Object Unistrength (Universal Object Strength Science)
Ph. D. & Dr. Sc. Lev G. Gelimson (AICFS)

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Object strength science uses nonuniversal dimensional mechanical stresses without expressing their risk (danger) degrees. There are no universal strength laws of nature. The common reserve is valid for simple loading only. The finite element method (FEM) gives often unverifiable and inadequate "black box" results.

Object unistrength [1-8] based on material unistrength includes the fundamental sciences of analytical macroelements, equivalent stress concentration factors, universal reserves, reliabilities, and risks, error tolerance, and analytical fatigue.

Apply the power and integral sciences of analytical macroelements along with the author's material unistrength universalizations of the Galilei, Tresca, Huber-von Mises-Hencky, and Pisarenko-Lebedev strength criteria in the principal unistresses

$\sigma_j° = \sigma_j/\sigma_t$ ($\sigma_j \geq 0$), $\sigma_j° = \sigma_j/\sigma_c$ ($\sigma_j < 0$), j = 1, 2, 3, $\sigma_{eG}° = \max\{|\sigma_1°|, |\sigma_2°|, |\sigma_3°|\} \leq 1$,

$\sigma_{eT}° = \sigma_1° - \sigma_3° \leq 1$, $\sigma_{eHvMH}° = \sigma_i° = \{[(\sigma_1° - \sigma_2°)^2 + (\sigma_2° - \sigma_3°)^2 + (\sigma_3° - \sigma_1°)^2]/2\}^{1/2} \leq 1$,

$\sigma_{ePL}° = (1 - \chi)\max\{|\sigma_1°|, |\sigma_2°|, |\sigma_3°|\} + \chi\{[(\sigma_1° - \sigma_2°)^2 + (\sigma_2° - \sigma_3°)^2 + (\sigma_3° - \sigma_1°)^2]/2\}^{1/2} \leq 1$

to a three-dimensional cylindrical glass K8 element with dimensions h = 60 mm, a_1 = 30 mm, a = 55 mm; σ_t = 29 MPa, σ_c = 1400 MPa, $\chi = \sigma_t/\sigma_c = 0.0207 << 1$ (Fig. 1):

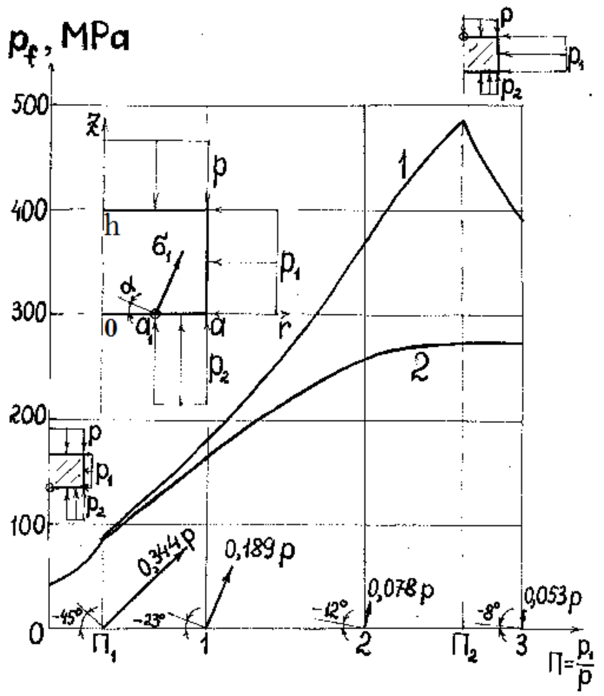

Fig. 1. Cylindrical glass fracture laws

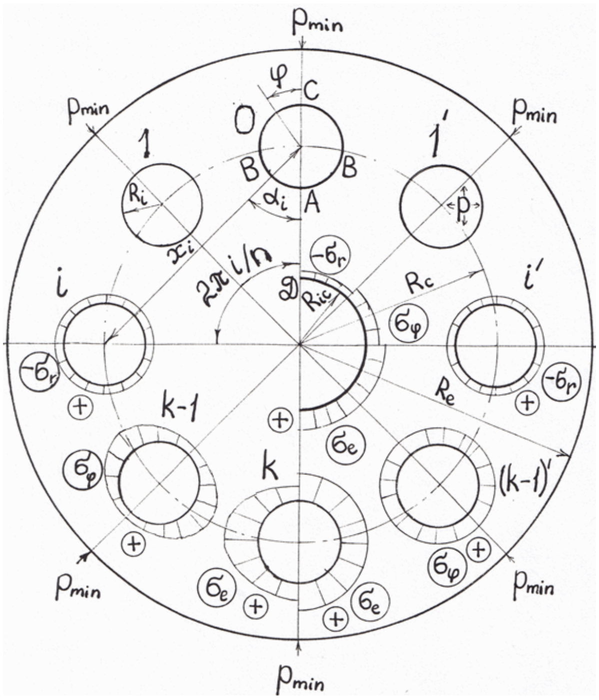

Fig. 2. Cyclically symmetric plate fatigue

1. When reaching critical value Π_1 of ratio $\Pi = p_1/p$, the failure initiation point abruptly moves from (0, 0) to (a_1 , 0). Failure initiation character changes from totally radially cracking to the cleavage of the central part $0 \leq r \leq a_1$ from the internal base side.
2. Applying side pressure p_1 multiplies the cylindrical glass element strength.
3. The Galilei strength criterion and especially the Tresca, Huber-von Mises-Hencky, and Pisarenko-Lebedev strength criteria universalized by the author lead to similar cylindrical glass element strength and failure laws experimentally verified.

In the cyclically symmetric plate fatigue problem with the central hole with radius R_{ic} > 0 (Fig. 2, to the right) and without this hole (R_{ic} = 0, to the left), pressure p in all holes cyclically varies from stationary external pressure p_{min} to p_{max} . The Lame and Kirsch solutions for a small hole in a plate give for the holes surfaces equivalent Tresca stresses $\sigma_{e\varphi}$ for n = 2k peripheral holes, σ_{ec} for the central hole, and optimal R_{icopt}:

$\sigma_{e\varphi} = (p - p_{min})\{2\alpha^2 - R_c^{-2}[A_k(\alpha^2 - 1)R_i^2 - 4R_e^2]\cos 2\varphi\}/(\alpha^2 - 1)$, $\sigma_{ec} = 2\alpha^2(p - p_{min})/(\alpha^2 - 1)$, $\alpha = R_e/R_{ic}$, $A_k = 2S_k - 1$, $S_k = \Sigma_{j=1}^{k-1}\cos(\pi j/k) / \sin^2[\pi j/(2k)]$, $R_{icopt} = R_e/[1 + 4R_e^2/(A_kR_i^2)]$. Fatigue reserve $n_F = \sigma_0/\sigma_{ec}|_{p=pmax}$ where σ_0 is the fatigue limit for the pulsation cycle. The linear Goodman approximate to the Haigh diagram gives $\sigma_0 \geq 2\sigma_u\sigma_{-1}/(\sigma_u + \sigma_{-1})$ (σ_u is the ultimate strength, σ_{-1} is the fatigue amplitude limit for the symmetric cycle).

Object unistrength is directly and adequately applicable also to aeronautical fatigue.

Keywords: Ph. D. & Dr. Sc. Lev Gelimson, "Collegium" All World Academy of Sciences, Academic Institute for Creating Fundamental Sciences, Physical Journal, universal physics, uniphysics, universal measurement science, universal metrology, unimetrology, universal mathematics, perfectly sensitive unimathematics, Unimathematik, Best Data Approximation Science, classical estimation, approximation, data processing, least square method, Deformable Solid Unimechanics, Deformable solid mechanics, nonuniversal dimensional mechanical stress, danger degree risk nonexpression, Material Unistrength, Universal Material Strength Science, material strength science, Object Unistrength, Universal Object Strength Science, arbitrarily anisotropic material, different resistance to tension and compression, variable load, possibly rotating principal stress state directions, limiting state criterion, triaxial mechanical stress, universal strength law of nature, Tresca criterion, Huber-von-Mises-Hencky criterion, pressure nonsensitivity, significant strength effect, Nobel prize winner Bridgman experiments, tensile-shear strengths ratio, prescribed value, universal stress, unistress, stationary loading, static loading, limiting value, direction, sign, material's point, loading condition, linearly correcting, limiting surface, limiting line, unordered principal stress, unequal strengths in tensions and compressions, anisotropy, variably loading, initial mean cycle stress, time, uniaxial stress process, own reserve, similar limiting process, damage accumulation, equidangerous unistress cycle, mean stress, amplitude stress, constantly vectorial reduced Unistress, limiting amplitude diagram, most dangerous stationary index permutation possibly depending on time, final universal criterion, simple loading reserve, finite element method, unverifiable and inadequate black box result, fundamental science of analytical macroelements, equivalent stress concentration factor, universal reserve, universal reliability, universal risk, error tolerance, analytical fatigue, power science of analytical macroelements, integral science of analytical macroelements, material unistrength universalization, Galilei criterion, Tresca criterion, Huber-von Mises-Hencky criterion, Pisarenko-Lebedev strength criterion, principal unistress, three-dimensional cylindrical glass K8 element, dimension, cylindrical glass fracture law, cyclically symmetric plate fatigue,critical value, failure initiation point, abruptly moving, failure initiation character, totally radially cracking, central part cleavage, internal base side, side pressure, cylindrical glass element strength, similar cylindrical glass element strength and failure laws, experimental verification, cyclically symmetric plate fatigue problem, central hole, peripheral hole, stationary external pressure, Lame solution, Kirsch solution, equivalent Tresca stress, fatigue reserve, fatigue limit, pulsation cycle, linear Goodman approximate, Haigh diagram, ultimate strength, fatigue amplitude limit, symmetric cycle, aeronautical fatigue, Stephen Timoshenko, General Problem Theory, Elastic Mathematics, General Strength Theory, The Stress State and Strength of Transparent Elements in High-Pressure Portholes, Generalization of Analytic Methods of Solving Strength Problems for Typical Structure Elements in High-Pressure Engineering, The generalized structure for critical state criteria, Basic New Mathematics.

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