School of Engineering EGR Mercer University

TO: Dr. Joanna Thomas

FROM: Ronald Alvarez
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RE: EGR 107 - 003

DATE : April 4, 2018

1.

Test Name: Motor Test

Type of Test: Performance Test

Equipment Needed: K'nex car, spring motor, electric motor, measuring tape, calculator, and a stopwatch.

Location: Mercer University Engineering Building

Date: April 2nd, 2018

Test Objective: The objective of this test is to determine which motor out of the two provided for us (Spring Motor and Electric Motor) will perform the best in the Hill Climber event. We are conducting this test so that we will have the best possible car design for the event.

Criteria for success: In order for a motor to pass this test, it must have the highest velocity of the two motors. The motor that has the lowest velocity will fail this test.

Procedure: Starting with the spring motor, we will determine its velocity by measuring out a distance of 0.50 meters and timing how long it takes the car to travel this distance. We will then up the distance 3 additional times by 0.50 meters each time, recording the time it takes the car to travel all of these distances. We will then conduct the same test with the electric motor in the car.

Once we have accumulated all of our data, we will calculate the velocities for each motor, and the motor with the highest velocity will pass the test.

2.

Test Name: Incline Test

Type of Test: Performance Test

Equipment Needed: K'nex car, plywood board, cinder blocks, measuring tape, and a stopwatch.

Location: Mercer University Greek Row

Date: April 2nd, 2018

Test Objective: The objective of the Incline Test is to determine if our car design is able to travel up inclines corresponding to the inclines used in the Hill Climber event. By testing this, we will be able to predict our car's performance in the actual event. This test is being performed so that our group will have a chance to test our car's performance before the actual Hill Climber event.

Criteria for Success: The car must be able to travel up the board at an elevation of 6", 12", 18", 24", 30", and 36" within 90 seconds for each elevation. If the car is unable to do so for one or more of the listed elevations, the car will fail the Incline Test.

Procedure: As a group, we will bring our K'nex car to Greek Row where we will then setup the plywood sheet with the cinder blocks underneath. We will then test the car's ability to make it up the elevation of 6" within 90 seconds. Once we have tested this level of elevation, we will then run the test the same way for the elevations of 12", 18", 24", 30", and 36".

3.

Test Name: Velocity Test

Type of Test: Performance Test

Equipment Needed: K'nex car, measuring tape, calculator, and stopwatch.

Location: Mercer University Engineering Building

Date: April 2nd, 2018

Test Objective: The objective of the Velocity Test is to determine if our predicted velocity of 0.30 m/s is correct. This test is being performed so that our team will know if our car's velocity satisfies the merit criteria, and so that we can succeed in the race.

Criteria for Success: If our K'nex car can travel at a velocity of at least 0.30 m/s then it will past the Velocity Test. If the car travels any slower than 0.30 m/s then it will fail the Velocity Test.

Procedure: Our group will meet in the engineering building and find a hallway that is not crowded. Once we have found a place to conduct this test, we will then measure out a distance of 1.9812 meters, which is the same length as the testing apparatus for the Hill Climber event. We will then have one member start the car at one end of the distance to be traveled while another member records how long it takes the car to travel this distance. Once the car has traveled the distance, we will then send it back and record this time. We will continue to do this until we have a minimum of 6 times, and we will then use these times and the distance traveled to calculate our car's average velocity.

$$v = \frac{d}{t}$$

Equation 1: Velocity

4.

Test Name: Dimensions Test

Type of Test: Performance Test

Equipment Needed: K'nex car, measuring tape.

Location: Mercer University Engineering Building

Date: April 2nd, 2018

Test Objective: The objective of the Dimensions Test is to confirm that our vehicle design meets the requirements of the feasibility criteria. This test is performed to ensure that our vehicle is a valid entry for the Hill Climber competition.

Criteria for Success: If our K'nex car is less than 30.48 cm long and 45.72 cm high, the vehicle will pass the Dimensions test. Otherwise, the design does not pass and must be modified.

Procedure: The Dimensions test will be conducted using a measuring tape to measure the maximum length (from tip of the front to tip of the back) and maximum height (from the bottom of the lowest wheel to the top of the car). One of our group members will hold the car while two other members align the measuring tape along the vehicle. These measurements will be taken from both sides of the car and the highest results will be used.