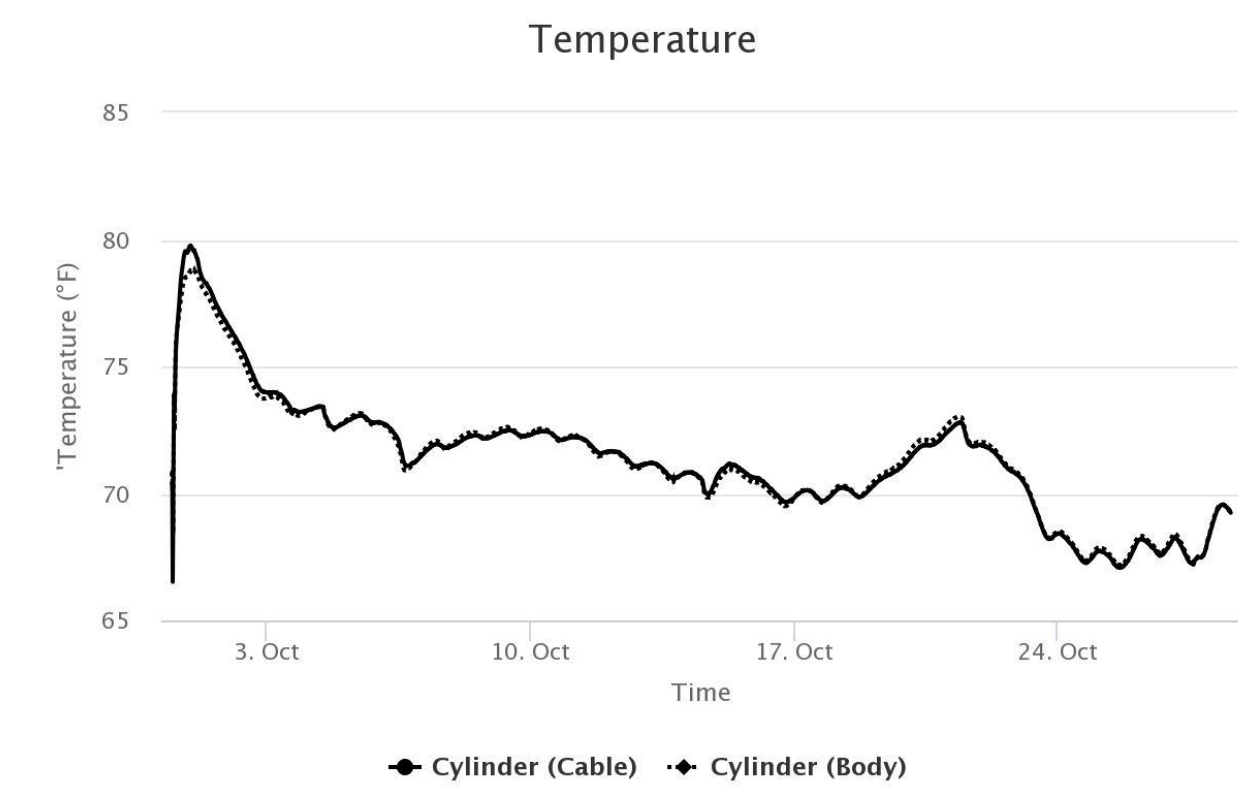
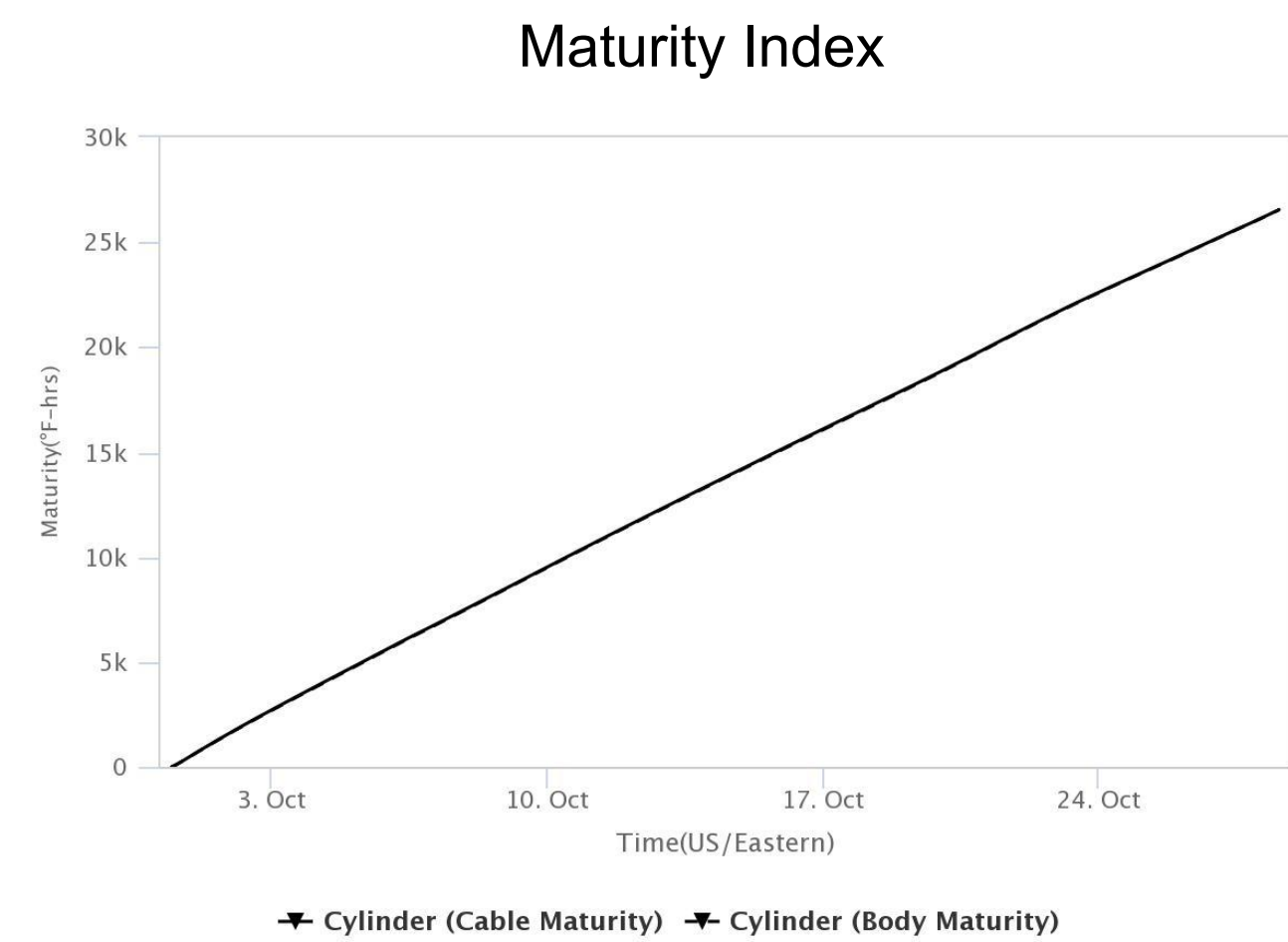
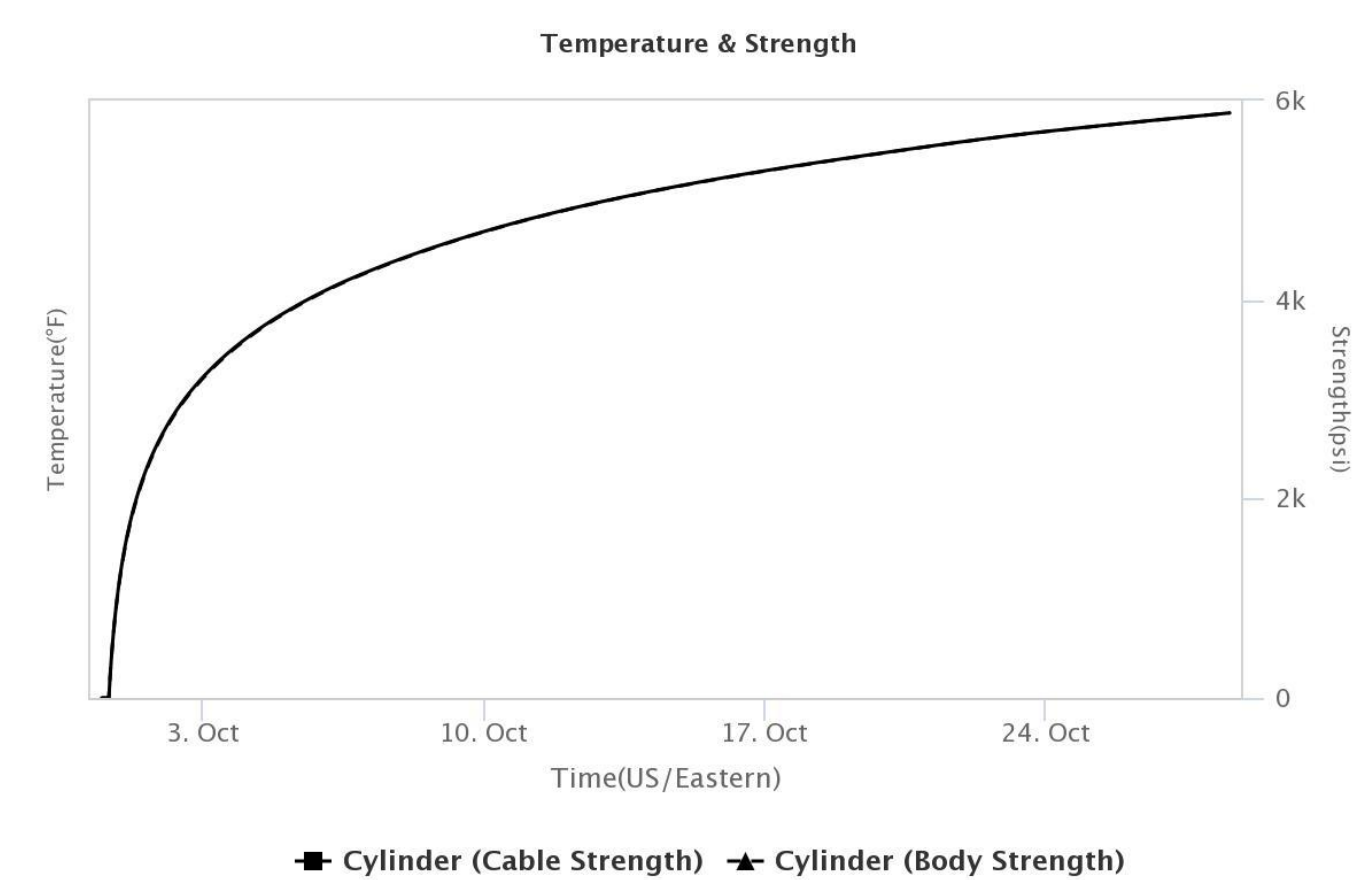


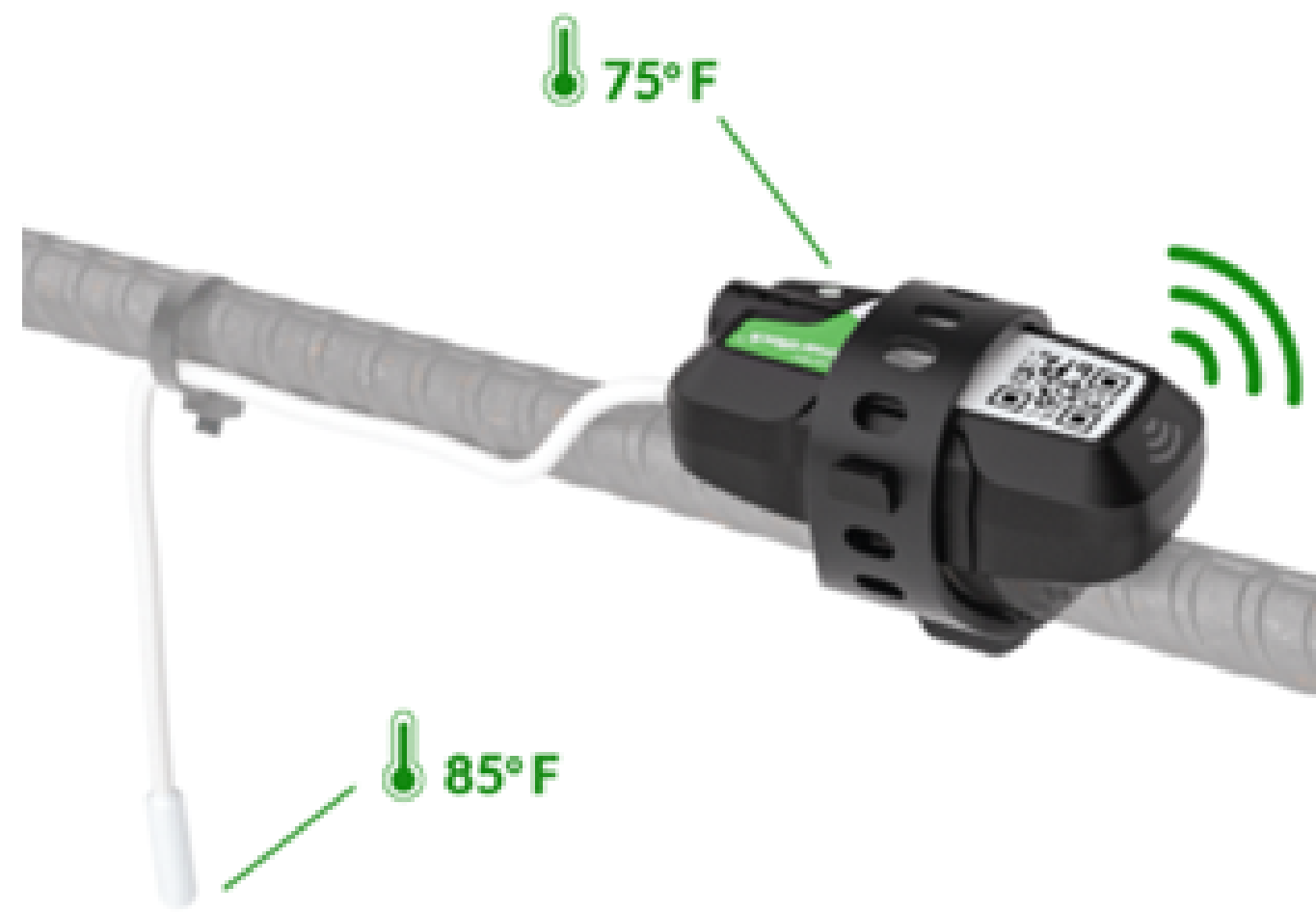
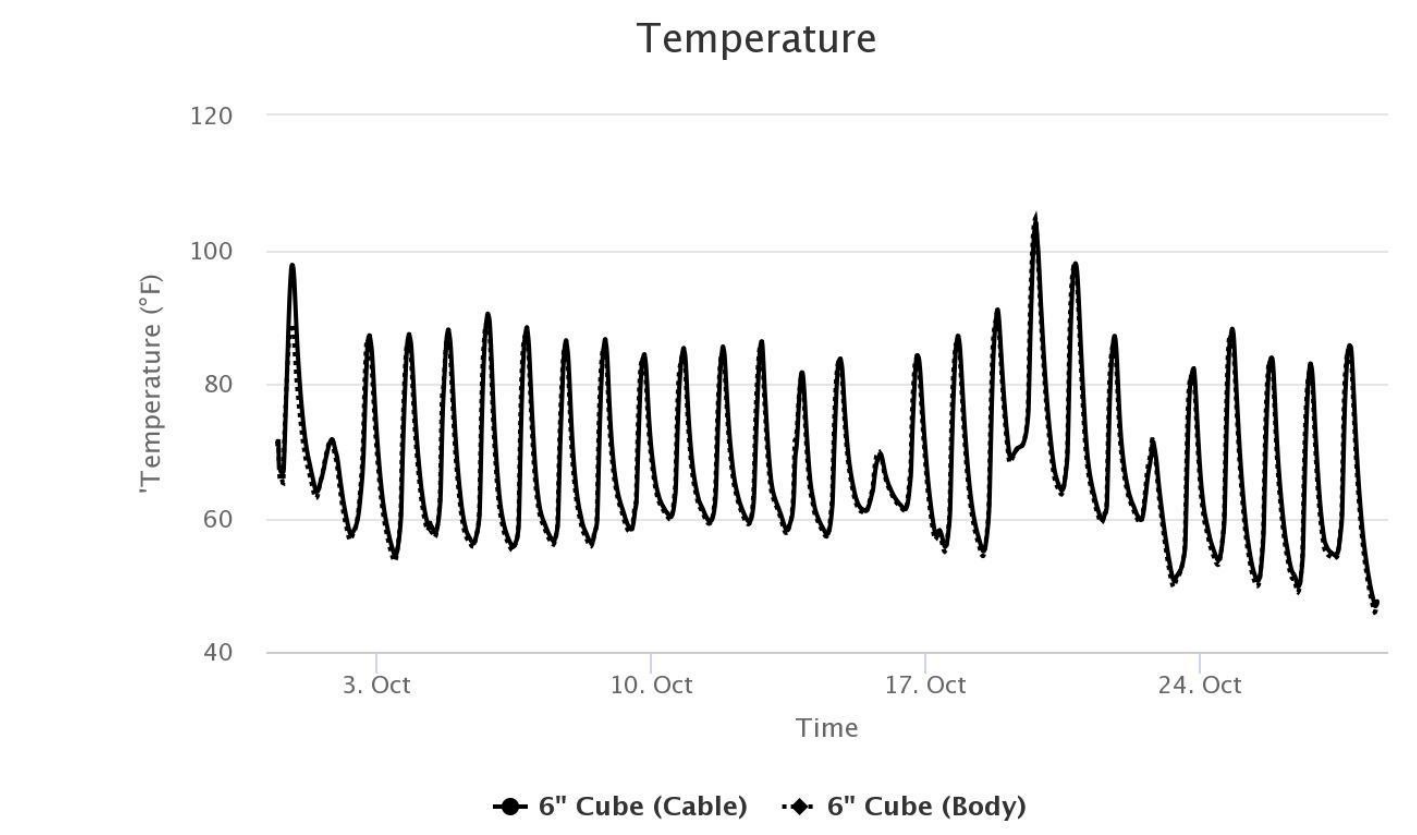
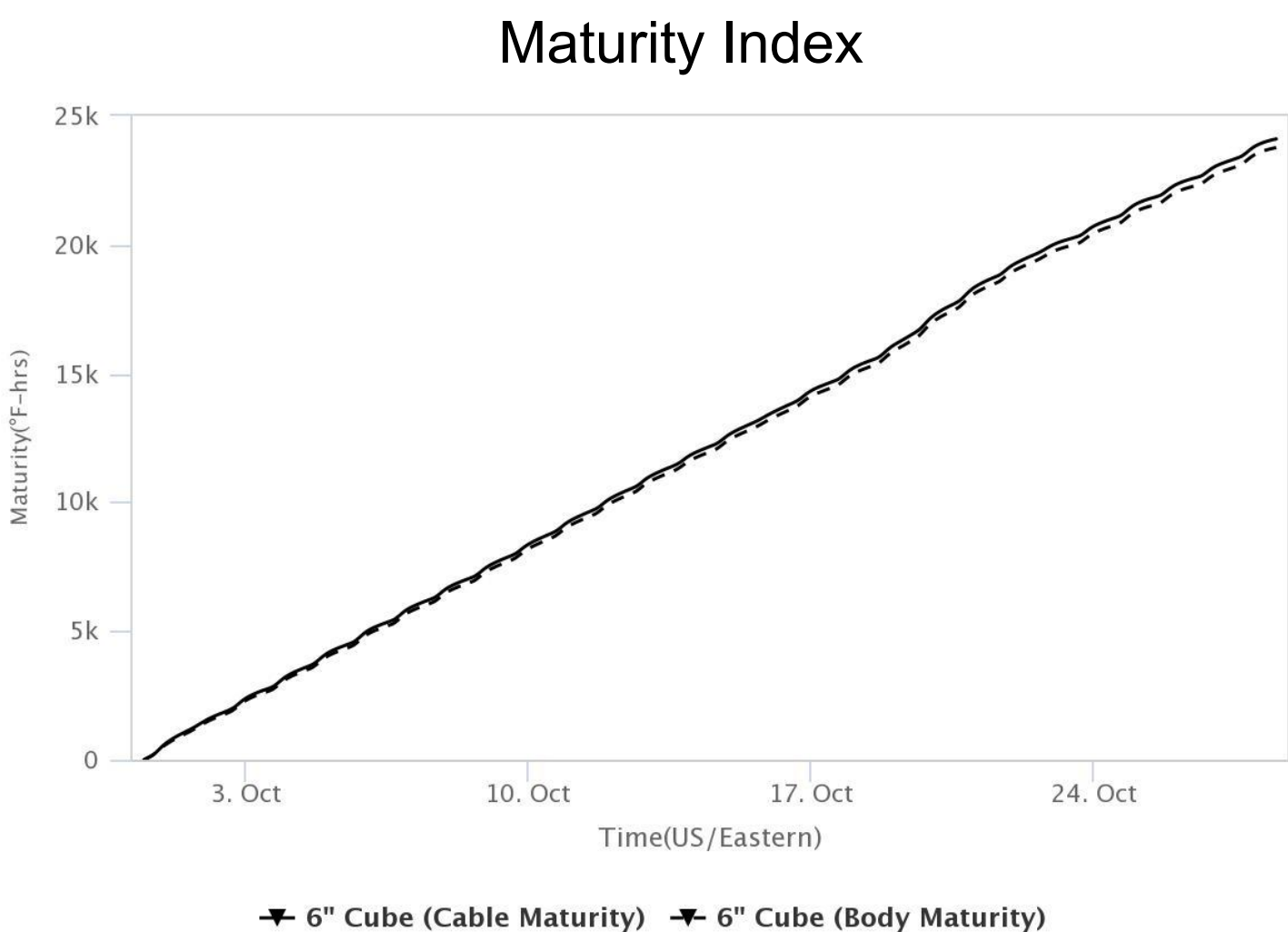
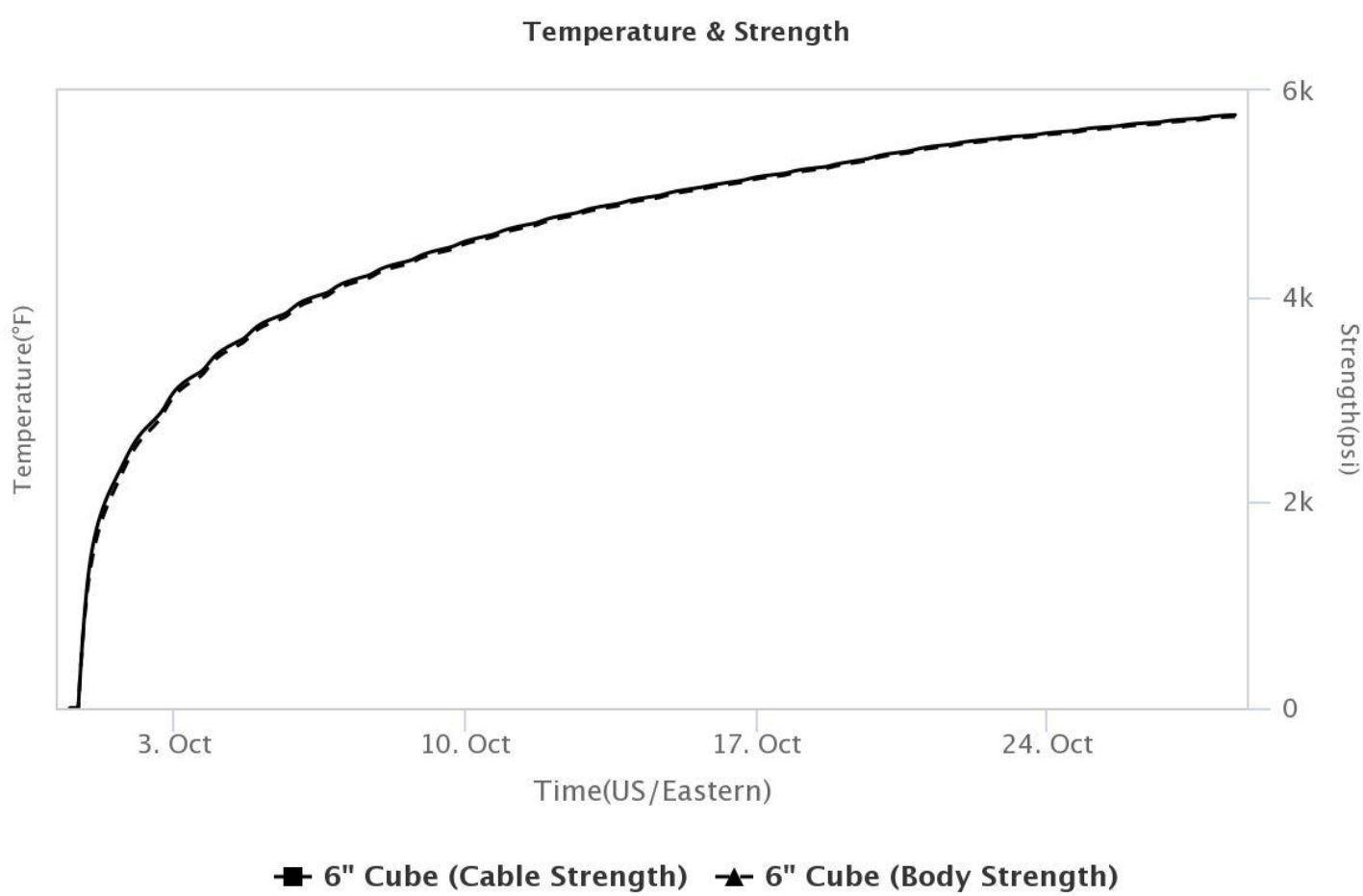
Evaluating SmartRock Temperature Sensor Performance in Measuring Concrete Strength

Concrete testing is one of the most important parts of the concrete placement process. Traditionally, this is done through the use of 6x12 cylinders cured in a lab that are broken at various stages of the curing process. These cylinders are not necessarily representative of the in-situ concrete because of their differing curing conditions- indoors versus exposed to the elements. Wireless temperature sensors, like Giatec's SmartRock, have the potential to determine concrete strength based off the temperature of the placed concrete over time, thus eliminating the need for cylinder breaks. Once calibrated to the specific mix design, these wireless sensors could prove to be a valuable tool to contractors as they could allow early stripping of forms or removal of concrete that is unlikely to make a specified strength. The accuracy of these sensors, and the difference between lab-cured and in-situ concrete, was tested against break tests performed using Cal Poly's CM 114 Mix A. It was found that the sensors were within 7.7% of the broken results. The in-situ concrete compressive strength was within 3.6% of the lab-cured concrete. These results indicate no significant difference in compressive strength between sensors and cylinders, or between lab-cured and in-situ concrete.

Lab Cylinder Results



Field Cube Results



SmartRock Temperature Sensor

Data By The Numbers

| | Broken Cylinder Compressive Strength (psi) | Sensor Cylinder Compressive Strength (psi) | Cube Compressive Strength (psi) | Cylinder Difference Vs Breaks (psi) | Cube Difference Vs Breaks (psi) | Lab vs Field (psi) |
|-----|---|---|---------------------------------------|---|------------------------------------|--------------------|
| Day | | | | | | |
| 7 | 4,531 | 4,341 | 4,183 | -190 (-4.2%) | -348 (-7.7%) | -158 (-3.6%) |
| 14 | 4,824 | 5,112 | 4,971 | 288 (6.0%) | 147 (3.0%) | -141 (2.8%) |
| 21 | 5,534 | 5,564 | 5,469 | 30 (0.5%) | -65 (-1.2%) | -95 (-1.7%) |
| 28 | 6,023 | 5,876 | 5,764 | -147 (-2.4%) | -259 (-4.3%) | -112 (-1.9%) |