CHAPTER SIX

GENERAL CONCLUSION
6. **General Conclusion**

By considering the laws governing Soil Mechanics, and the theories of elasticity and the equilibrium of forces, an analytical basis for a concept of Soft Rock Mechanics has been established. From this has ensued better understanding of the behaviour of the strata of the Coal Measures, particularly at depth. Formulae have been developed, and, by comparison to known conditions underground, have been shown to give good quantitative as well as qualitative agreement.

In the realm of roadway drivage, an equation has been developed which gives values in general agreement with the observed phenomena of roadway closure in soft rocks. Further investigation is required on some of the parameters to be inserted, such as in situ strength, the expansion in the yield zone and the cohesive effect of broken material, but even with these parameters approximated, the equation gives more reliable information than the previously adopted ideas used out of context.

A set of formulae has been developed which allows the calculation of the minimum pillar width for roadway protection. Although to a large extent built up from concepts difficult to prove in practice, the overall deductions do fit the observed facts. The formulae have already been quite widely used in practice, but quoted examples have been limited to cases where some form of verification was possible. For wide extractions on both sides of the pillar, the formulae give results similar to the 'one tenth depth plus 15 yd' rule. However, extractions less than the critical width can now be taken into account, and
the role of support resistance can be better appreciated. The triaxial stress factor (or its equivalent, the angle of internal friction), a parameter hitherto ignored, plays a dominant role in the calculation. The low value of triaxial stress factor in some seams such as the Blackshale in Nottinghamshire and the Barnsley in Yorkshire explains the difficult roadway conditions associated with these Seams.

As regards the support of longwall faces in soft rocks, which can be fully and easily caved, the required support load and its distribution can be obtained by considering a freed block of strata the size of which is governed by the height of extraction, the distance from face to waste and the angle of caving. The calculated support values conform to the empirically deduced values currently adopted. Thus the proposed techniques can confidently be applied to conditions outwith existing experience.

In considering wider than normal prop-free-front distances with weak roof, the load which can be taken by the front legs is the limiting condition. In inclined seams, as has been indicated, it is essential to have adequate setting pressure when working up the dip, in order to clamp the lower roof to the upper roof and thus prevent the possibility of the roof block sliding back and creating a serious hazard on the face. When using shield supports, the lateral forward thrust of the supports contributes greatly to the stability of the roof block.
Further research into all aspects of Soft Rock Mechanics is required. Arrangements are in hand to study in detail the closure of main drivages, to investigate the support of large insets in weak strata, and to ascertain the effects of improved packing techniques on the stability of gate-roads. Thought must also be given to how best to achieve a more thorough understanding both of the behaviour of roof strata in longwall working and the stability of shafts as greater depths are reached.

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