Application of Electrical Analogy to Draw Flownets for Sudden Draw down Conditions in Earth Dams*

by

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Author's Reply

This author thanks the discussors for their valued opinions on the paper and admits that the limitations, which are inherent with this kind of 'Electrical Analogy', are there in their tests.

Coming to the discussions; Misra and Mahanty have stated (*i*) that the "upstream face is not a stream line" with which the author does not disagree. What has been assumed in the paper, written within brackets, is that it is very much similar to a flow line. The author wishes to convey that a careful examination of the application of potential to the u/s face would reveal that $\theta = -ky$ condition has been satisfied without appreciable error creeping in.

(*ii*) The authors have clearly stated on the nature of the 'phreatic line of the steady state seepage' after any sudden draw down, in the first paragraph of the paper (the last two sentences) which the discussors should not have over looked. That, this phreatic line approximates to a flow line "immediately" after sudden draw down, has been assumed and this assumption is in fact not far from the true situation. On application of potential along the phreatic line, the author wishes to say that if a test actually be conducted applying potentials following the methed suggested by the discussors, it could be seen that this elaborated arragement practically does not give any different flow net over the zone close to the u/s face (to which zone the study of sudden draw down essentially matters), where as the present set-up is quite simpler to make and work giving same flow net. (As a matter of fact the method suggested by the discussors has been given by Singh and Punmia in their paper and has been briefly quoted by Singh (1967) in his book on Soil Engineering.)

(*iii*) The discussors have not reasoned out to show why "It is not correct to apply a potential to a point along the base of the dam." Also their statements (those follow the above statement) are not clear. What the author feels is that, possibly, the discussors have confused the case studied (having a horizontal impervious base) with the case of a dam having a permeable base layer and for which reason they have given these statments, perhaps.

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Brahma's last sentence reads "Once the location of the free surface is known for a particular instant due to a rate of lowering of reservoir level, the equipotential lines or flow nets can be easily drawn 'assuming' the flow to be 'steady' at that moment." Immediately after an instantaneous draw down the free surface is known, which is approximately the phreatic line of the steady state seepage. Thus, if one draws the flow net for that instant of time (soon after the instantaneous draw down has occured), as per Brahma, he can correctly assume the flow to be steady for a small duration of time. The present study being exactly what has been stated above, it is not clear what has attracted Brahma's remarks.

The boundaries of the flow region changes with time. But surely the severe most situation develops soon after a sudden draw down has occured and not after lapse of a certain duration of time. Therefore, for design point of view, it is extremely pertinent to draw the flow net for that instant of time. This study, therefore, has been restricted to that instant of time only and has not been extended to any other moment.

The study on the "movement and nature of free surface with time" is not within the scope of the paper. However, most of the comments of Brahmat have essentially relevance to such studies and has no direct relevance to the study reported by the authors. Also the references quoted have much relevance to such studies (the author could not see Shestakov's work). To bring clarity let it be stated here that the 'aim' of the present study was "to draw the flow net for the case of a homogeneous earth dam having an 'impervious base', for the instant that follows an instaneous draw down."

The author wishes to mention here that there was a mistake in the figure No. 1(b). The gradients shown in that figure vary from 0.0 to 2.0, where as it should be from 0.0 to 1.25. However, this correction does not introduce any corresponding correction any where in the paper.

Reference

SINGH, ALAM—(1967), "*Soil Engineering In Theory and Practice*", Asia Publishing House pp. 157.