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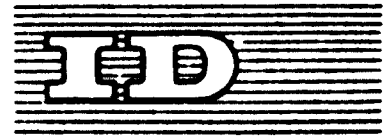
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ISSUE PAPER

SESSION III

ITEM 6 OF THE PROVISIONAL ANNOTATED AGENDA

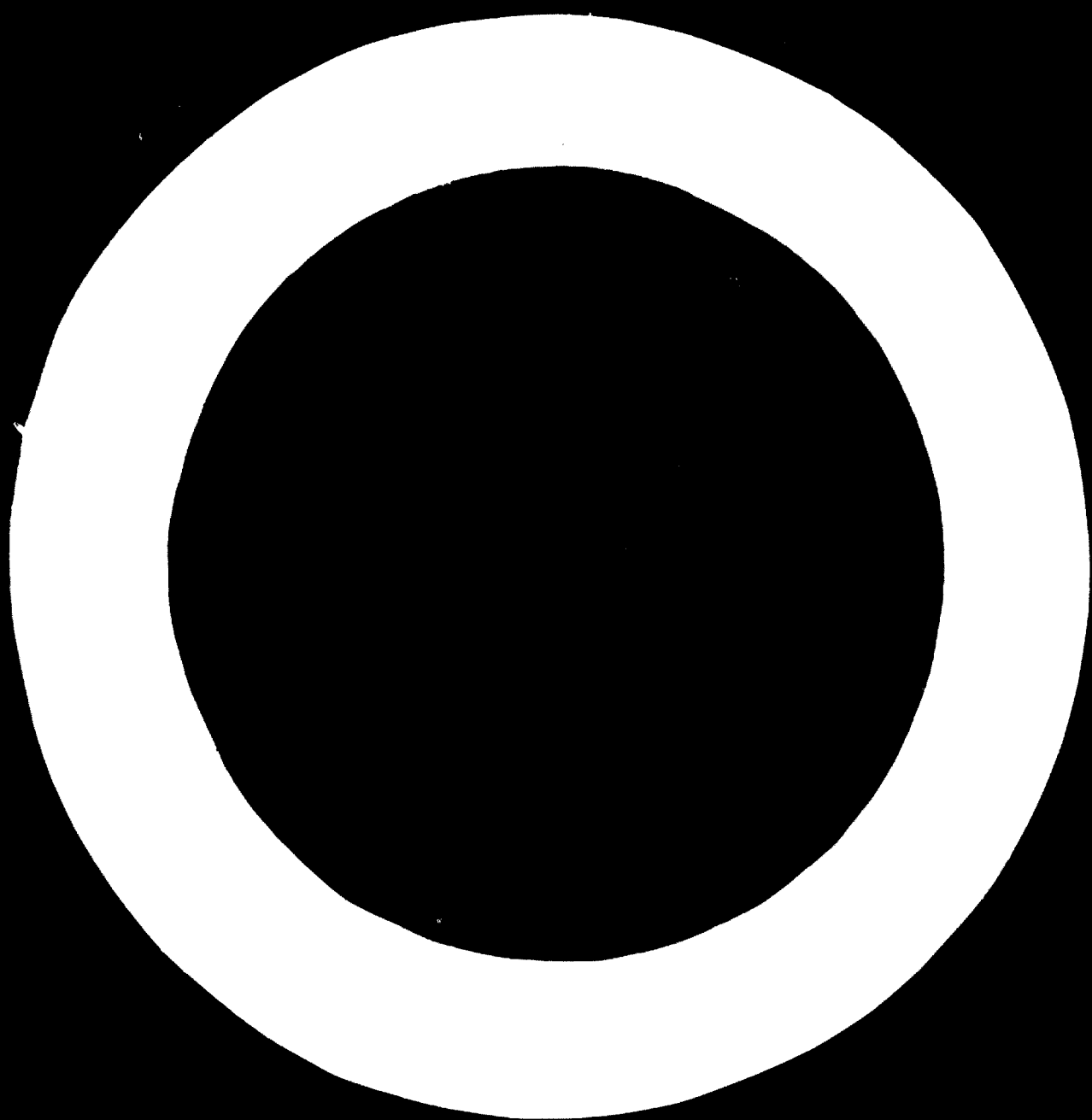
ENGINEERING ASPECTS OF MAINTENANCE ^{1/}

prepared by
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Introduction.

The various aspects of maintenance are inter-dependent and none of them can accomplish its objective singly without the support of the others. Engineering activities cannot cope with maintenance problems unless they are preceded and supported by a number of other activities, such as planning, scheduling, determining level of maintenance required and other facilities. All of these measures are pre-requisites to the actual work of maintenance and repair which is the task of the engineering personnel, whether at the ordering and design stage or after production has started. Programmes such as those of repair operations, correction or replacement of parts, and details of preventive maintenance, are also their concern. At the same time, economic and organizational policies and plans cannot be implemented unless efficient engineering facilities are made available.

Some of the requirements which need examination in this context are:

- a) Technical and Design Departments and centres at the enterprise level and/or at the country level;
- b) Adequacy of maintenance and repair facilities to cope with modern equipment;
- c) Consideration of maintenance problems in design and procurement of installations;
- d) Foundry and forge shops.

a) Technical and Design Departments and centres at the enterprise level and/or at the country level.

One of the major problems facing developing countries is that of building up skills and acquiring equipment at the rate required. This problem is particularly acute in the field of maintenance and repair. Little attention has been given so far to this aspect of industrialization. In the meantime the volume of maintenance and repair work to be coped with has exceeded by far the services present facilities can render. Maintenance prevention has thus become extremely important in order to cope with this problem.

Most equipment supplied to developing countries comes from foreign firms which are not fully acquainted with local conditions. Their ability to change design and improve maintenance procedures to suit local conditions is rather limited, and their attention is directed almost entirely towards requirements of the industrialized countries. Consequently, the burden of preventive maintenance and of improving current maintenance operations, falls on the developing countries themselves. Technical offices for the study and prevention of failures through change of design of parts, change of materials or of working methods, would contribute greatly to improve maintenance conditions in these countries.

Design and technical centres represent an important part of the industrial infra-structure, not only for maintenance, but for all aspects of industrialization. Such centres exist already in many developing countries, and part of their efforts could be applied towards meeting maintenance requirements. Where such centres do not yet exist, the establishment of technical offices dealing with maintenance would be an excellent start for eventually launching such centres. Governments would be well advised to establish such central technical offices and design centres to serve industry, especially those which cannot afford to establish local offices either due to lack of funds or lack of personnel.

Such central technical offices would demonstrate the usefulness of this activity and encourage industrial enterprises to start technical offices of their own, and at the same time serve as a nucleus for future activities in this field, such as the local manufacture of spare parts. Design of spare parts and elaboration of technology for producing spare parts would be a crucial aspect of their manufacture. At a later stage, developing countries could aspire to develop their own indigenous designs and plant layouts, for which such centres would be a pre-requisite. Additionally such centres would raise the competence of developing countries to examine and select any offers made by foreign suppliers, and to propose changes and modifications to suit local conditions.

b) Adequacy of maintenance and repair facilities to cope with modern equipment.

Modern equipment with its fine tolerances and finer finishes cannot be serviced with outdated tools and by a traditional work force. Machinery today must be assembled, adjusted and attended to according to precise specifications if it is to give the expected performance. Furthermore, if proper maintenance procedures are not observed, the life span of modern equipment will be very much reduced and equipment failures are bound to occur. Up-to-date repair equipment is, therefore, essential for proper maintenance. The maintenance of adequate facilities to cope with modern equipment raises a number of problems for the developing countries which, in this respect, are at a great disadvantage as compared to industrialized nations. Enterprises in developing countries often have the services of manufacturers and suppliers at their disposal, especially for heavy and specialized repair work. Outside specialists and skilled personnel can give service at short notice. In addition, specialized repair shops are usually available to them. Such enterprises need to cope with simple day to day maintenance only. The rest can be contracted out to specialized shops or the manufacturers of equipment.

Conditions in developing countries are very different. Enterprises in these countries are located far from suppliers and assistance from them is not easily available. They cannot enlist the services of specialists from machine suppliers at short notice and, if they do, it is extremely costly. Specialized repair shops and contractors hardly exist in these countries. Under these conditions, enterprises have to cope by themselves with all their repair work. They have to establish repair facilities and sometimes heavy repair equipment which they can ill afford, and which is used for only very short periods.

One solution would be to establish central and specialized workshops which would serve major sectors of the national economy. Such central shops would do repair work which is beyond the scope or economical means of each individual enterprise. These central shops would also cope with the heavy repair work of many enterprises; thus heavy repair equipment would be more economically used and would enable central shops to employ highly skilled labour. It would be sound policy, and of substantial help to industry if developing countries were to sponsor such centres at least until such time as these centres could become self-supporting.

In this context, it should be recalled that many developing countries even find it difficult to cope with day to day maintenance. Many enterprises in developing countries are widely separated and distant from industrial centres. Mobile work shops and repair units might be considered as one of the means to meet this need. It should, however, be stressed that such mobile units would have to be specially designed to meet local conditions.

c) Consideration of maintenance problems in design and procurement of installations.

The proper choice of equipment at the ordering stage is an important factor in maintenance prevention. Most of the equipment produced in industrialized countries is designed to suit their own conditions and

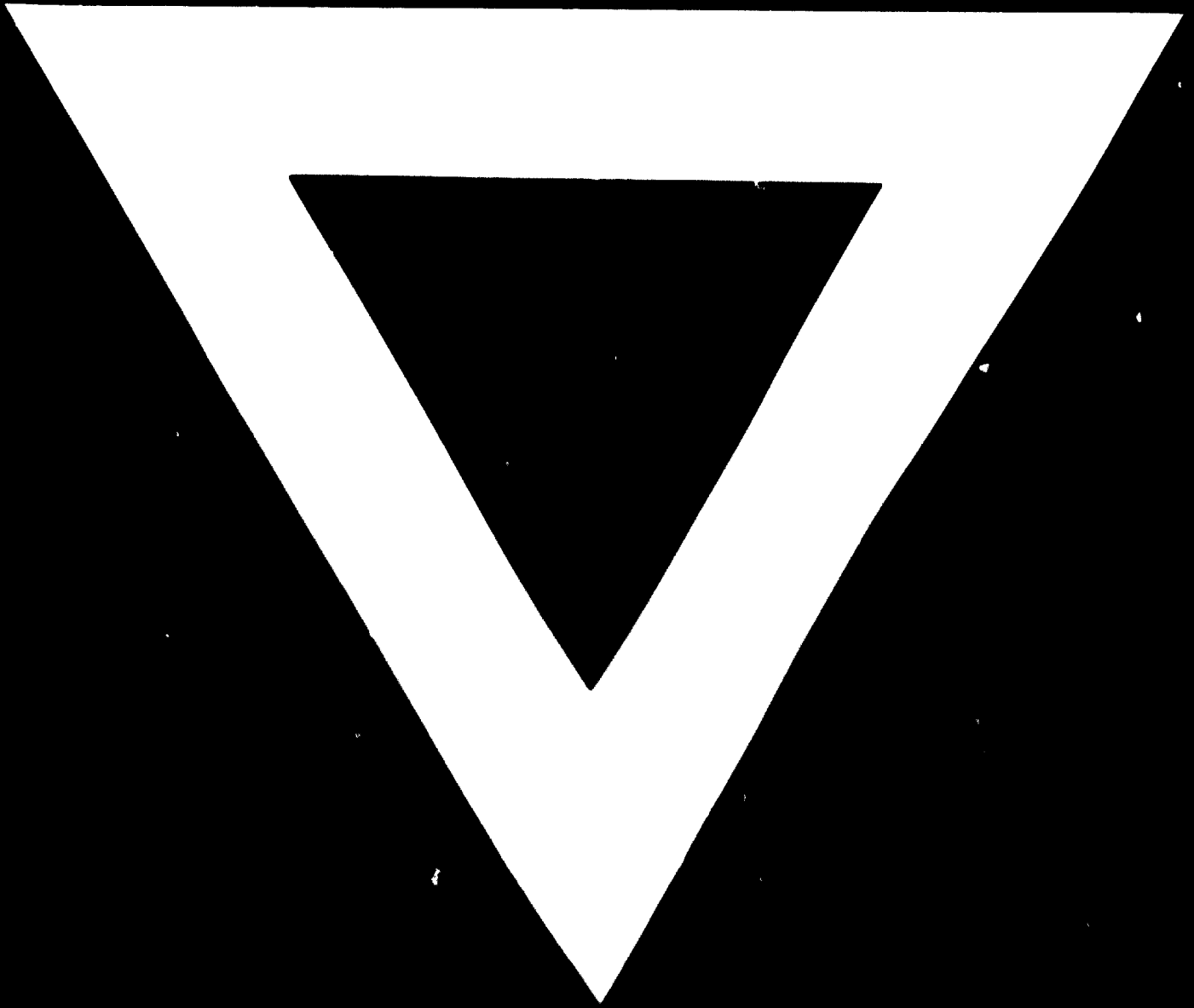
not those of developing countries. Consultation and cooperation between local and technical personnel and suppliers at the procurement stage may well result in many cases in useful modifications and adaptations which would considerably reduce maintenance problems and work load.

Also, in deciding upon offers or bids submitted, preference should not always be entirely determined by the purchase price of equipment, but also take into account operating and maintenance expenses. In many developing countries, such expenses as fuel for instance, are taken into consideration while little or no attention is given to future cost of maintenance. This neglect of the maintenance aspect is costly in the long run since it is known that maintenance and repair costs of most equipment, even with proper organization, equal and, in many cases, exceed the purchase price of the equipment.

d) Foundry and forging facilities.

Lack of adequate foundry and forging facilities in many developing countries is a considerable handicap in repair work and particularly in the manufacture of spare parts.

The Symposium may wish to discuss the importance and means of establishing such facilities.



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