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After spending one year at Columbia University studying civil engineering, I have decided that I would like to dedicate myself to the advancement of the subject matter both in academia and in the industry. This newly found passion has driven me to seek a research opportunity with one of my professors at Columbia University. This year, I have been given the opportunity by Professor Huiming Yin, an associate professor in the Department of Civil Engineering, to conduct research about the fracture mechanics behind wire coatings. Under the guidance of Professor Yin, I would design the test procedure, choose the wire and coating materials and conduct wire tension tests. Previous classes where I learned information pertinent to my research are: Mechanics of Solids and Experimental Mechanics of Materials. Current classes that I am taking in which the information would be useful for my research are Advanced Mechanics of Solids and Finite Element Analysis 1.

Fracture mechanics is the study which considers crack-extension behavior as a function of applied loads. In the research I would be studying the geometry at which wire coatings crack under certain load. According to my preliminary review on the topic, my test design would include three to four different wire coatings made from both brittle and ductile materials. It is important to study the fracture mechanics behind wire coatings because fractured wire coatings play a big role in many different aspects of civil engineering.

For example, without coatings, the metal core of wires can be easily corroded due to changes in temperature. Once the metal core is corroded, the wires are in danger of failure. This result is dangerous and could cause casualties. To prevent wires from corroding, different kinds of weatherproof coatings are used to cover wires. In general, materials with a similar yield strength to the metal core are ideal for wire coatings. Otherwise, the coating may start cracking before the metal core does. If this happens, then the metal core can be easily corroded. Materials with yield strengths much higher than the metal core are not ideal. In this situation, if the metal core fails the coatings will be wasted. However, finding the precise material for wire coatings is not an easy task. By studying the fracture mechanics of different coatings, we can hopefully find the most cost-effective material to be used in the future.

Under the advisement of Professor Yin, I will defer designing the test procedure for this research until I have gained more knowledge about the specific mechanics behind the fracture analysis. The topic will be covered in Advanced Mechanics of Solids in a few weeks. At that time I will design the procedure for the study. In the mean time, I will be doing a literature review regarding current research in this area.