HEALTH & SAFETY EXECUTIVE

TESTING MEMORANDUM No 13

CONDITIONS OF TEST

AND APPROVAL OF

ELECTRIC DETONATORS

HM INSPECTORATE OF MINES

HEALTH & SAFETY EXECUTIVE

ST ANNES HOUSE

UNIVERSITY ROAD

BOOTLE, MERSEYSIDE, L20 3MF

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electric detonators

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PARTS

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Part 1

INTRODUCTION

1. Detonators are required to be approved by the Health and Safety Executive for the purposes of Regulation 7 of the Coal Mines (Explosives) Regulations 1961 made under the Mines and Quarries Act 1954. The text of this Regulation is reproduced at Appendix C. Detonators so approved may be electric detonators of the instantaneous type or the delay type or detonators for infusion shotfiring; they are referred to in Regulations and in this Memorandum as ‘permitted’ detonators
2. Part II of this Memorandum sets out the procedure to be followed when applying for a test with a view to approval. Part III gives details of the approval documents and the conditions of approval and Part IV states the requirements for approval.

PROCEDURE WHEN APPLYING FOR TEST

3. Application for test

i. An application for a test with a view to the approval of a detonator to a new design or of the modification of a design previously approved, must be made in writing on form MD13 to:

HM Inspectorate of Mines

Health & Safety Executive

St Annes House

University Road

BOOTLE, Merseyside, L20 3MF

from whom the forms may also be obtained. The application should be made either by the manufacturer of the detonator or, where the principal is not domiciled in the United Kingdom, by his duly accredited agent in the United Kingdom.

ii. Application may also be made for tests of an experimental character (see paragraph 6(iii)).

iii. The application should be accompanied by a drawing or drawings showing details of mechanical construction and the filling and loading of the detonator.

iv. A separate application should be made for each distinct type of detonator.

v. An application may be withdrawn at any time, but the Department reserves the right to retain for future reference any information supplied.

vi. If a design as originally submitted is rejected for any reason and is not re-submitted with appropriate modifications within six months of such rejection, the Department reserves the right to treat the application as withdrawn.

vii. An applicant will be given an estimate of the probable cost of testing and this will be required to be paid in advance of the test. The applicant will be informed should extra work prove necessary at any stage and it appears likely that the final fee will appreciably be assessed on the actual cost and either an additional amount requested or a refund made.

4. Request for fees and detonators for test

When the specification given in the application has been scrutinized and appears, prima facie, to comply with the Department's general requirements, the estimate of cost and request for payment as described in paragraph 3 (vii) will be sent to the applicant together with instructions for the despatch of detonators required for the test.

The fee should be sent to:

HM Inspectorate of Mines

Health & Safety Executive

St Annes House

University Road

BOOTLE, Merseyside, L20 3MF

and the quantities of detonators and bare fuseheads as required in Appendix B to:

Research & Laboratory Services Division (EFL3)

Health & Safety Executive

Harpur Hill

BUXTON, Derbyshire, SK17 9JN

(0298 26211)

5. Attendance at tests

The applicant or his representative may, if he so wishes, witness the testing of his detonators. Arrangements for attendance at the tests should be made in advance with the Chief Testing Officer (Explosives).

6. Test reports and results

i. A report summarizing the nature and results of the tests will normally be supplied to the applicant. If the detonator passes the tests outlined in Appendix A and is otherwise acceptable, an approval document will be issued.

ii. If a detonator submitted for approval fails to pass the tests, it will not normally be accepted again for test purposes of approval.

iii. Where the applicant only desires tests of an experimental character to be undertaken, a report on the results of such tests will be supplied to the applicant but no approval document will be issued.

Note: Test reports are supplied on the understanding that they will not be used for advertising purposes; they are in so sense to be regarded as approved documents.

Part III

APPROVAL DOCUMENTS AND CONDITIONS OF APPROVAL

7. Approval documents

After the satisfactory completion of tests the Health & Safety Executive will issue to the applicant an approval document which will show the name of the manufacturer and the name assigned to the detonator by the manufacturer. It will also incorporate the specification, the conditions of approval and any other information which the Health & Safety Executive considers relevant. The schedule to the approval will show such details of the filling specification and construction of the detonator as will serve uniquely to identify it.

8. Conditions of approval

Approval documents are issued subject to the following general conditions:

i. Detonators supplied as being of an approved type shall conform, as regards filling, construction and other characteristics, with the specification contained in the Schedule to the approval document.

ii. If any time after a detonator has been approved by the Health & Safety Executive the manufacturer wishes to make any changes in its manufacture, filling specifications or construction, the Executive should be informed. The Health & Safety Executive may require a detonator so modified to be retested.

iii. Approvals are subject to review from time to time. The Health & Safety Executive require incorporation of any alteration of design, filling specification or construction that experience may have shown to be necessary or desirable. If such alteration is required, reasonable time will be allowed for the introduction of the modification and issue of a variation approval.

iv. The Health & Safety Executive reserves the right to revoke an approval at any time. In particular, it may do so if an approved detonator fails on retest or proves dangerous under practical conditions of use or if a detonator supplied as being of approved type proves to be defective in filling or manufacture or is found not to comply with the approved construction and filling specification.

v. The Health & Safety Executive also reserves the right to revoke the approval of any detonator which is not brought into use within two years from the date of approval or which has ceased to be supplied for use in coal mines.

vi. The manufacturer must give an assurance that any alterations made in the construction of detonators would not result in a lowering of shot-firing safety or an increase in ignition risk in the conditions in which detonators are used.

9. <u>Check testing and inspection at the applicant's works</u>

i. The Health & Safety Executive may require an approved detonator to be retested at any time. Notice of such retest will be sent to the manufacturer.

ii. Investigations and check tests may be made by the Executive at intervals through the period of production to ensure that satisfactory standards of manufacture and control are being maintained and that detonators supplied for use in mines conform in design, filling specification construction and performance with the detonators as tested and approved. These tests will be carried out by a representative of the Health & Safety Mining Explosives Testing Laboratory. The requisite detonators for the purpose shall be supplied by the applicant. Where tests are carried out at the place of manufacture the representative of the Health & Safety Executive shall be allowed to examine any such detonators in any stage of manufacture. No fee is charged for such check testing; the Executive, where appropriate, will

bear the cost of returning the detonators to the applicant and will inform him of the results of the test.

10. Acceptance of terms and conditions
In submitting detonators for approval the applicant must signify his acceptance of the terms and conditions set out in the Memorandum

Part IV

REQUIREMENTS FOR APPROVAL

11. The detonators submitted for test must comply with the requirements specified in Appendix A and in paragraph 13 below and must pass such tests as may be required by the Chief Testing Officer (Explosives). Such tests are designed to provide an evaluation of the detonator with regard to the risks of misfire and ignition of firedamp.

12. The tests will ordinarily be made as detailed in Appendix A. These tests may be revised at any time or they may be varied in detail, or other tests, including periodic check tests to ensure standards are being maintained, may be added at the discretion of the Chief Testing Officer (Explosives), either to afford additional information or to meet particular conditions in the use of the detonator.

13.

i. The manufacturer must provide evidence that the detonator is capable of satisfactorily initiating detonation in the explosive or explosives with which it is intended to be used.

ii. The detonator must be of such a character as not to be liable to deteriorate or to become dangerous under conditions of storage or use.

iii. The detonator must be copper cased and must have leading wires of copper.

Appendix A

SPECIFICATION AND TEST OF ELECTRIC DETONATORS

1. Requirements applicable to all detonators

   i. Fusehead resistance The electrical resistance of the fusehead shall be not less than 0.9ohms and not greater than 1.8 ohms. The measurement will be made on a sample of at least 100 fuseheads.

   ii. Firing current With a current of 0.6 ampere d.c. applied for 50 milliseconds, the probability of a misfire shall not exceed 1 in 10,000.
   The determination of firing current will normally be made using bare fuseheads and by measuring the probability of misfire when a range of currents less than 0.6 ampere d.c. are applied for 50 milliseconds, such measurements being made, using suitable values of current, on a sufficient number of fuseheads to allow a reliable estimate of the probability of misfire with a current of 0.6 ampere d.c. to be calculated.

   iii. No-fire current With a current of 0.25 ampere d.c. applied for 5 seconds the probability of a detonator firing shall not exceed 1 in 10,000.
   The determination of no-fire current will normally be made using bare fuseheads and by measuring the probability of firing when a range of currents greater than 0.25 ampere d.c. are applied, such measurements being made, using suitable values of current, on a sufficient number of fuseheads to allow a reliable estimate of the probability of firing with a current of 0.25 ampere d.c. to be calculated.

   iv. Detonator resistance Not more than 2% of the detonators of any one type shall have a total resistance, inclusive of the leading wires, of more than 2.2 ohms.
   The measurement of resistance will be made by any suitable method and will be carried out on a sample of at least 50 detonators.

   v. Series-firing current When a current of 1.25 ampere d.c. is applied for 4 milliseconds there shall be no failure in 20 consecutive rounds each of 10 detonators connected in a series.
   In making the test the current pulse specified will be applied by any suitable method.

2. Requirement for instantaneous and low incentive delay detonators

Incendivity When fired in the presence of a firedamp-air mixture, containing 9% firedamp, in a steel-lined chamber of approximate dimensions 711mm x 267mm x 51mm (29 in x 10.5 in x 2) the probability of ignition shall be such that not more than 14 ignitions in 200 tests are produced.

In the case of low incendive delay detonators, 200 detonators of each nominal delay number will be tested, and not more than 14 ignitions will be acceptable in any such two hundred.

3. Requirement for all detonators for use in infusion shot firing

The detonators shall satisfy the requirement of 1 (ii) after having been immersed in water at a pressure of 10.3 NM/m_2 (1500 lb per sq in) for a period of 30 minutes.

The determination of firing current will, in this case, be made using complete detonators.

4. Additional requirements for short delay detonators for use with permitted explosives for firing in coal and in rippings

Delay times The mean delay time for each delay number should correspond approximately to the nominal delay time and the tolerance on the delay times should be such that the probability of the delay time of a detonator taken at random from one delay number in the series overlapping the delay time of a detonator similarly taken from an adjacent delay number shall not exceed 1 in 20

The delay times of a sufficient sample of detonators of each delay number in the series will be measured, when fired with a current of 1.25 amperes applied for 4 milliseconds, to allow a reliable estimate of the means of the delay times to be made and the probability of overlap to be calculated.

Appendix B

QUANTITIES OF DETONATORS AND FUSEHEADS REQUIRED FOR TEST

1. Instantaneous detonators

   Bare Fuseheads: 1500

   Detonators, with maximum length of leading wires: 400

2. Delay detonators

   Bare Fuseheads: 1500

   Detonators: 300 of each nominal delay in the series

Note: If detonators are to be approved for infusion shot firing, an additional 250 detonators will be required.

Appendix C

COAL MINES (EXPLOSIVES) REGULATIONS 1961

REGULATION 7

1. At any mine in which the use of lamps and lights, other than permitted lights, is unlawful, no person shall take or use below ground any explosive or detonator other than an explosive or detonator of a type approved by the Executive for use I places hazardous by reason of the presence or possibility of the presence of inflammable gas or combustible dust. An explosive or detonator of a type so approved is hereinafter referred to as a 'permitted explosive' or a 'permitted detonator' as the case may be.

2. No person shall take into or use in any part of a mine, being a part in which safety-lamps are for the time being in use by way of a temporary precaution, any explosive other than a permitted explosive or any detonator other than a permitted detonator.

3. No person shall use any explosive other than a permitted explosive or any detonator other than a permitted detonator –

   a) in a length of road which as regards any working face is an intake airway and which begins at a shaft or outlet or the current of air in which is subsequently split; or
   b) in a length of road through which coal is, or during the last preceding six months has been, transported by means of a conveyor or in vehicles moved otherwise than by hand or by animal traction; or
   c) in any place within thirty feet of such a road (not being road head)

4. If an inspector is of opinion that any part of a mine is dry and dusty he may serve on the manager a notice stating that he is of the opinion and requiring him to ensure than no explosive other than a permitted explosive and no detonator other than a permitted detonator is taken into or used in that part of the mine and any such notice shall, if it so specified therein, become operative forthwith.

5. The provisions of Part XV of the Mines and Quarries Act 1954 with respect to references upon notices served by inspectors shall apply to the notice served under the last preceding paragraph and the relevant ground of objection to such a notice shall be that that part of the mine is not so dry and dusty as to make the use therein of explosives other than permitted explosives or detonators other than permitted detonators, dangerous.