Abaqus Analysis Workflow

Your Name Here

September 21, 2025

Step 1: Model & Assembly

1. **File** → **Import** → **Assembly**
2. **Type:** Parasolid (→ Select `.x_t` file)

Step 2: Property Module - Material Definitions

Material 1: ALU-LINEAR

- **Name:** `ALU-LINEAR`
- **General** → **Density** → `2.7E-009`
- **Mechanical** → **Elasticity** → **Elastic**
  - Young's Modulus (E): `70000`
  - Poisson's Ratio (μ): `0.33`

Material 2: ALU-NONLINEAR

- **Name:** `ALU-NONLINEAR`
- **General** → **Density** → `2.7E-009`
- **Mechanical** → **Elasticity** → **Elastic**
  - Young's Modulus (E): `70000`
  - Poisson's Ratio (μ): `0.33`
- **Mechanical** → **Plasticity** → **Plastic**

Yield Stress	Plastic Strain
276	0
324	0.2

Step 3: Property Module - Section Creation

1. **Section 1:** Name: `LINEAR` → Solid, Homogeneous → Material: `ALU-LINEAR`
2. **Section 2:** Name: `NON-LINEAR` → Solid, Homogeneous → Material: `ALU-NONLINEAR`

Step 4: Property Module - Section Assignment

1. **Assign Section** → Select **Part 1** & **Part 2** → Section: **LINEAR** → OK
2. **Assign Section** → Select **Part 3 (ring)** → Section: **LINEAR** → OK
3. **Assign Section** → Select **Part 4 (spring)** → Section: **NON-LINEAR** → OK

Step 5: Step Module - Analysis Step Creation

- **Create Step** → Name: `Step-1`
- **Procedure type:** General → **Static, General**
- **Basic Tab:**
  - Time period: `1`
  - Nlgeom: **On**
  - Automatic Stabilization: Specify dissipated energy fraction
- **Incrementation Tab:**
  - Type: Automatic
  - Max. no. of Increments: `500`
  - Initial: `0.1`, Min: `1E-05`, Max: `0.1`

Step 6: Interaction Module

Reference Points (RPs)

Procedure: **Tools** → **Reference Point** → Select geometry.

1. **RP1:** Top of the cam piston.

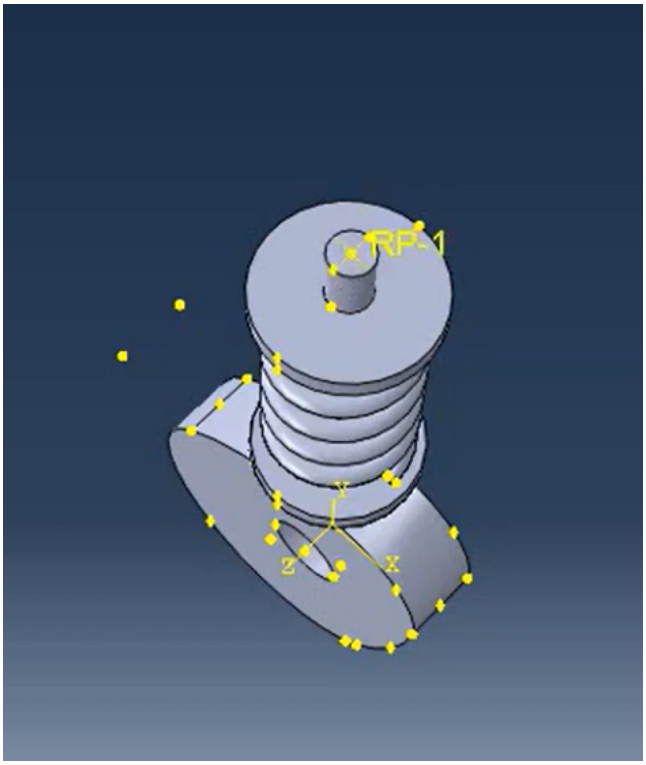

Figure 1: RP1 Location.

2. **RP2:** Bottom of the end of the spring.

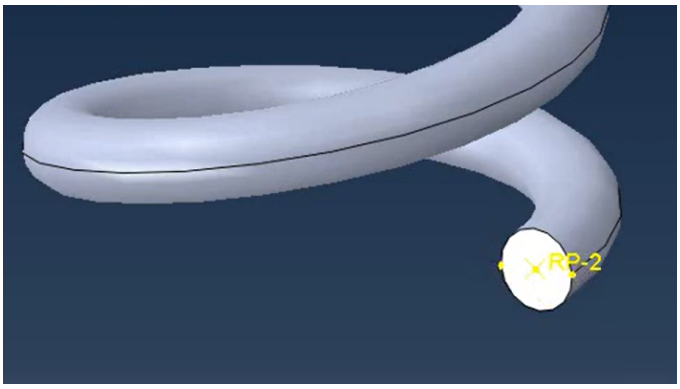

Figure 2: RP2 Location.

3. **RP3:** Top of the spring.

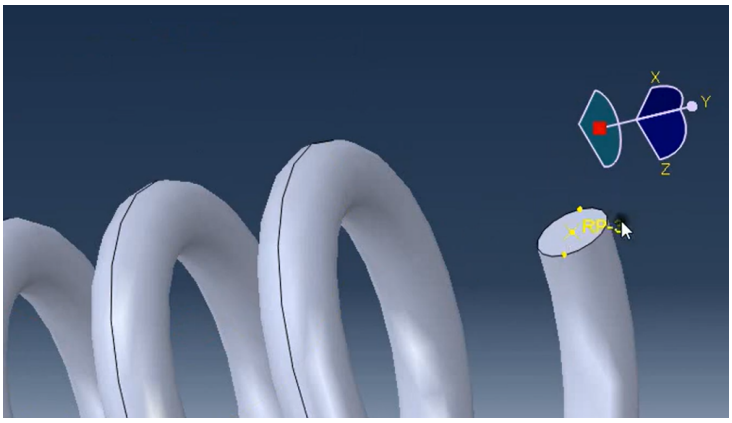

Figure 3: RP3 Location.

4. **RP4:** Cam center.

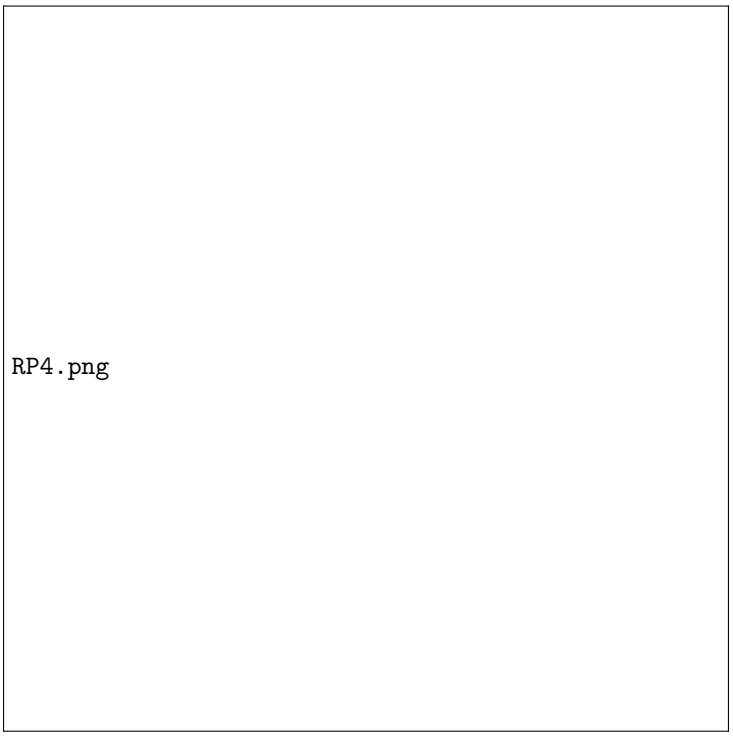

Figure 4: RP4 Location.

5. **RP5:** Cam piston center bottom.

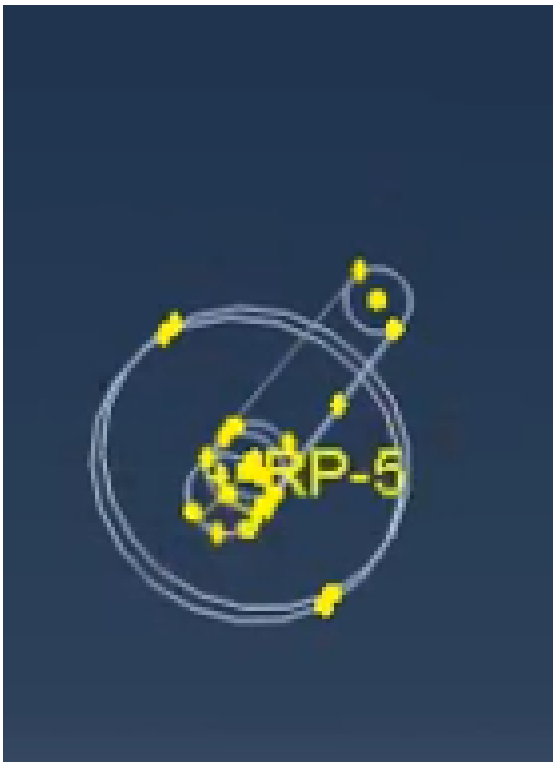

Figure 5: RP5 Location.

6. **RP6:** Cam disk left point.

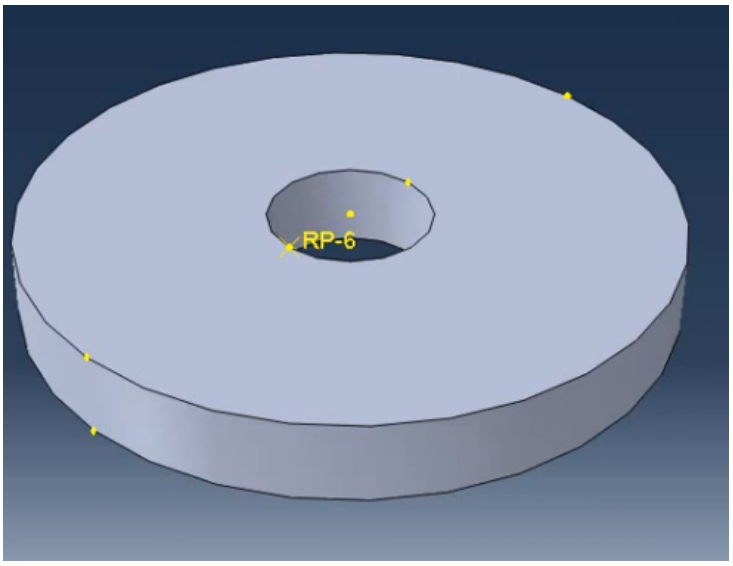

Figure 6: RP6 Location.

7. **RP7:** Cam piston side.

RP7.png

Figure 7: RP7 Location.

Interaction Property

- **Create Interaction Property** → Type: Contact
- **Mechanical** → **Tangential Behavior**
- **Friction Formulation:** Penalty → **Coefficient:** `0.15`

Interaction Definitions

1. **Interaction-1:**
   - **Master Surface (Red):** cam piston bottom surface
   - **Slave Surface (Purple):** cam top outer surfaces

   (a) **IN1:** Top of the cam piston.

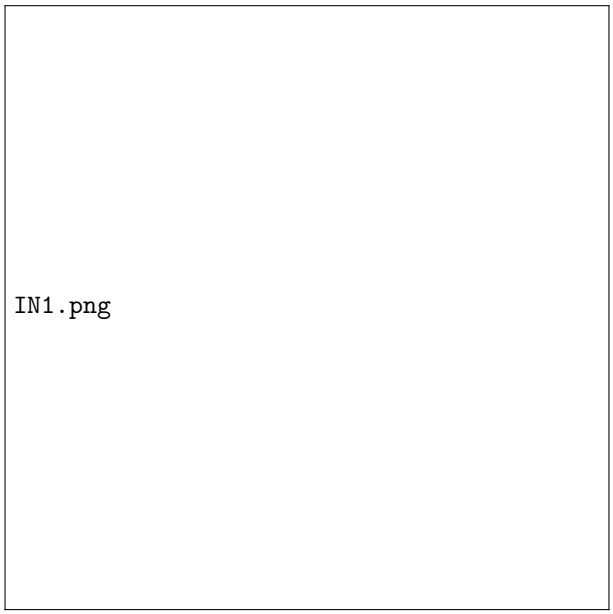

Figure 8: IN1 Location.

2. **Interaction-2:**

   - **Master Surface (Red):** spring
   - **Slave Surface (Purple):** cam piston top surface (below spring)

   (a) **IN1:** Top of the cam piston.

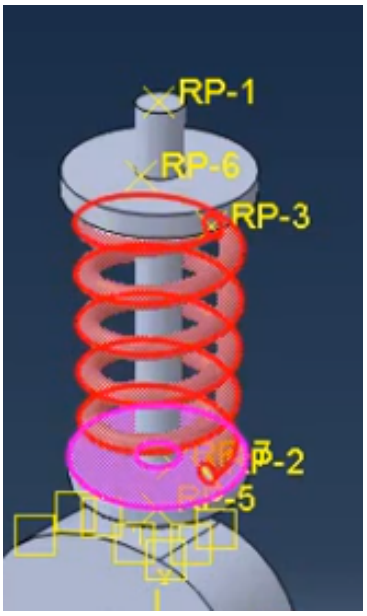

Figure 9: IN1 Location.

3. **Interaction-3:**

   - **Master Surface (Red):** disk bottom surface
   - **Slave Surface (Purple):** spring

   (a) **IN1:** Top of the cam piston.

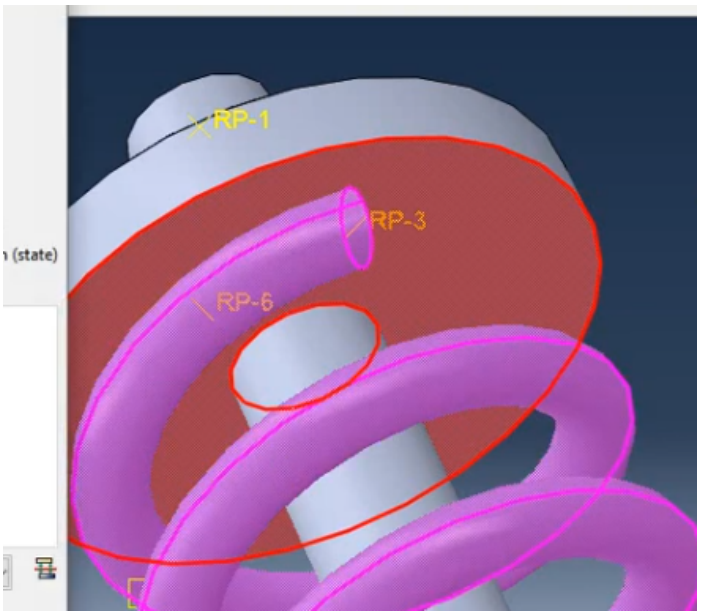

Figure 10: IN1 Location.