



Henri Édouard Tresca (1814 – 1885)

Comparison of Tresca and Von Mises Criteria

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Henri Édouard Tresca (October 12, 1814–June 21, 1885) was a French mechanical engineer, and a professor at the Conservatoire National des Arts et Métiers in Paris.

He is the father of the field of plasticity, or non-recoverable deformations, which he explored in an extensive series of experiments begun in 1864. He is the discoverer of the Tresca (or maximal shear stress) criterion of material failure. The criterion specifies that a material would flow plastically if

$$\sigma_{tresca} = \sigma_1 - \sigma_3 > \sigma_{max}$$

Tresca's criterion is one of two main failure criteria used today. The second important criterion is due to von Mises. See comparison on the image above right.

Tresca's stature as an engineer was such that Gustave Eiffel put his name on number 3 in his list of 72 people making the Eiffel tower in Paris possible.

Tresca was also among the designers of the standard metre etalon. After the Treaty of the Meter had been signed in 1875, the International Bureau of Weights and Measures (BIPM) in Sèvres, France made 28 prototype line standards of platinum-iridium. The bars had a modified X cross section named for the French scientist, Tresca who designed them. The Tresca section was designed to provide maximum stiffness. Small elliptical areas on the upper surface of the central rib at each end of the bars were highly polished, and three lines, nominally 0.5 mm apart, were ruled on these surfaces, the distance between the middle lines of each group defining the standard length. One of the bars was selected as the International Meter. The United States received

National Prototype Meters No. 27 and No. 21 in 1890. When the Mendenhall Order in 1893 declared the meter to be the fundamental length standard, No. 27 became the US primary national standard for all length measurements. It remained so until 1960,

Tresca was made an honorary member of the American Society of Mechanical Engineers in 1882.