February 2012

Fact Sheet: New Encasement for the 1297 Magna Carta

The only original Magna Carta permanently in the United States returns to public display, courtesy of David M. Rubenstein, at the National Archives Building in Washington, DC, in a new state-of-the-art encasement. This new enclosure, designed and fabricated by the National Institute of Standards and Technology (NIST), is based on an original design used to protect the Charters of Freedom--the Declaration of Independence, the U.S. Constitution, and the Bill of Rights. These documents, which are on permanent display in the National Archives Rotunda, were re-encased in a multi-year project that was completed in 2003 by the National Archives in partnership with NIST.

MAGNA CARTA ENCASEMENT DETAILS

Approximate Encasement Weight: 102 kg (225 lbs)

Approximate Assembled Dimensions: Length = 1041 mm (41 inches), Width = 743 mm (29.25 inches), Thickness = 162 mm (6.38 inches)

Encasement Environment – The encasement was sealed with an atmosphere of 99% high-purity argon, 1% high-purity helium, and an initial oxygen concentration of 1 part per million. The encasement seal achieved a very low leak rate that greatly exceeds the project requirements. The interior humidity ranges from ca. 40 to 42% relative humidity, depending on the temperature of the display area. This estimate was determined by measuring the helium leak rate and converting to account for the different permeation rates of helium and oxygen through the Viton seal material.

Seal – The compressive sealing pressure exerted by the glass and encasement body on the Viton O-rings is somewhere between 1.1 and 2.1 mega pascals (160 and 320 pounds per square inch), depending on the material properties of these specific O-rings (two concentric O-rings are used for the glass to metal seal). The gas pressure abutting the O-ring is atmospheric, approximately 100 kilo pascals (15 psi); air on the outside, argon and helium on the inside, and a time varying mixture of argon, helium, oxygen and nitrogen between the O-rings.

Bolts – 32- 3/8” stainless steel bolts, spaced slightly more than 98 millimeters (3.88 inches) on center around the perimeter of the underside of the frame and sealing surface of the base. This provides an approximate seal pressure of 300 pounds per linear inch along the O-ring groove.

Frame - Monolithic 7075 aluminum alloy with a “dash black” powder coating finish for protection.

Base - Monolithic 7075 aluminum alloy with a black hard coat anodized interior finish.

Glass – Two 5 millimeter (3/16 inch) low iron glass (low iron) with 1.27mm (.05” inch) laminated interlayer that includes anti-reflective coating.

Platform - High-grade aluminum with holes spaced to provide moisture transfer between the humidified argon gas and the document, and a machined pocket in the profile of the wax seal.

Pockets - To reduce weight of encasement, strategic areas (or pockets) of material have been removed from the base, the document platform and the frame. In the base, there are 32 pockets along the side. In the frame, the 32 pockets are in between the bolt holes and are on the underside of the frame (concealed from view). The 36 pockets in the document platform are on the underside of the platform hidden from view.

O-rings – Two nested Viton 6.4mm (.25 inch) diameter o-ring seals run along the inside surface of the Base; one 2663mm (104.8 inches) and one 2972 (109.9 inches) long.

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12-61