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Complete analytical solution of linear soil pressure on rigid spread rectangular footings

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Title:	COMPLETE ANALYTICAL SOLUTION OF LINEAR SOIL PRESSURE ON RIGID SPREAD RECTANGULAR FOOTINGS
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Abstract:	<p>In this paper the complete analytical solution concerning the linear soil pressure on rigid spread rectangular footings is formulated. All five distinct regions on the eccentricity map are related to five possible types of footing deformation each corresponding to a unique shape of compression zone. For each type the linear distribution of the soil pressure on the footing base, the neutral axis position, the maximum pressure and the pressure values on the four corners, are expressed analytically as functions of eccentricities, mean soil pressure and footing dimensions. Special and boundary cases are also presented, proving the correctness and the consistency of the developed mathematical formulas as well as the regional continuity and the physical meaning of the eccentricity map. These explicit expressions guarantee their direct programmability providing high computational efficiency to heavy engineering calculations required, such as in forming envelopes for shear forces and bending moment, in optimizing the design of footing geometry or footing reinforcement. Several examples dealing with rigid spread footings under variable eccentric loading, demonstrate our developed software that uses all procedures presented here and 3D visualization technology to facilitate inspection of the results and validate engineering perception.</p>