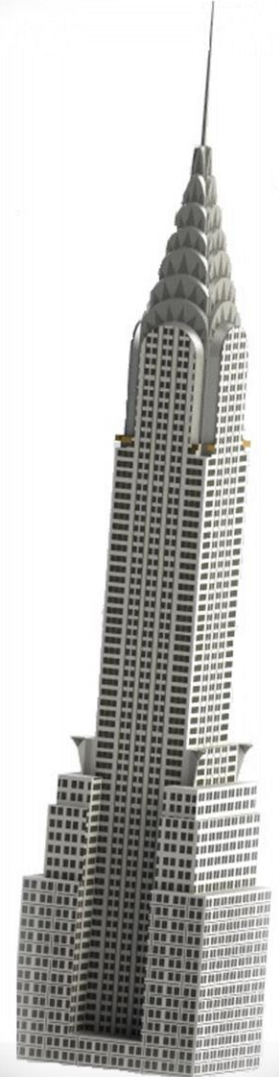
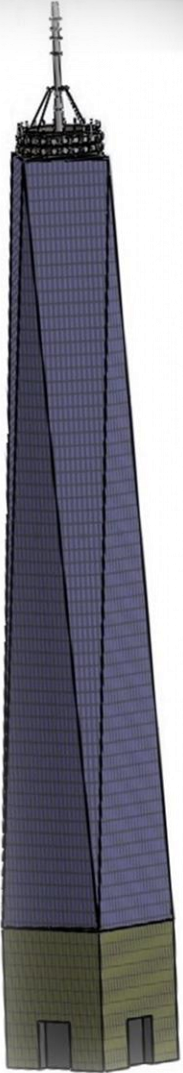


# Matt Allen

## Design and 3D Modeling Portfolio

- ▶ Citizen Eco-Drive Watch
- ▶ Automated Stair Climbing Wheelchair
- ▶ Fireman's Escape
- ▶ Wheel Rim Assembly
- ▶ Acoustic Guitar
- ▶ NYC Skyscrapers (1WTC and Chrysler Building)
- ▶ Transmission Shift Knob

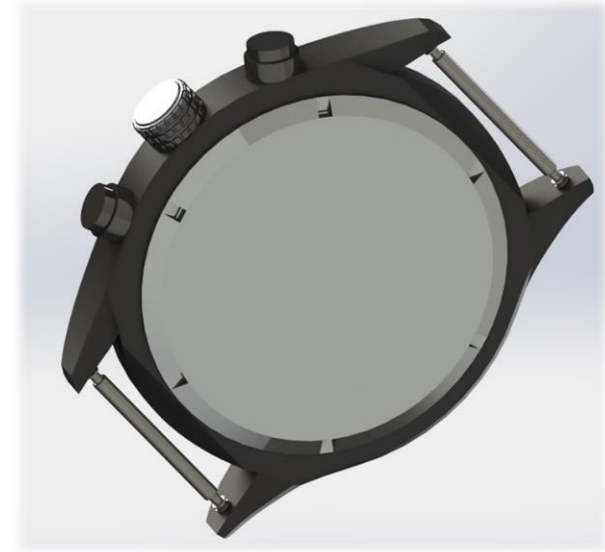
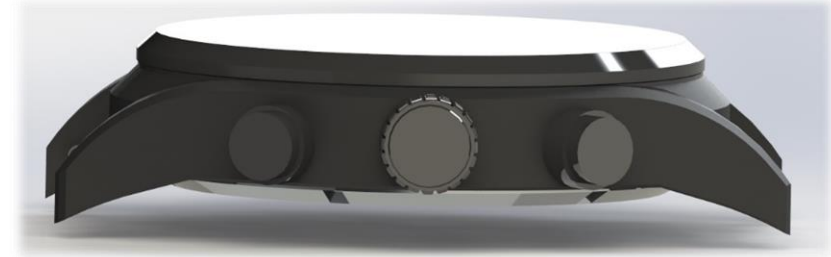


# Citizen Eco-Drive Watch

**Objective:** Translate the Citizen Eco-Drive watch shown below into a 3D model in Solidworks



Actual



Model Render

# Citizen Eco-Drive Watch



Actual

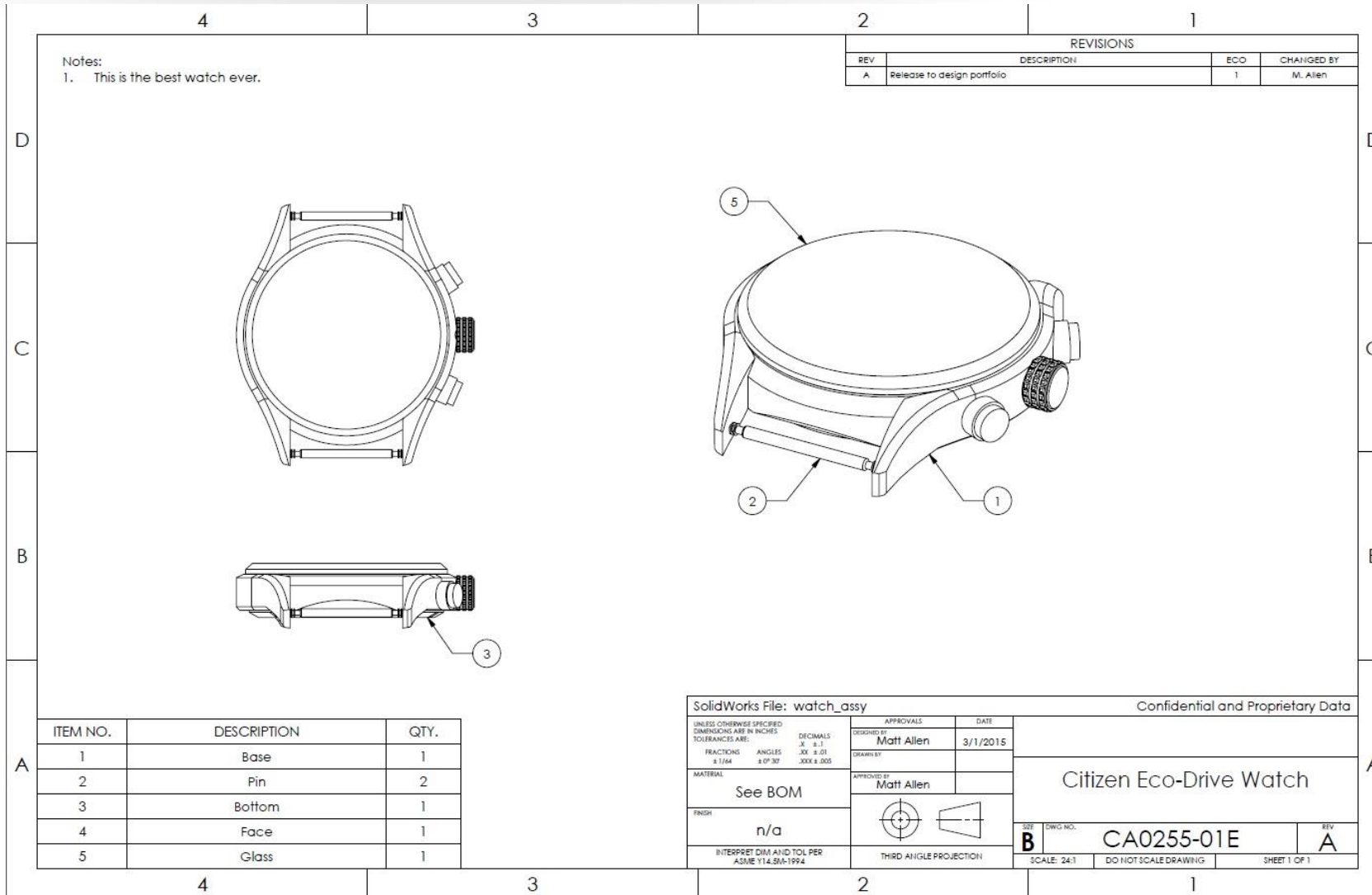


Model Render





# Citizen Eco-Drive Watch



# Automated Stair-Climbing Wheelchair

**Objective:** Design and prototype a wheelchair that is capable of carrying a 200lb rider up and down stairs

## **Design Specifications:**

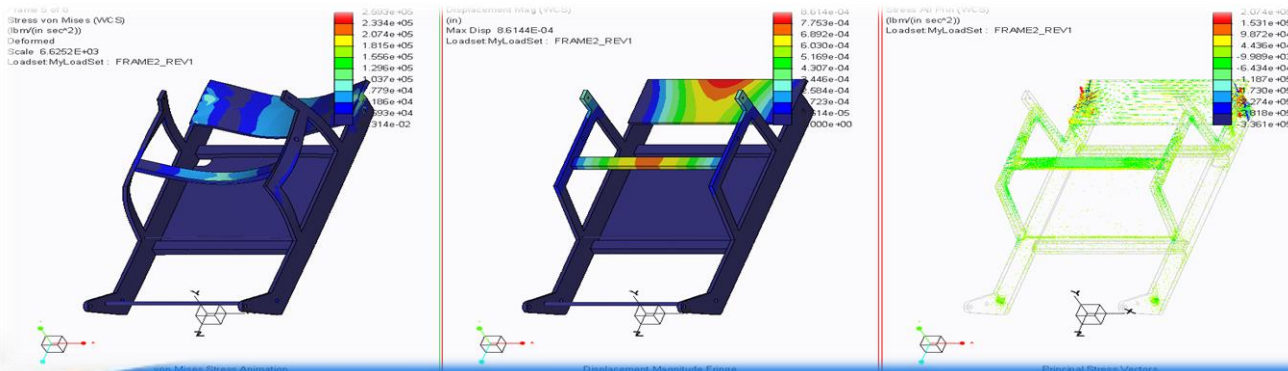
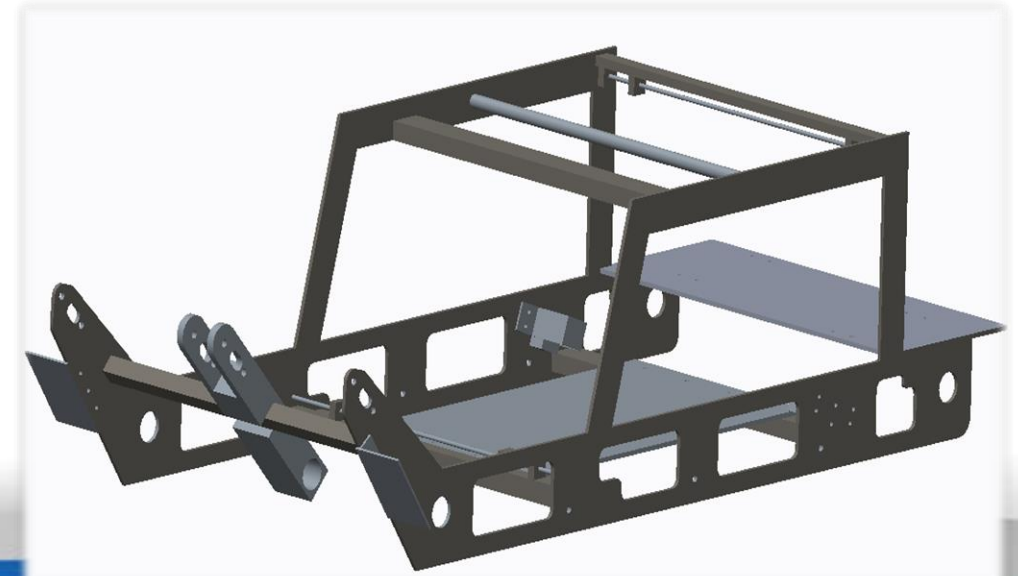
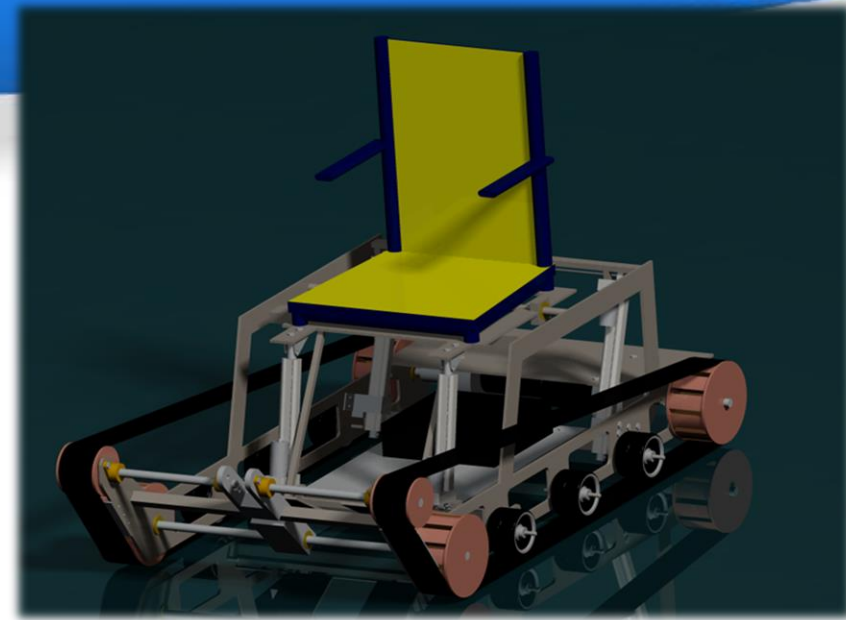
1. Minimum stair climbing angle of 30 degrees
2. Battery operated
3. Compact with maximum dimensions of 3.5 feet length x 2 feet width x 2.5 feet depth
4. Assist a 200 pound rider up and down at least 6 steps of stairs
5. Potential to climb common types of stairs (wood, carpet, concrete, etc) - slippery/wet stairs, irregular stairs, mixed slopes do not apply
6. Speed of at least 8 m/min



# Automated Stair-Climbing Wheelchair

## Concept Design:

- Track driven, so that the driving forces stay in constant contact with the stairs, so that it can smoothly ride the stairs, and it provides traction so that it doesn't slide
- Front end angled at  $50^\circ$  to get onto the first step
- Linear actuators at the rear of the chair that angle the chair forward to pre-tilt the chair before going down stairs
- Linear actuators under the seat to tilt the seat to a level position while the chair is angled forward (going down stairs)
- All automation interfaced with a PS3 controller
- All CAD and FEA done using Pro-E

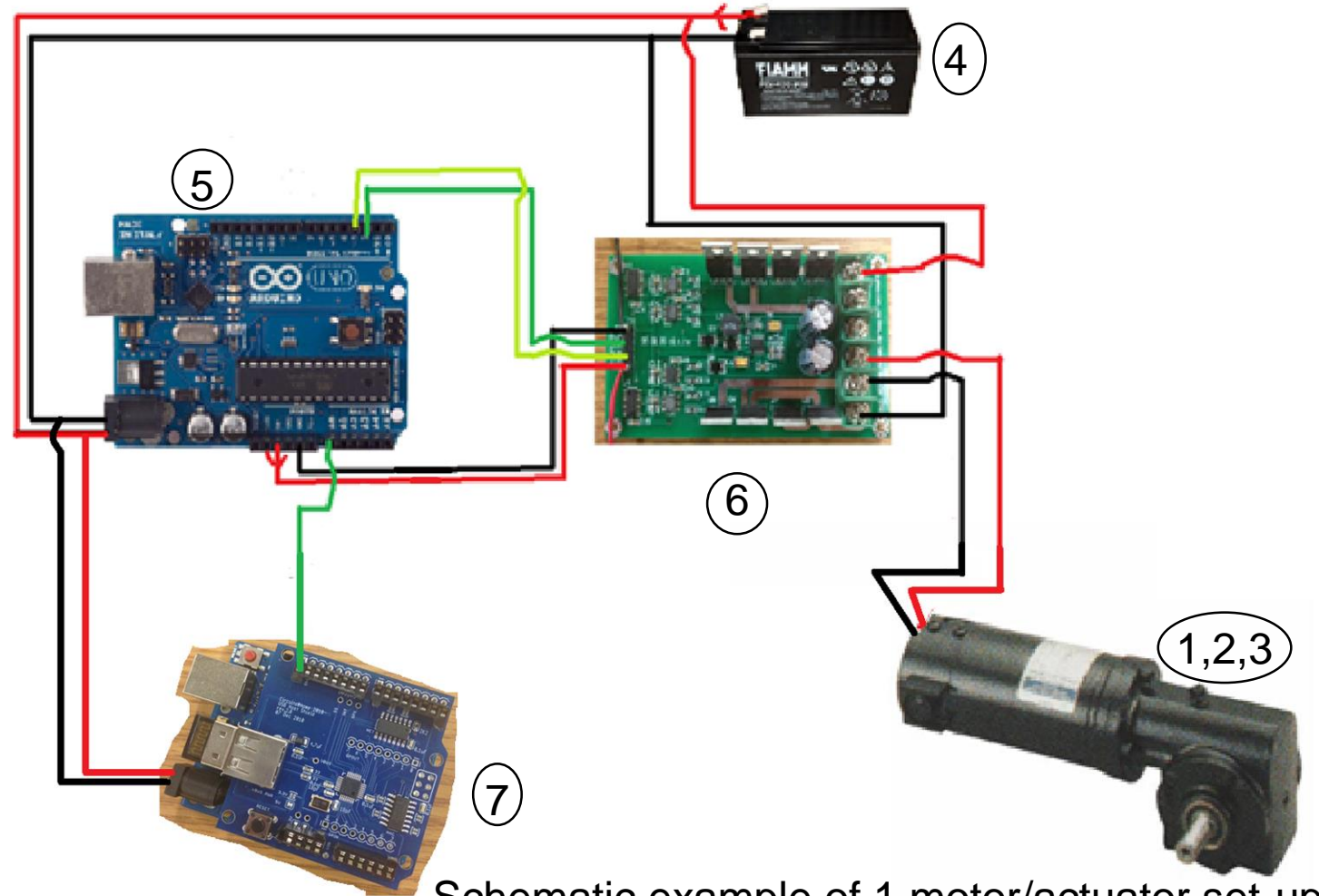




# Automated Stair-Climbing Wheelchair

## **Mechatronic Design:**

1. 2x 500 lb-in DC gear motors for driving
2. 2x 225 lb DC linear actuators to pre-tilt the frame
3. 2x 112 lb DC linear actuators to tilt the seat
4. 8 Ah 12v Rechargeable battery
5. Arduino Uno microcontroller
6. 3 x 30A h-bridge motor controllers
7. PS3 UBS Host Shield
8. PS3 controller



Schematic example of 1 motor/actuator set-up

# Fireman's Escape

**Objective:** Design a hands-free device that assists a firefighter in carrying a civilian out of a burning building

**Design Specifications:**

1. Operable by one person
2. Functional in temperatures of up to 300 degrees F
3. Quick Deployment (Under 3 steps)
4. Compact design (Under 4 Cu. Feet)
5. Easy to move over rough terrain and obstacles
6. Stability to prevent tipping
7. Range of adjustability for people of different height
8. Securely and safely transport the patient
9. Storability

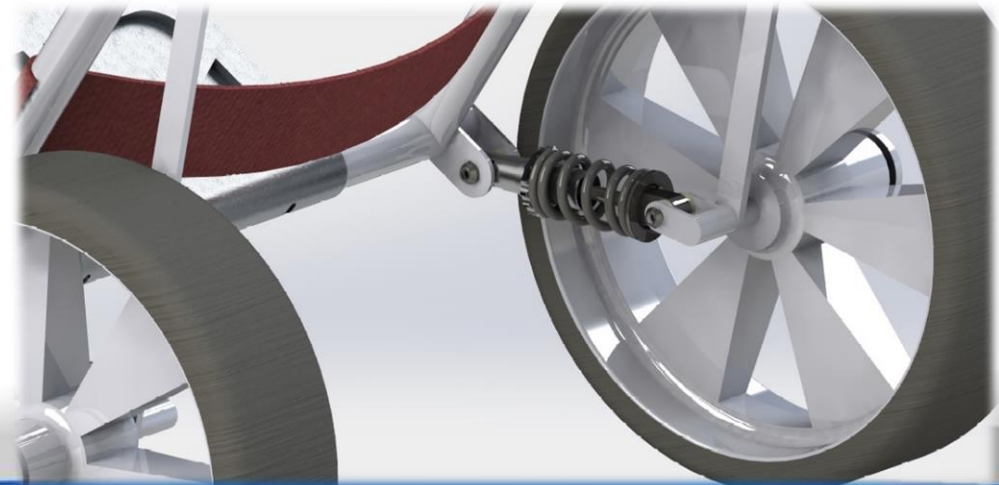
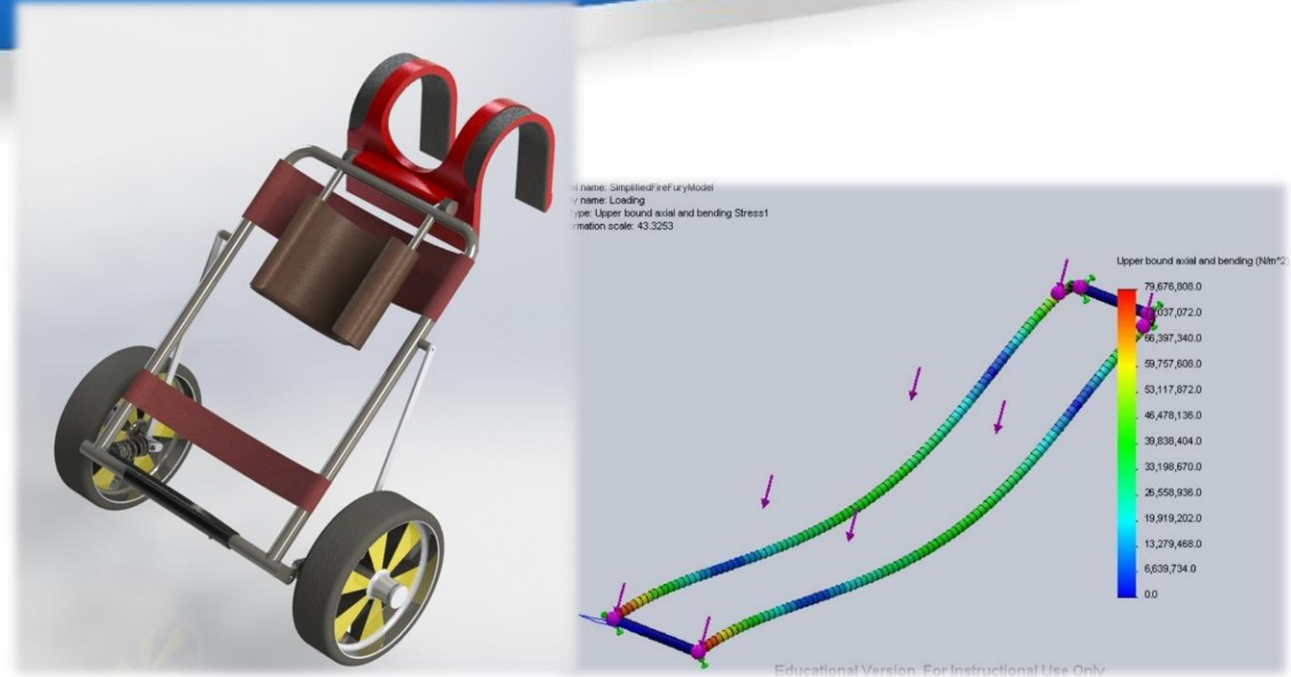




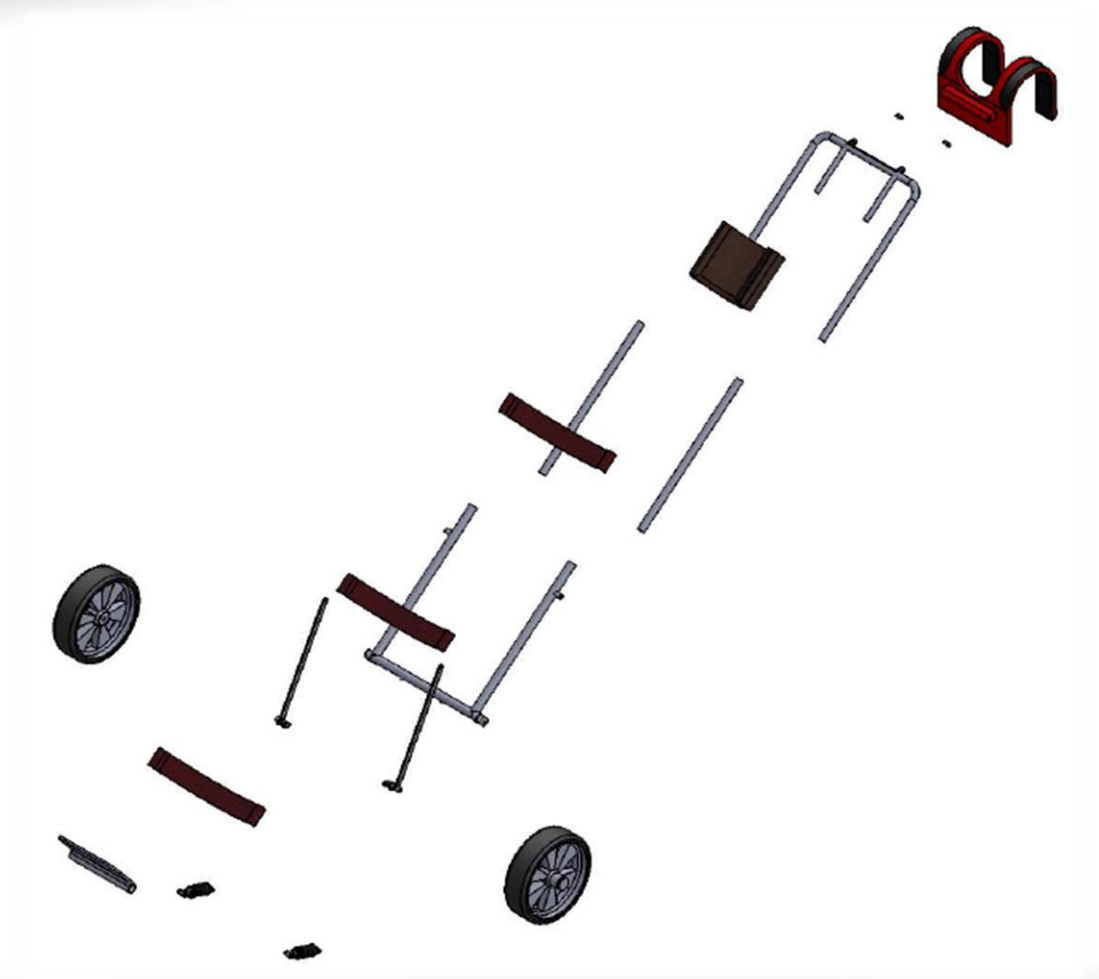
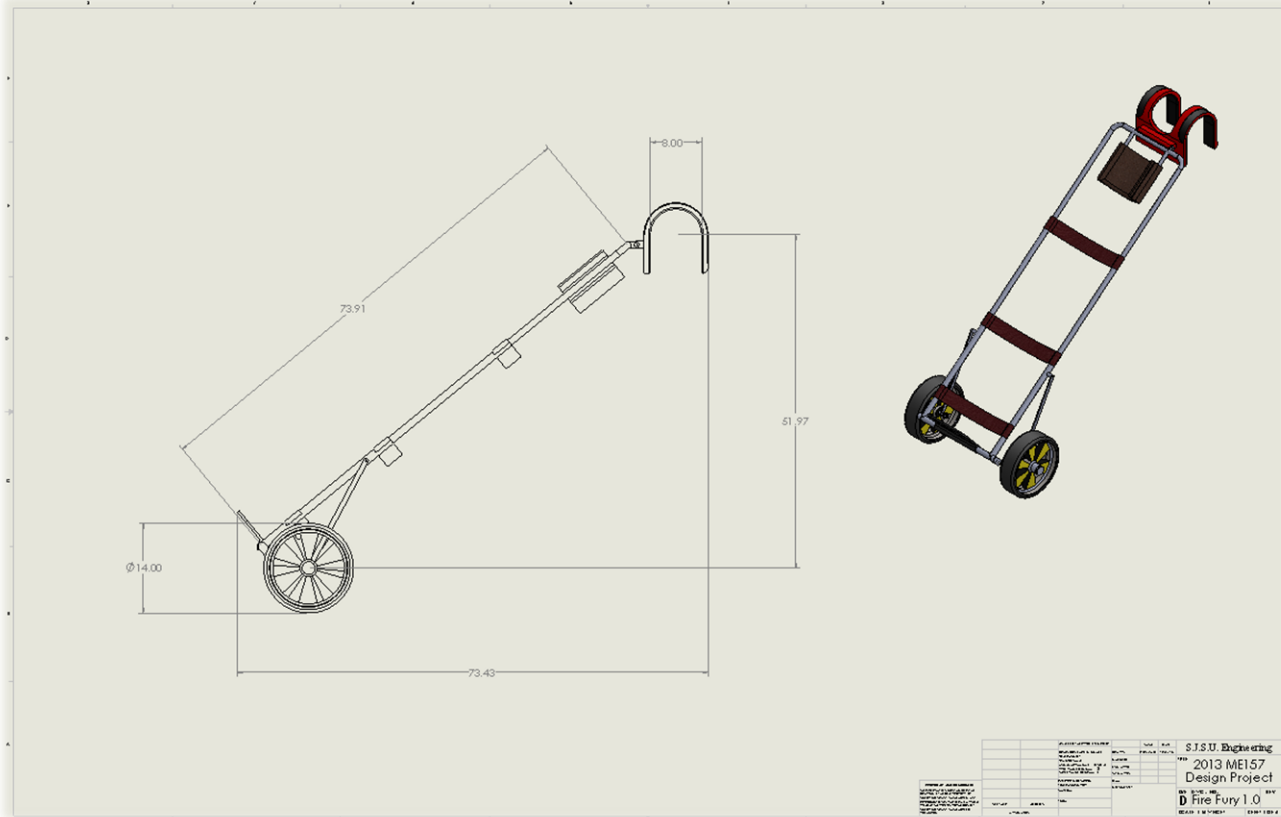
# Fireman's Escape

## Design:

- Operable by a shoulder harness to free-up the firefighter's hands
- The frame, constructed out of tubular 4130 Chromoly material, is composed of 3 sections: the base, middle, and top loop
- These three frame members have concentric circular cross sections with varying diameter so they are able to collapse into each other and allow for storability
- Nomex fire-retardant straps and an adjustable headrest to cradle the victim and prevent any lateral motion
- The 14" wheels are attached to a swing arm suspension with a shock absorber to safely and comfortably maneuver over debris



# Fireman's Escape



# Wheel Rim Assembly

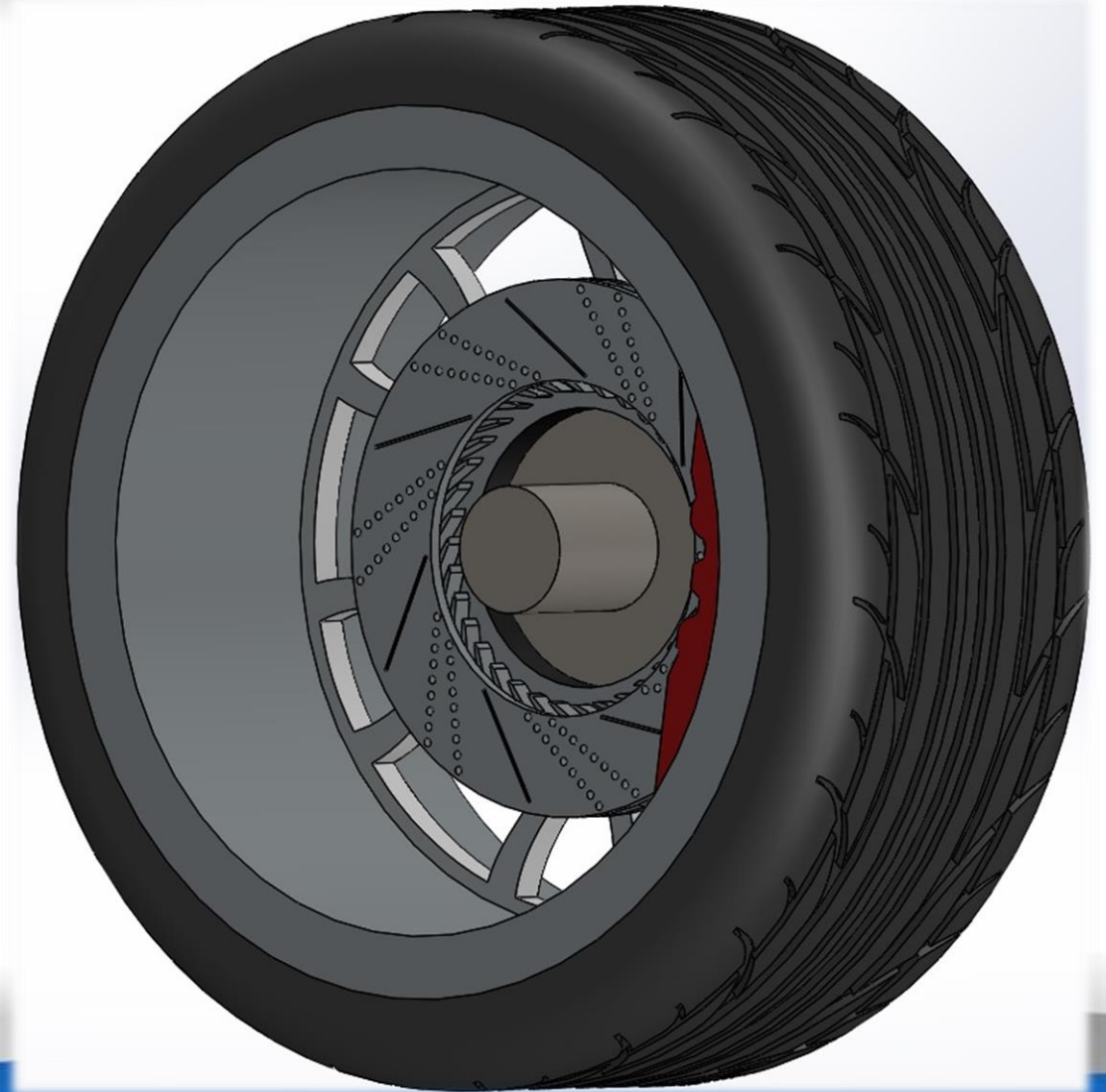
**Objective:** Design a custom front wheel rim assembly in Solidworks



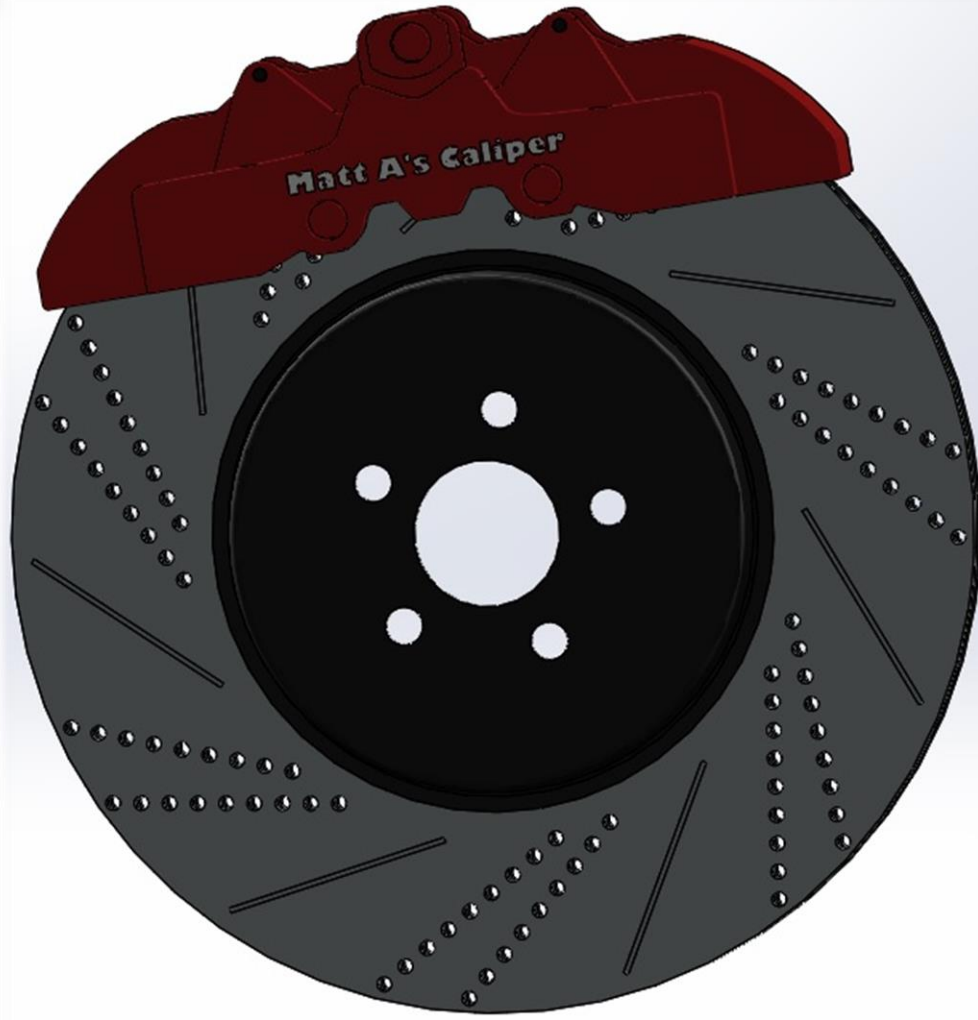
Design 1



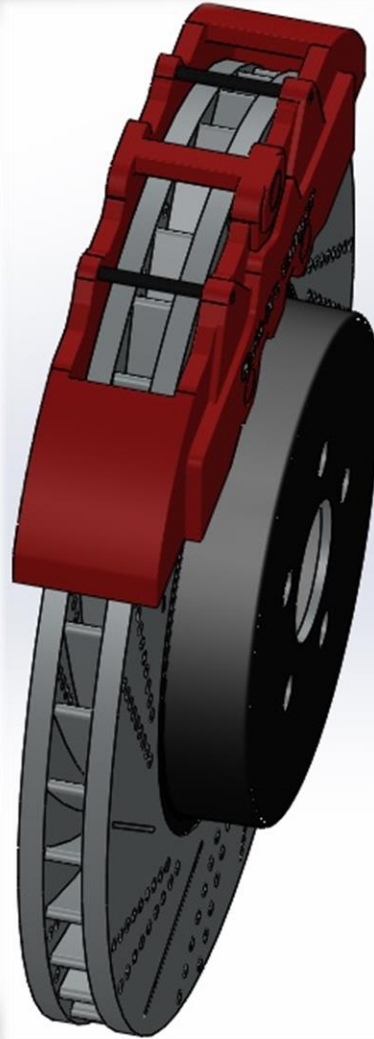
# Wheel Rim Assembly



# Wheel Rim Assembly



Rotor and Caliper



Inspiration



# Wheel Rim Assembly



Exploded View



# Acoustic Guitar

**Objective:** Translate the acoustic guitar shown below into a 3D model in Solidworks using just the picture



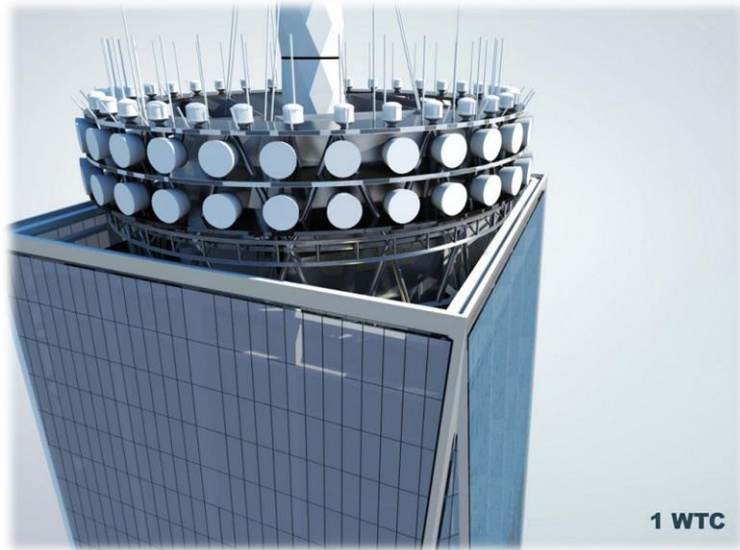
Actual



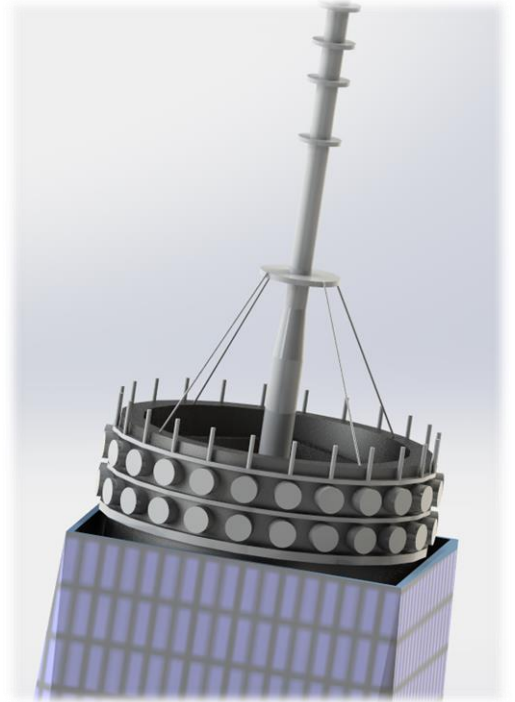
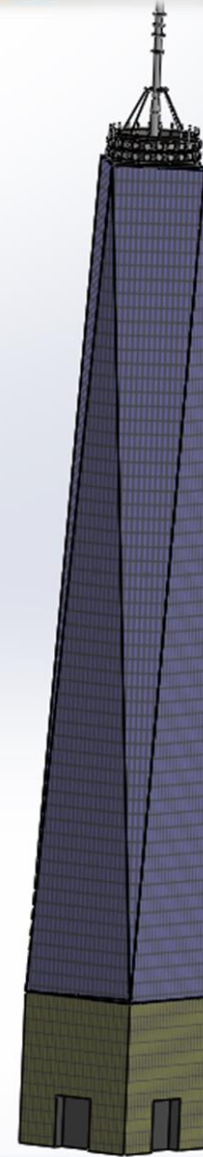
Model Render

# NYC Skyscrapers

**Objective:** Translate the Chrysler Building and World Trade Center into a 3D model in Solidworks using just pictures online



Actual



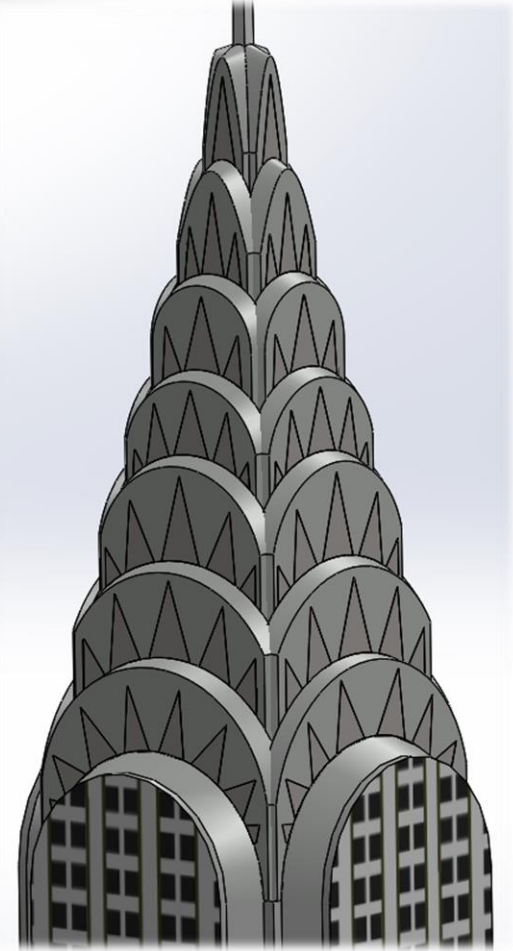
Model



# NYC Skyscrapers



Actual (Rear view)



Model (Front View)



# Transmission Shift Knob

**Objective:** Translate the transmission shift knob shown below into a 3D model in Solidworks using features, not surfaces



# Transmission Shift Knob

