Influence on an SPT longboard truck of the impact of an impactor weighing 20 kg damped by a 70 Shore A rubber mat with a thickness of 17mm according to DIN EN 13613 dropping of the height of 200 mm

$\mu := 0.5$ Poisson's ratio

$R := 0.395$ mm

$C_1 := 0.549$ N

$C_2 := 0.07516$ N

$C_3 := 0.025$ mm

$h := 0.2$ m drop height

$g := 9.81$ $\frac{m}{s^2}$ gravitational acceleration

$m := 20$ kg mass of the impactor

$L_0 := 0.017$ m thickness of the rubber mat

$d := 0.1$ m diameter of the rubber mat

$Sh_A := 70$ shore hardness of the rubber mat

$E := \frac{1-\mu^2}{2 \cdot R \cdot C_3} \cdot \frac{C_1 + C_2 \cdot Sh_A}{100 - Sh_A} \cdot (2.6 - 0.02 \cdot Sh_A)$ $\frac{N}{mm^2}$ elastic modulus of the rubber mat according to 1)

$A := \left(\frac{d}{2}\right)^2 \cdot \pi$ m^2 area of the rubber mat

$D := \frac{E \cdot 10^6 \cdot A}{L_0}$ $\frac{N}{m}$ spring constant of the rubber mat

$E_p := \frac{1}{2} D \cdot s$ J potential energy of the impactor

$E_p := m \cdot g \cdot h$ J elastic potential energy

$s := \sqrt{\frac{2 \cdot m \cdot g \cdot h}{D}}$ m deflection of the rubber mat according to principle of conservation of energy

$s = 4.387 \times 10^{-3}$

$F := D \cdot s$ N force on the truck

$F = 1.789 \times 10^4$

1) J. Kunz und M. Studer, "Druck-Elastizitätsmodul über Shore-A-Härte ermitteln", Kunststoffe 6/2006, Carl Hansen Verlag, München