2.12.2.4.4 Silicone Rubber Gaskets

Silicone rubber gaskets are used between mating surfaces of the bolted closures of the VP-55 design. Specifically, there is 1/8-in. thick gasket between the Inner Container Blind Flange and Inner Flange Ring, and there is a 0.308-in. thick gasket between the Drum Lid and Top Plate Ring of the Internal Structural Support. Although a gasket may be used between the Drum top ring and Clamp Ring, no gasket is included in the model for this connection. The elastic material properties of silicone rubber [28] are presented in Table 2-15.

Table 2-15. Silicone Rubber Material Properties (Min/Max Values)

Modulus of Elasticity (psi)	Density (lbm/in^3)	Poisson's Ratio
1.45×10^2 / 7.25×10^3	0.0397 / 0.083	0.47 / 0.49

2.12.2.4.5 Bolts

The bolts used to connect various components in the VP-55 Package are specified as ASTM A429/SAE J429 Grade 5 minimum. SAE J429 Grade 5 bolts have a minimum tensile strength of 120,000 psi and a minimum elongation of 14% per reference [29].

2.12.2.4.6 Ceramic Blanket

The ceramic blanket wrap around the Inner Container is modeled with the material properties of 5 PCF polyurethane foam. Basis: Dynamic material properties for the ceramic blanket are unavailable in the open literature. Additionally, the ceramic blanket has a density of 6 to 8 PCF—which is comparable to the polyurethane foam. The polyurethane foam is a very soft material which allows for a large compression of the blanket.

2.12.2.5 Boundary Conditions, Loads, and Initial Conditions

To simulate the free-drop the VP-55 package, a constant acceleration of 32.17 ft/s^2 (386.04 in/s^2) is applied to all parts of the model. The nodes of the shell elements representing the flat, horizontal, unyielding surface are constrained in all three translational directions and all three rotational directions.

The free drop of the VP-55 package is governed by the equations for uniformly accelerated rectilinear motion:

$$\int_{v_0}^{v} v\,dv = g\int_{h_0}^{h} dh$$

$$\frac{1}{2}(v^2 - v_o{}^2) = g(h - h_0)$$

$$v^2 = v_0{}^2 + 2g(h - h_0)$$

where,
v = velocity,
t = time, and
g = gravitational constant.
v_o = initial velocity, and
h_0 = initial height