of steel. There were several ways of contributing to research of that kind, and surely one of them was to be a large and discriminating buyer ; in that connexion it was interesting to recall that the former London and North-Western Railways had built its first steel bridge carrying the line in 1876, and from 1884 onwards that Company had almost ceased to use wrought iron for its structures. That was long before many other authorities and engineers had begun to use mild steel for similar purposes.

Mr Wilks had made several interesting comments on Part II of the Paper, but was not entirely up-to-date in his knowledge of Western Region practice.

His suggestion that selected designers should spend several years on works maintenance, and maintenance staff a similar period on design was counsel of perfection which could rarely be followed in practice.

The smoke chute shown in *Fig. 19* was a development of the old pattern timber chute and was proving less costly to maintain.

Mechanical extraction of smoke from engine sheds was more costly to install and maintain and was really effective only when engines were correctly placed in relation to the extractor fans.

Braced roof trusses and lattice roof girders in Western Region engine sheds had given satisfactory service without excessive corrosion because of their height above engine-stack level. An example of that could be seen in the Old Oak Common shed constructed before 1900.

Airport Paper No. 23

" Methods of Soil Stabilization and their Application to the Construction of Airfield Pavements " †

by

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Correspondence

Mr R. S. Colquhoun referred to the Authors' suggestion, on p. 450, that for temporary military airfields it would be desirable to devise a surfacing which combined the rigidity of metal surfacing with the imperviousness of bituminized hessian surfacing. With that suggestion he completely agreed, but he was at variance with the Authors' opinion that such a development had yet to be made.

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† Proc. Instn Civ. Engrs, Part II, vol. 2, p. 447 (June 1953).

During 1944 a number of airfields had been built in Eastern Bengal and the Arakan, under the direction of the Engineer-in-Chief, India. Those airfields had been constructed with compacted soil bases and surfaced with a combination of prefabricated bituminous surfacing and pierced steel plank. At Dohazari, near Chittagong, the P.S.P. had been bedded into a 1½-inch bituminous sand carpet, laid on top of the P.B.S. On other sites, notably Agartala and Fenny, the P.S.P. had been laid directly on the P.B.S. The waterproof membrane had thus been completely ruined, since the sharp edges of the pierced sections of the plank had punched circular holes in the P.B.S. when subjected to load. That difficulty had been overcome by laying two layers of P.S.P., the lower layer being reversed so that the sharp edges pointed upwards. That method had been used at Petenga, in the Arakan, and subsequently in the initial stages of the rehabilitation of Kallang airfield, Singapore. A more striking instance of P.B.S./P.S.P. surfacing was its use on the temporary runway at Changi, Singapore, where the subsoil consisted of recent alluvium and mangrove swamp. That temporary runway had been in constant use for 3 years, 1946–49, by all types of aircraft, including Constellations. Though settlements of up to 10 inches had occurred, that site provided an example of the capacity and life of a " temporary " airfield equipped with P.B.S./P.S.P. surfacing.

The Authors had stated, on p. 450, that the general form of temporary military airfield was visualized as a stabilized soil base with a prefabricated surface. Under active service conditions in forward areas, the key factors in airfield construction were the amount of mechanical equipment available and the tonnage of material which had to be imported. Those two factors would largely determine the time which had to elapse before the site was operational. The techniques of soil-cement and soil-bitumen stabilization were known to both British and American military engineers serving in south-east Asia from 1943 onwards, but those techniques had never been used for forward airfield construction, nor did Mr Colquhoun know of any instance of those techniques being similarly employed in north-west Europe or in Korea. The reasons were not far to seek. All soil stabilization by admixture required a careful soil survey, specialized mixing plant, skilled supervision, and the delivery of large quantities of the stabilizing agent in a short space of time. The breakdown or absence of any one of those requirements would seriously jeopardize the rapid completion of any forward airfield. On the other hand, the grading and compaction of soil could be carried out with standard earth-moving equipment, and the subsequent surfacing of the soil base with P.B.S. and/or a metal surface were tasks which could be done by semi-skilled manual labour. It was not surprising, therefore, that those were the techniques used for forward airfield construction in south-east Asia and Korea.

In future, it was likely that the construction-time element would be even more important, whilst the longer and wider runways which were

now required would necessitate the selection of sites which were naturally flat and which were frequently ill-drained and of low bearing capacity. The development of such sites into forward airfields would, he suggested, be largely a matter of providing them with a composite surface which was impervious and which was capable of so spreading the load of aircraft wheels that that load, when transmitted to the subgrade, was within the range of the subgrade's natural bearing capacity. To avoid permanent distortion where local overloading occurred, such a surface should be under an initial prestress, which could later be increased should the role of the airfield be changed, involving its use by heavier aircraft. A modified form of channel track, which lent itself to prestressing, in combination with P.B.S. would go far to fulfill those requirements and might well eliminate the need for a stabilized base in forward-airfield construction.

The Authors, in reply, expressed a doubt as to whether, taking into consideration the higher tire pressures of modern aircraft, P.S.P. would prove as adequate a form of construction now as it had been during the 1939–45 war.

They found it difficult to believe that the construction of airfields by compaction of the soil could be carried out with less attention to detail than those constructed by the soil-cement process and yet give equally good results. It also seemed doubtful to them whether it could be carried out under such varying conditions of drainage and climate.

It was not generally realized, and did not seem to have been taken into account by Mr Colquhoun, that the quantities of materials which he considered prohibitive in the case of soil-cement stabilization were more than doubled for two layers of P.S.P. For instance, a soil-cement construction stabilized with 10 per cent of cement at a dry density of 110 lb. per square foot for a depth of 6 inches could carry as much traffic and give at least as great a length of service as P.S.P. In addition, it had to be remembered that there were other drawbacks to the use of metal surfacings in war-time, and taking all those into account, it was the Authors' opinion that their development should be regarded with caution.