, as well as there being no way for us to have a downward load from the drum of the winch (which is a round entity) none of the parts were included in the analysis. We began eliminating parts from the analysis one by one until all the mesh errors were resolved, and unfortunately everything except the housing of the winch was excluded. Even the housing isn't shown in the pictures below because there was no way to apply the load on the U shaped surface, so SolidWorks left it entirely out of the results image.

Name	Type	Min	Max
Stress Test	Von Mises Stress	0 psi	9465.6 psi



The picture above is of the stress test, with a combined 80lb of force applied at the mounting plate and across the top part of the arm. The bottom faces of the legs are the constrained geometry. We decided to test at 80lbs, because it is around the weight of the heaviest compressor we were able to find, although most compressors we found were around 40 lbs. Essentially the test shows an extreme case, for the purpose of showing the device's superior quality. The most strain (max of 9465.6 psi) is located just below where the brace mounts to the bottom of the arm. The arm is made of ASTM A36 Steel, which has a maximum yield strength of 36,259.4 psi. That amounts to only 26% of the maximum strain which is well within the elastic deformation range of steel.

Name	Type	Min	Max
Displacement	URES: Resultant Displacement	0 in Node: 498	.5304 in Node: 31622



The picture above is of the displacement estimation of the same test of 80lb of combined force between the top arm and the mounting plate. Because the stress is very little on the entire assembly, the maximum deformation is at the tip of the arm, and is only .5 inches. As mentioned above the load during this test is twice what it would be under the usual application (this is tested with the heaviest compressor weight that we could find) and the stress levels are well within elastic deformation for ASTM A36 Steel so any displacements of parts under normal operation will return to their original position after the load is removed.

Conclusion

After looking over both the stress test and the displacement test of the lifting apparatus, we are confident enough in our design and believe that it will hold up sufficiently in any situation where lifting any residential compressor. The test was evaluated at 80lbs, and the weight of the largest compressor we were able to find was 86.2 lbs. Below are the weights of 10 compressors from www.grainger.com that can be used to represent a sample of common loads that will be used with our device.

	Weight (lbs)	Location
BRISTOL H22A623DBEA	86.2	http://www.grainger.com/Grainger/BRISTOL-AC-Compressor-5AGZ6?Pid=search
PANASONIC 2P19S3R236A	30	http://www.grainger.com/Grainger/PANASONIC-AC-Compressor-4Z555?Pid=search
PANASONIC 2V34S236A	42	http://www.grainger.com/Grainger/PANASONIC-AC-Compressor-6Z382?Pid=search
DANFOSS HRM047U1LP6	72.75	http://www.grainger.com/Grainger/DANFOSS-AC-Compressor-4UKX2?Pid=search
PANASONIC 2K21S3R276A	38	http://www.grainger.com/Grainger/PANASONIC-AC-Compressor-6Z380?Pid=search
PANASONIC 2R10S3R236A	21	http://www.grainger.com/Grainger/PANASONIC-AC-Compressor-6D638?Pid=search
BRISTOL H22J36BABCA	67.55	http://www.grainger.com/Grainger/BRISTOL-AC-Compressor-5AGY5?Pid=search
BRISTOL H2EB28SABCA	60.35	http://www.grainger.com/Grainger/BRISTOL-AC-Compressor-5AGY2?Pid=search
HITACHI SHY73MC4-U	45.75	http://www.grainger.com/Grainger/HITACHI-AC-Compressor-6GMU1?Pid=search
HITACHI SL253SN-C7EU	39.3	http://www.grainger.com/Grainger/HITACHI-AC-Compressor-6GMT8?Pid=search
Max:	86.2	
Min:	21	
Median:	43.875	
Average:	50.29	