

LETTER

SI Units in Geotechnical Engineering

To the editor:

I would like to comment on the article by Mr. R. D. Holtz in the June 1980 issue of *Geotechnical Testing Journal*, which has only recently come to my attention.

Many organizations in Britain made the change from traditional to SI units during 1969 to 1972. I was responsible for implementing the changeover at Soil Mechanics Ltd. at that time, and as a guide to our own staff and our clients we drew up a list of recommended SI units which we issued in the form of a summary card [1]. These units were subsequently adopted and recommended by the British Geotechnical Society (BGS) with very little modification [2], and are generally in accordance with the British Standards Institution "The International System of Units (SI)," (BS 3763:1970).

Many of us, myself included, regretted having to abandon our traditional system which had evolved through the centuries. However, our experience was that when the system had been clearly explained, and after some initial trepidation over the newton, the new units were soon accepted by engineers, technicians, and site operatives, most of whom could appreciate the coherent simplicity of SI. The main difficulty was to calibrate oneself to appreciate the magnitude of the new units, so that one could "think metric" entirely. This process was aided by the use of posters, visual aids, and simple approximations such as a kilonewton equals a tenth of a (British) ton, and 100 kN/m^2 is about a ton per square foot or one atmosphere. Another problem was to appreciate the distinction between mass and weight (force), but the logic of multiplying the mass of a body of soil by "g" when it produces a force was not difficult to grasp.

We found that geotechnical computations are, in fact, much easier than before. In the laboratory under the old system we generally measured cell pressures and compressive stresses in lb/in.^2 , then derived shear strengths in lb/ft^2 , in order to calculate bearing pressures in ton/ft^2 . Now for soils we use kPa (kN/m^2) throughout, or MPa (MN/m^2) for rocks. An early inconvenience was to speak the mouthful "kilonewtons per square metre" in place of "psi" or "psf," but that has now been overcome by saying "kPa."

In his article Mr. Holtz states that the British ton is 2000 lb, but I have always understood this to be the value of the U.S. (short)

ton. The British (long) ton is equal to 2240 lb. To cover both units the following factors should be included in Tables 4, 5 and 6:

In Table 4:

$$1 \text{ U.S. (short) ton (2000 lb)} = 907.2 \text{ kg}$$

$$1 \text{ British ton (2240 lb)} = 1016 \text{ kg}$$

In Table 5:

$$1 \text{ U.S. ton-force} = 8896 \text{ N} = 8.896 \text{ kN}$$

$$1 \text{ British ton-force} = 9964 \text{ N} = 9.964 \text{ kN}$$

In Table 6:

$$1 \text{ U.S. ton-force/ft}^2 = 95.76 \text{ kPa}$$

$$1 \text{ British ton-force/ft}^2 = 107.3 \text{ kPa}$$

Finally, I must confess that I was unaware of "figanewtons" and its multiples and submultiples. In the same vein I doubt whether Mr. Holtz would appreciate certain traditional English units such as "kilofirkins per square ell," which the BGS rejected. However, I would be delighted to investigate the variability of "boxafiganewtons" (without a newton of course) after the box is opened, if Mr. Holtz would care to supply one.

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References

- [1] "SI Units for Soil Mechanics and Foundation Engineering," Soil Mechanics Ltd., Bracknell, Berks, England, 1972.
- [2] British Geotechnical Society Subcommittee on the Use of SI Units in Geotechnics, "Report on the subcommittee," *Géotechnique*, Vol. 23, No. 4, 1973, pp. 607-610.

Bibliography

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- Page, C. H. and Vigoureux, P., "The International System of Units," (approved translation of *Le Système International d'Unités*, Paris), National Physical Laboratory, Her Majesty's Stationery Office, London, 1977.
- Walley, F., "Metrication," *Proceedings of the Institution of Civil Engineers*, Vol. 40, May 1968. Discussion includes contribution by Head, K. H., Vol. 41, Dec. 1968.