

SAISI SAICE



G R O U N D P R O F I L E G R O N D P R O F I E L

N°6
SEPT.1975

SOUTH AFRICAN ATTENDANCE AT THE TOKYO SOILS CONFERENCE

The story begins at a meeting in Harvard in 1937, at which Professor Jennings was present. At this meeting the International Society for Soil Mechanics and Foundation Engineering was established.

In Rotterdam in 1948 international relationships were formalised by the establishment of various national societies which extended throughout the world. South Africa formed one of the first of these and has continued to play a significant part in the international geotechnical scene.

According to paragraph 2 of the Constitution, approved once again as late as 1969 in Mexico, the aim of the Society

"... is the promotion of international co-operation among engineers and scientists for the advancement of knowledge in the field of soil mechanics and its practical applications and in the civil engineering applications of geology, and of rock, snow and ice mechanics."

By-law 15 provides :

"Place - An invitation to act as host for an international conference and the accompanying executive committee meeting must be received sufficiently long in advance so that it can be placed on the agenda of the executive committee at the time of the previous conference. Before accepting an invitation, the executive committee shall be satisfied that the host country has :

- (a) A meeting place with appropriate facilities;
- (b) Suitable hotel accommodation for members and their wives;
- (c) Sufficient of interest in the country for technical and other visits;

- (d) Expressed willingness to follow conference rules laid down by the executive committee or the officers.

Any invitation from a country which de-bars visiting members solely on the grounds of nationality, race, creed or political views will not be acceptable. If an invitation is received from more than one national society, the final selection shall be made by secret ballot."

When South Africans attempted to attend the Moscow Conference they were prevented at the eleventh hour, so to speak, and accordingly when the location of the following conference was being discussed at a meeting in Moscow, Professor Fukuoka for Japan gave an assurance that if the conference were to be held in their country all the members of any national society would be welcome to attend.

Next the United Nations steps into the limelight.

In December 1973 the General Assembly adopted the following resolution (No. 3151) :

"Calls upon all Governments which have not yet done so :
... to end all cultural, educational and civic contacts and exchanges with racist institutions in South Africa."

In December 1974 by General Assembly Resolution No. 3324, the following was adopted :

Item 8. "Recommends that the South African regime should be totally excluded from participation in all international organizations and conferences under the auspices of the United Nations so long as it continues to practice apartheid and fails to abide by United Nations resolutions concerning Namibia and Southern Rhodesia.

Item 19. "Requests all Governments to prohibit all cultural, educational, scientific, sporting and other contacts with the racist regime and with organizations or institutions in South Africa which practise apartheid."

It is of interest to note that the General Assembly of the United Nations can only make resolutions and recommendations and it is a matter for the decision of individual countries to decide how to accept them. Careful examination of these resolutions reveals that they do not apply to our division or the SAICE which does not practice apartheid in its operation.

Nevertheless, the Japanese Government has ruled that no Rhodesians would be admitted to Japan and South Africans could enter only for tourism or business activities. No permission to enter will be given to those who wish to come for the purposes of sport, culture or academic activities.

In April 1975 Professor Jennings at the request and sponsored by the Division of Geotechnical Engineering proceeded to Istanbul to, as it were, save the situation by discussing the whole affair at a meeting of the Executive Committee of the ISSMFE. At this meeting Professor Jennings spoke of the history of the Society, its aims and the issues involved. In urging South Africa's case he noted that the South African Group is one of the largest in the Society and he believed it had made some contribution to the general practice of Soil Mechanics and Foundation Engineering. He referred to the well publicised case of the International Press Union which resisted the refusal of the Nigerian Government to allow the attendance of South

Africans to a conference in Lagos by moving its meeting to Zurich. He pleaded that the International body should not allow its international relationships to crumble under the weight of unrelated political pressures.

At this particular meeting, the following clauses, inter alia, of a resolution proposed by Professor Sowers and seconded by Professor Jennings were, by secret ballot, voted on and approved :

Clause 5. If in 3 months the officers of the International Society have not obtained the necessary assurance (that by-law 15 should be applied to the Tokyo Conference) the President is requested to cancel the Tokyo Conference.

Adopted with 22 in favour, 15 against.

Clause 6. In this case, the Presidents and Secretary General (after consulting all Vice-Presidents) shall seek an alternate site and date considering first the proposal of the F.R. of Germany made in due form in Moscow and also the current proposal from Israel.

Adopted with 22 in favour, 9 against.

It is interesting to note the use of the word "requested" and not "required" to cancel the Tokyo Conference; one is apt to wonder if societies such as the International Society for Soil Mechanics and Foundation Engineering in a directive to its officers are required to do more than "request" to convey its strongest stand and desire. Words such as "require" or "instruct" sound perhaps too imperative and lacking in the finesse which should characterise the dealings of an International society of professional men.

By the end of May 1975 it was apparent that the Japanese Government was not going to change its policy. Moreover, in discussions with the United Nations it was suggested that By-law 15 be changed, adding something about general directives of the United Nations or UNESCO. It is reported that the President of the Society, J. Kerisel and its Secretary General, J.K. Nash, are accordingly working on just such a change. Needless to say many feel it would be a disaster if such a change to By-law 15 were effected.

Blithely ignoring the spirit, if not the strict wording, of Clause 5 of the Istanbul Executive Committee Meeting, the Secretary General, J.K. Nash, decided that the South Africans should attend as tourists in Tokyo; a dodge which the Japanese regard with high disfavour and which would preclude South Africans from attending in any official capacity.

In June, Nash intimated that in his opinion it would be a brave thing if the International Society were to resist governments and refuse to allow itself to be pushed about by them and that perhaps if the Society were a political one the feeling of moral well-being which resulted therefrom would give the Society a certain cohesion; but in his view the Society is not a political one nor can it reform the politics of the world.

Further Nash noted that By-law 15 merely states :

"An invitation from a country which debars visiting members ... will not be acceptable"

and when the Japanese invited the Society to hold the conference in Tokyo they did not debar members. Moreover he had merely been requested to act not required. Reasoning worthy of a desperate lawyer stuck with a bad case - Let Geotechnicals never more disparage legal ingenuity !

Nash accordingly requested member societies of the International Society to write to him expressing their views.

In July the President of the International Society wrote to the Presidents of all National Societies. Extracts from his letter as follows eloquently speak for themselves :

"... the stand taken by the Japanese Government rest unaltered. If then I enforce the letter of the motion passed at Istanbul I must now cancel the IXth International Conference and enter into negotiations successively with Germany and then with Israel.

... Germany cannot now act as host for financial reasons ... Israel's offer ... was not received early enough according to By-law 15.

... Replies to a circular letter (on the matter of cancellation) may be summarized as follows :

- | | |
|--|----|
| - in favour of proceeding with the Conference in Tokyo | 15 |
| - delegation to the President to proceed as he thinks in the best interest of the ISSMFE | 15 |
| - in favour of seeking a fresh host country | 2 |

Our Society has no direct links with the United Nations but it cannot exist without the governments of the member nations of the ISSMFE having to observe the Charter of the United Nations.

... Article (sic) 15 cannot be applied and I shall be making a proposal to amend it when our Executive Committee next meets.

... All six vice-presidents are in favour of going ahead with the Tokyo Conference ... the three past-presidents are in favour of going ahead ... we see the slight majority of 22 to 15 in Istanbul has been reversed on fresh reflection.

All these reasons have made your Presidents decide to hold the IXth Conference in Tokyo as originally agreed in Moscow.

I am very sorry our South African and Rhodesian friends have been upset over this matter ..."

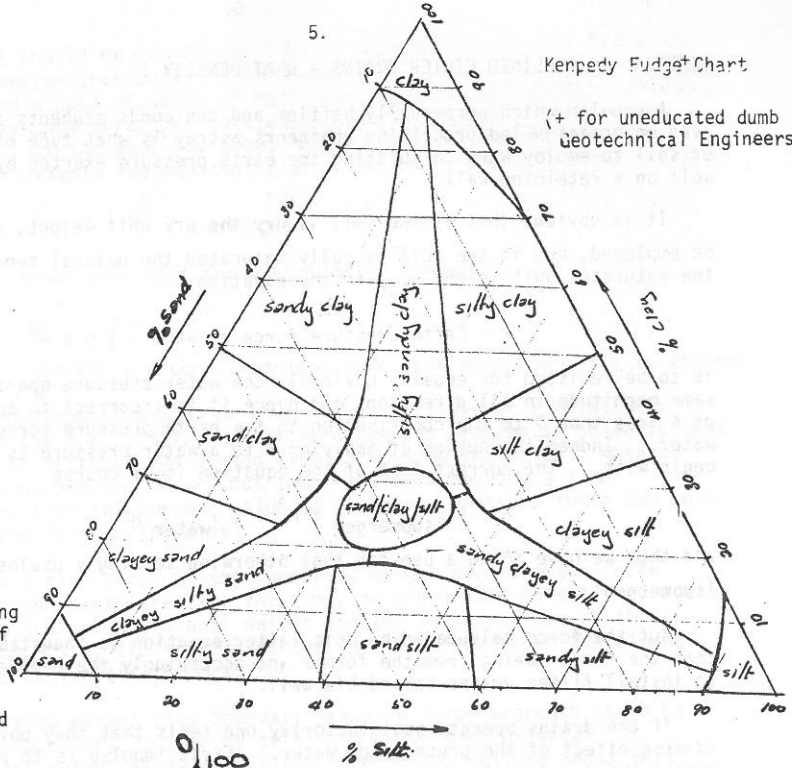
And that is the end of the story. In spite of the noble efforts of the South African Committee and others and of much expense, South Africa, a foundation member of the International Society will almost certainly again be excluded from participating in an International Soils Conference.

TOKYO CONFERENCE EXHIBITION

Concurrent with the International Conference an exhibition of geotechnical measuring instruments and construction equipment is being organized. Interested exhibitors should contact the General Secretary C.P.O. Box Tokyo 2129, Japan.

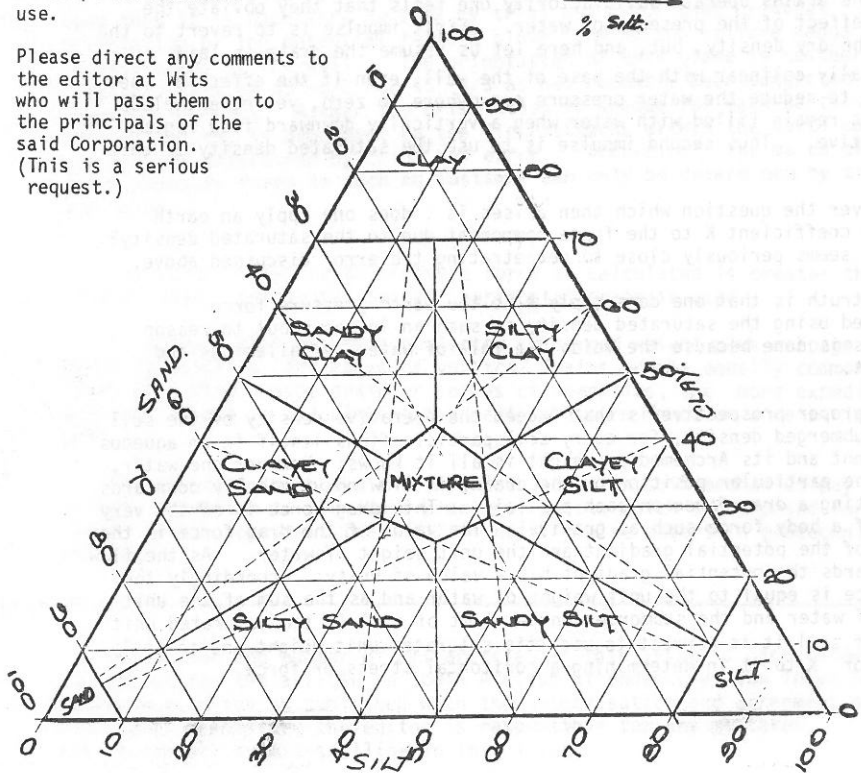
5.

Kempedy Fudge⁺ Chart
 (+ for uneducated dumb
 Geotechnical Engineers)



FUDGE INC. are at present hotly debating the issue of which of the two soil classification systems shown here to adopt for standard use.

Please direct any comments to the editor at Wits who will pass them on to the principals of the said Corporation. (This is a serious request.)



VERTICAL OR INCLINED FILTER DRAINS - WHAT DENSITY !

A problem which perpetually baffles and confounds students and which has even on occasion led practising engineers astray is what type of unit weight of soil to employ when calculating the earth pressure exerted by a mass of soil on a retaining wall.

It is obvious that if the soil is dry the dry unit weight, γ_{dry} , is to be employed, but if the soil is fully saturated the natural tendency to use the saturated unit weight γ_{sat} in the equation,

$$P = \text{Earth pressure force on wall} = \frac{1}{2} \gamma K H^2$$

is to be resisted for equally obviously the water pressure operates with the same magnitude in all directions and hence it is incorrect to apply a factor of K less than 1 to the contribution to the earth pressure force due to the water. Indeed the notion of applying K to a water pressure is ludicrous to begin with. The correct form of the equation is of course

$$P : \frac{1}{2} \gamma_{submerged} k H^2 + \frac{1}{2} \gamma_{water} H^2$$

and thus we have found a use for that otherwise seemingly useless quantity $\gamma_{submerged}$.

But the force calculated by this latter equation is inevitably higher than the force coming from the former and accordingly the engineer decides to install filter drains behind his wall.

If the drains operate satisfactorily one feels that they obviate the adverse effect of the presence of water. First impulse is to revert to the use of the dry density, but, and here let us assume the drain is laid horizontally colinear with the base of the wall, even if the effect of the drain is to reduce the water pressure everywhere to zero, yet nevertheless the voids remain filled with water when a vertically downward flow regime is operative. Thus second impulse is to use the saturated density or unit weight.

However the question which then arises is : does one apply an earth pressure coefficient K to the force component due to the saturated density? To do so seems seriously close to perpetrating the error discussed above.

The truth is that one does apply K to the earth pressure force calculated using the saturated density in such an instance but to reason that this is done because the voids are full of water is fallacious and incorrect.

The proper prospective is that indeed the operative density of the soil is the submerged density, for every soil particle finds itself in an aqueous environment and its Archimedes weight is all it knows; however the water, due to the particular position of the drain, is flowing vertically downwards and exerting a drag force on each particle. This drag force is of the very nature of a body force such as gravity. The value of the drag force is the product of the potential gradient and the unit weight of water. As the flow is downwards the potential gradient has a value of unity; accordingly the drag force is equal to the unit weight of water and as the sum of the unit weight of water and the submerged unit weight of soil is the saturated unit weight of soil it is correct to use this saturated unit weight and to apply the factor K to it in determining a horizontal stress or force.

In passing it should be remembered that it is possible for the hydraulic gradient to be greater than unity. This occurs when, say, the wall is retaining a mass of fill and a pool of water of more than mere negligible depth develops. Accordingly the seepage force per unit volume can be greater than the unit weight of water. If the pool was about half as deep as the depth of the retained soil for example the equation giving the earth pressure force would be

$$P = \frac{1}{2} K H^2 (\gamma_{\text{submerged}} + 1,5 \gamma_{\text{water}}).$$

It should be noted then that for a horizontal drain

$$P = \frac{1}{2} K \gamma_{\text{sat}} H^2$$

which is greater than for dry conditions but less than where no drain is present.

So much for horizontal drains or even drains inclined at a relatively shallow angle to the horizontal. A far more complex problem to solve is that where the drain is vertical and placed directly behind the wall. When no water is present no problem occurs but once let there develop a flow situation and the true and correct value of the earth pressure force can only be calculated from first principles.

Firstly draw a flow net. If the submerged weight plus seepage force approach is used the earth pressure force may be calculated directly by adding the force due to the submerged unit weight and the vectorial sum of the horizontal components of the seepage forces for the elements of the flownet with which it is convenient to work.

If the saturated weight plus boundary pressure force approach is to be used then it is necessary to seek by trial and error that critical orientation of the potential failure plane forming the failure wedge that is restrained by the wall. The orientation of this plane is neither the classical Rankine $45^\circ - \phi/2$ nor $45^\circ - \phi/3$ as has recently been suggested by the Riemert brothers. Rather the orientation is unique for each particular flow situation, is dependent on the flow patterns within the earth mass and can only be determined by trial and error. Accordingly the value of the earth pressure force in such an instance can only be determined by trial and error.

The value of the earth pressure force so calculated is greater than results when a horizontal or near horizontal drain is used.

It appears that the much neglected submerged weight plus seepage force approach is, for cases of vertical drains or the equally common cases of a single pipe drain or series of weepholes, the more expedient approach to use in calculating the earth pressure force on a retaining wall.

The standard textbooks and reference works on soil mechanics pay scant, if any, attention to the above practical points which are exposed for review in the hope that they will if nothing else entertain geotechnical devotees.

The author and editor of all articles in this issue is Jack Caldwell and except for the article on South African attendance at the Tokyo Soils Conference, which is published with the authorisation and agreement of the Divisional Committee, the editor is responsible for any mistakes, mis-statements or mis-spelling in this issue.

Revision of Code of Practice for Safety Relating to Site Investigations

At a recent meeting of the divisional committee, a decision was taken to revise the Code of Practice Relating to Site Investigation.

Mr. A. Williams of C.S.I.R. will act as the co-ordinator responsible for revising the Code.

Suggested revisions concern matters such as mouth to mouth resuscitation, the latest methods of detecting gasses, new harnesses etc. Anybody who has further suggestions for changes or improvements to the Code is requested to contact Mr. Williams.

The Divisional Committee wishes to bring most strongly to the attention of all concerned the pressing need to be and the vast importance of being familiar with and at all times making use of the Code when working in trial pits or other situations to which the Code is applicable.

There is a very real danger associated with trial pit soil investigations and strict observance of the provisions of the Code is the only safeguard against the inherent risk of descending trial pits. Failure to comply with the provisions of the Code would undoubtedly be branded as professional negligence in the event of an accident.

It should not be forgotten that it is always open to the authorities to halt the practice of descending trial holes if it becomes apparent that the profession is disregarding the Code.

Quotes from the last Annual General Meeting :

"The Geotechnical Engineer's information is much more expensive to collect than the Structural Engineer's; to manipulate information is however far cheaper for the Geotechnical Engineer than for the Structural Engineer."

"Drilling contractors and cartage contractors are the most bankruptcy prone business operations."

"As regards the position in the United Kingdom; If only a portion of the money paid to lawyers and accounts to sort out problems resulting from inadequate site investigation were spent in the first place on site surveys, a great saving to the community as a whole could be effected."

(One wonders if the same is true for South Africa. Certainly the relative complacency displayed at the meeting indicates the contrary. And this conclusion is supported by the dearth of foundation failures of which one hears.)