

DELEGATED DIMENSIONAL INSPECTION

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In recent years increasing attention has been given to the attainment of higher standards of dimensional accuracy in the construction of machinery for H.M. Ships. The experiences of the war years led to a greater exchange of information between allied nations, particularly between this country and the United States of America, and the combined operations of the major fleets gave prominence to a number of technical limitations.

Among the limitations recognized by the Engineer-in-Chief is the need for higher standards of dimensional accuracy with a view to ensuring interchangeability in warship machinery. Also, as machinery designs advanced the more severe operating conditions called for improved standards of accuracy.

The problem of maintenance in war time is most acute and to alleviate this the principle of maintenance by replacement is followed. This means that spare parts for any given type of machine are required to be readily interchangeable in similar machines fitted in single or several ships. To achieve such interchangeability calls for a careful screening of defective items during manufacture by an effective system of inspection.

A further important aspect of dimensional accuracy is the consideration of dispersed production in time of war. This demands an unambiguous design statement, the adoption of approved standards and standard practices, and good inspection if the several components of the machine, produced by different manufacturers, are to assemble without difficulty.

It was appreciated that the attainment of higher standards of accuracy would involve some changes in the existing arrangements for inspection and oversight at contractors' works. In 1944, therefore, the Engineer-in-Chief consulted Sir Claude Gibb* and as a result of their discussions Mr. Fielding, then in the service of the New South Wales Government, was asked to undertake an investigation into the problem. He did so and recorded his findings in the Fielding Report.

This report confirmed what was already known—that the inspection organization of many main and auxiliary machinery manufacturers, whilst it was sufficient for their own commercial needs, needed improving if the objects of interchangeability were to be realized. It was also obvious that the existing Admiralty Overseeing Service could not cope with the burden of dimensional inspection which would be met with in future.

An outcome of Mr. Fielding's work was the decision to relieve the Overseeing Service of responsibility for the details of dimensional inspection (whilst retaining the overall responsibility) and to vest it in the manufacturers. This delegation of responsibility is now known as delegated dimensional inspection and, in fact, it sets a seal on existing practice. It had never been possible for overseeing staffs to inspect all work dimensionally, the greater part of such inspection being left to the manufacturers. Nevertheless, the overseers bore the responsibility. The delegation of inspection now relieves the overseer of

* Chairman and Managing Director, Messrs. C. A. Parsons, Ltd.; Director-General, Armoured Fighting Vehicles, 1943; Chairman, Tank Board, 1944.

direct responsibility though he retains the right to make such inspection as he desires.

The somewhat negative transfer of responsibility from the overseer to the manufacturer would not in itself raise the standards of accuracy called for under post war conditions. It was necessary, therefore, to lay down standards of inspection and to approve only those firms who satisfied the Engineer-in-Chief in this respect. It is important to note, however, that, whether approved or otherwise, manufacturers are still under the normal contractual obligation to produce to specification. One requirement of inspection is that it must be divorced from production. Although this is widely accepted in industry generally, many marine firms, with strong traditions of craftsmanship, found it difficult to accept this view. Yet, however well-meaning the craftsman may be, he cannot inspect his own workmanship with the impartiality of a detached observer. And, of course, it will be admitted that not all craftsmen are well meaning, nor of the highest integrity, particularly when manufacture is on a piecework basis. Hence the need for independent inspection.

A second requirement is that the head of the inspection department must have sufficient status to carry the responsibility for accepting satisfactory products after inspection, and have sufficient authority to reject defective items without contradiction from anyone other than the customer or his agent. To uphold this position the Chief Inspector is required to be suitably qualified both professionally and personally.

A third requirement is that the organization of inspection is such as will ensure effective screening of defective items, and minimize the possibility of their reaching the customer. At the same time, the organization should prevent, as far as possible, the production of defective times, and in any event, make early detection of defects to avoid further expenditure of labour on defective work.

Other requirements are that the means of inspection must be adequate, and reference standards must be maintained from which the inspection equipment derives its accuracy. The reference standards themselves must be checked periodically by an independent authority.

The delegation of inspection, as outlined above, is still very much in its infancy, but progress is being made and there is a discernable tendency towards the achievement of the standards of accuracy necessary to ensure interchangeability. Inspection does not of itself produce accuracy—that is the function of the operative and the machine ; but, together with the design statement, effective inspection exercises considerable influence over standards of accuracy. For instance, in the field of gear cutting, post war standards of accuracy are frequently more than twice those obtaining in pre-war years. This has been made possible by more accurate gear cutting machines, and in this the application of metrology—the science of measurement—and of inspection has played an important part.

Much of the main machinery of the Daring Class has been made under delegated inspection and some valuable experience gained. Inevitably there have been teething troubles but none so serious that they have not been overcome. The implementation of inspection procedure was in some respects too rigid ; a greater flexibility is now allowed to cater for different shop practices. A good deal of documentary work was of doubtful value, or at least of doubtful necessity ; the absolute minimum of paper work is now called for—a relief not only acceptable to the manufacturers but to Headquarters also. Whilst some firms rather grudgingly accepted delegation others have been quite enthusiastic, and several firms have extended the system to some of their Merchant Navy contracts.

In introducing delegated inspection the Engineer-in-Chief has adopted a policy of encouragement rather than enforcement. Firms are visited, literature is circulated, information is exchanged and, where sought, advice is given. In this way, it is hoped gradually to raise the level of accuracy throughout the whole of the main and auxiliary manufacturers to the benefit not only of the Engineer-in-Chief, but of the manufacturer and his other customers.
