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## A CORROSION TEST FOR HEAT-SENSITIVE FIRE DETECTORS

by

R.W. Pickard

### SUMMARY

The effects of corrosion on the operation of heat-sensitive fire detectors are discussed, and the results obtained with a method by which detectors have been tested for corrosion resistance are described.

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# A CORROSION TEST FOR HEAT-SENSITIVE FIRE DETECTORS

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## 1. Introduction

Fire detectors in service may be subjected to a variety of atmospheric conditions ranging in severity from those of normal office accommodation to those occurring in chemical and other industrial works. The degree of corrosion which may occur is therefore likely to vary widely, and will depend upon the composition of the atmosphere, (1) the materials of which the detector is made and the period for which it has been installed. Failure of the detector to operate satisfactorily may occur in one or more of the following ways.

- (1) seizure of components designed to move on operation.
- (2) development of high resistance at electrical contacts.
- (3) formation of corrosion products on sensitive elements, resulting in increased response time.
- (4) breakage of part of an electrical circuit, causing a false alarm, or failure to give an alarm.
- (5) raising of the melting point of fusible alloys<sup>(2)</sup>.

The composition of industrial atmospheres depends largely upon the processes carried out, and it is not considered possible to specify a standard corrosive test atmosphere which could be used to predict the degree of corrosion which would occur in any one of a number of atmospheres, after a period of service.

However, it would still be of value if the standard test could give an indication of weak points in the design and protection of a detector, and enable a general comparison to be made of the corrosion resistances of different detectors. For this purpose, a controlled corrosive atmosphere is required which gives, as far as possible, degrees of corrosion in material representative of those which occur in practice, and accelerates this corrosion to reduce the testing time to the minimum.

These requirements are met by the Chemical Research Laboratory sulphur dioxide apparatus (Fig.1.) which is described in British Standard 1391:1952 and a test has been developed using this apparatus.

## 2. Experimental

The test apparatus consists of a 5 litre beaker (Fig.1) fitted with a cover and surrounded by a tube through which cold water flows. The corrosive atmosphere is that of sulphur dioxide and moisture, which is produced by regular additions of sulphuric acid to a sodium thiosulphate solution. The beaker stands on a heating element, the temperature of the atmosphere being maintained at 45°C by means of a thermostat.

A number of proprietary detectors have been examined as follows. The operating time of the detector was first determined at a rate of rise of air temperature of 10°C per minute<sup>(3)</sup>. The detector was then placed in the corrosion chamber for a period of 2 days after which it was removed, allowed to dry, and its operating time again determined. It was then returned to the

chamber for a further 2 days. This procedure was repeated until the total period of corrosion was sixteen days or until the detector failed to operate if this were a shorter period.

### 3. Discussion of results

Six proprietary detectors and two types of fusible link sprinkler heads were tested. Of the detectors, one failed to operate after a period of 12 days due to the seizure of a moving component. In another, a component forming part of an electrical circuit corroded to the extent of fracture and would have given a false alarm. One type of sprinkler failed to operate after 8 days corrosion. In general, it was found that there was little change in the operating time of detectors or sprinklers during the period of corrosion.

The results indicate that this test is able to demonstrate weak points in the design and protection of detectors affecting their resistance to corrosion. The detectors which did not fail showed a severe degree of corrosion and it seems likely that a period of 16 days is sufficient in which to assess the relative corrosion resistance of detectors.

Some detectors identical to those which still operated after 16 days corrosion, were corroded continuously for the same period. It was found that, in appearance and operating time, they were very similar to those which had been tested in 2-day cycles, suggesting that a testing procedure in which the detector is continuously corroded for 16 days would be equally suitable.

### References

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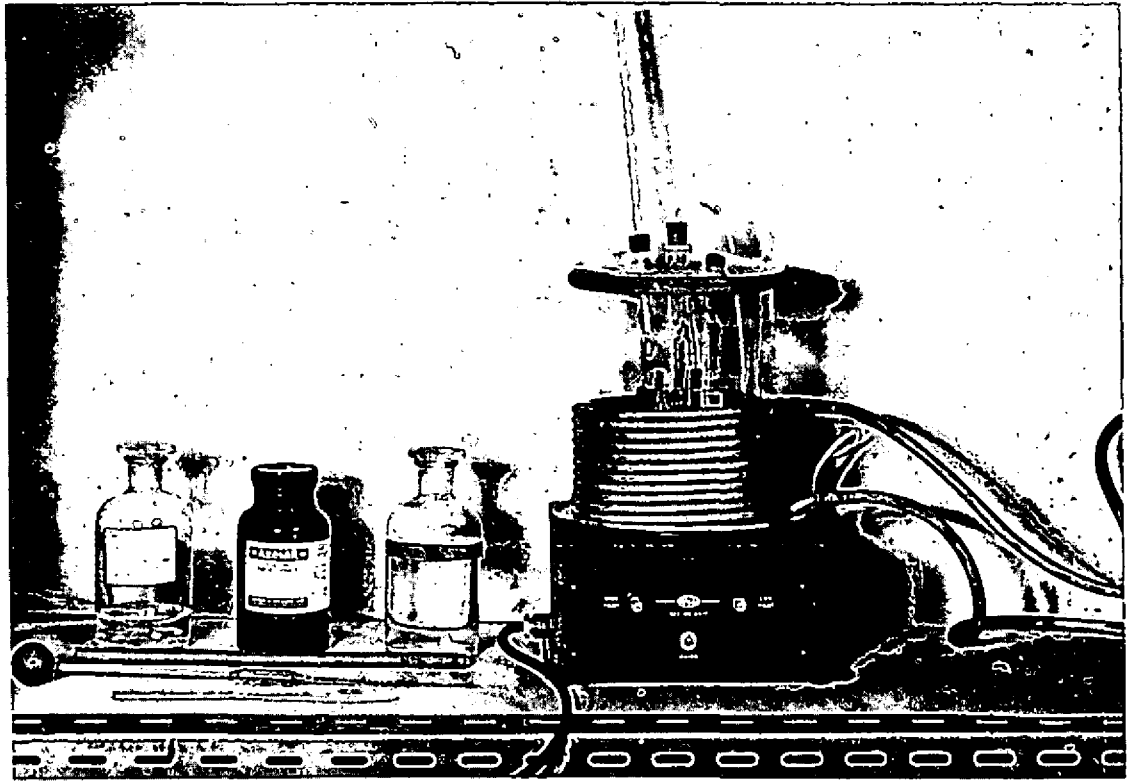


FIG. I. CORROSION APPARATUS