Warning and Monitoring Branch
HOME OFFICE
Horseferry House, Dean Ryle Street, LONDON S.W.1
Telex: 24986
Telephone: 01-834 6655, *ext.* 23

Our reference: WMO/69 14/5/13
Your reference:

11th August 1970.

Dear Mr Sampson

1. I have mentioned to you informally that following a review of the cover given by our various warning instruments and trials conducted with two compressed air sirens in the Harrogate area, we have decided to go to the Treasury for authority to embark on a long-term (10 years or more) programme to install about 2,000 compressed air sirens throughout England and Wales and, to a limited degree, in Scotland.

2. We have already had a preliminary meeting with the Ministry of Technology and with Mr Cutts of your DCED/SE1 to discuss the preparation of a specification for the sirens and work on this has started in advance of Treasury Authority for the general project.

3. There are, however, a number of other matters in connection with the installation of these sirens on which we would appreciate your views.

i. SITES At the present time, electrically driven sirens - to which the compressed air sirens can most closely be equated - are mounted on poles or on roofs of buildings at sites found and acquired on varying terms by the police who act as our agents in this work. To our knowledge, none of these sites is bought. The vast majority are acquired either formally or informally on goodwill terms or on peppercorn or nominal annual rentals. The compressed air siren will, however, present a different problem.

As you will see from the enclosed literature, the installation includes a compressed air storage vessel and a 'machinery room' which, with the tower, make up a considerable installation and for this a site of some 20 feet square will be required. In addition easements may be required for access during installation. The likelihood of our siting these on buildings is at this stage remote and can be ignored.

It does seem to us, therefore, that we cannot ask the police to negotiate and acquire these sites - for which we will require some security of tenure - on our behalf and that, once the police have located a suitable site and made preliminary enquiries about its likely availability, the remaining negotiations should be conducted as they would be for any other site required for Home Office purposes.

We would be grateful if you would consider whether it would be possible for the MPBW to undertake these negotiations for us, and also make application for planning permission for the erection of the sirens. As I have said earlier, the installation programme will be spread over many years and the additional work involved in acquiring the sites should not prove onerous.

ii. INSTALLATION The two sirens which were installed at Harrogate for our trials were installed by the firms which supplied them. At the meeting which I have mentioned above, however, the Ministry of Technology made it clear that they would prefer to let a contract for the supply of the sirens only (although, of course, the installation could be the subject of a separate contract). Mr Cutts said that it might be possible for the installation work to be carried out by MPBW and we would be glad of your views on this. It would clearly be of

assistance to the Ministry of Technology in deciding whether or not to let an installation contract to know whether your Ministry could undertake the work and, if so, at what approximate cost. Sections 5 and 6 of the enclosed Design Study done by one of the two firms who will be invited to tender for the supply shows that they estimate £800 for this - including erection and commissioning. I would be grateful if you would consider whether all, or part, of this - including erection and commissioning. ~~I would be grateful if you would consider whether all, or part, of this work~~ could be undertaken by MPBW. A visit to one of the sirens at Harrogate can easily be arranged at short notice if this would assist.

iii. INSPECTION Mr Cutts offered the services of MPBW Inspectors both during the manufacturing contract and subsequently of the completed installations. May I assume that you would have no comment on this arrangement?

iv. MAINTENANCE This is shown in Section 7 of the Design Study enclosed. Clearly it is of utmost importance that the sirens be properly maintained and that it be done on a national basis rather than it is now for the present electrical sirens by local contracts made by the police. We would be glad of your views on whether this too is something which the MPBW could undertake on our behalf.

All these questions, except that of site acquisition and planning applications, have a bearing on the contract which will be offered by the Ministry of Technology and it is important therefore that we have your views as soon as possible. If it would help to have a discussion, we shall of course, be pleased to arrange this, or, alternatively to supply any further information we are able.

Yours sincerely

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PINTSCH BAMAG

PINTSCH BAMAG LTD. - Mill Lane - Fullbridge - Maldon - Essex - England
Telephone: MALDON 3016 & 3033 Telex: 99363 Telegrams: PINTSCH BAMAG

The Home Office,
Warning & Monitoring Branch,
Horseferry House,
Dean Ryle Street,
London S.W.1.

Your Ref Our Ref.: 1096/E/EO Date 3rd July 1970

Subject:

Dear Sirs,

We have much pleasure in submitting for your consideration a design study for the manufacture, erection and maintenance of our Compressed Air Sirens.

The design has been carefully re-considered with the view to reducing costs without loss of efficiency or detraction from the basic design. All plant and components are of U.K. manufacture apart from the Siren Head and Air Motor. For the purposes of this study we are using the Siren Head as manufactured by our principals Pintsch Bamag AG but should the project reach fruition this matter will be given further consideration and should it offer a price advantage we will have them manufactured in the U.K.

With regard to costs the stated prices are those ruling at this time.

Your Miss Clarke has indicated that the first area to be covered is likely to be the South West of England, and our erection and maintenance costs are based on this assumption.

We have endeavoured to make the study as comprehensive as possible but should you require elaboration on any point or further information please let us know.

Yours faithfully,

For and on behalf of Pintsch Bamag Ltd.

P. J. Froggatt

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1. **DESCRIPTION**

The Pintsch Bamag High Performance Siren is designed to operate with compressed air as the motive power.

The equipment includes a machinery vessel containing a diesel driven compressor, fuel tank, control cabinet, compressed air controls, battery and ancillary equipment, a siren head mounted on a lattice constructed tower and a compressed air storage vessel designed for a maximum working pressure of 13.5 ATA.

Our specification includes for the complete installation at site, including all necessary civil work, erection and commissioning.

The characteristics of the high performance siren are:-

(a) High acoustic volume of signal.
(b) Good distribution of sound.
(c) Small equipment costs compared to acoustic output.
(d) Simple installations and maintenance.
(e) Independent of electric mains supply.
(f) Full intensity of sound immediately the siren comes on and maintains while it runs down.

The alarm signals emitted are similar in tone to the conventional siren and by operating various controls the following signals can be given:-

(a) Rise and fall sequence of tone.
(b) Continuous pitched tone.
(c) Various continuous pitched tones with selected pauses.
(d) Typhoon signals. (These signals are of a completely different nature as the frequency and volume can be controlled separately).

The equipment specified includes all necessary electronic controls for the safe operation of the plant by manual control, and by means of accessories (not included in our Tender) is capable of actuation by remote control.

2. EXTENT OF SUPPLY

2.1. Siren Head

1 - Siren Head approximately 4' 0" Dia. x 10' 0" high manufactured in 3 sections from corrosion resistance materials, supplied complete with a sound generator and electro-magnetic valve for producing variable tone signals.

The upper section containing the sound generator designed to produce, by means of compressed air, sound tones in a frequency range of 200 - 420 HZ ± 20 HZ at a sound level of 122 dB over 2 x 10^{-4} Ubar horizontally measured at 30 metres. The centre section constructed from cast allumin-ium alloy and consisting of the 4 exponential horns which convert with high efficiency the compressed air energy into sound energy with a uniform radially sound propagation.

The lower section designed for fixing to a lattice type tower with a hinged door at the base to give access for maintenance. An electro-magnetic valve is fitted in this section on the compressed air line for issuing the typhoon signals.

2.2. Lattice Tower

1 - Three post lattice tower of tubular construction to give an overall height from ground level of approximately 80' 0". The tower is designed in accordance with BS449 to safely withstand a wind velocity of 90 MPH as required by the latest British Standard Code of Practice. Climbing irons welded to the outside of the tower with a simple type platform at the siren head to facilitate maintenance. The tower complete with foundation structure, 1½" NB compressed air line and conduit for electrical cables. The tower can be supplied with a galvanised or zinc sprayed finish at extra cost as indicated in our price summary.

We also submit for your consideration the extra cost for a fabricated ladder of conventional design which we feel may prove more beneficial to your own engineers should they require access to the siren head.

2.3. Compressed Air Vessel

1 - Compressed Air Vessel 4' 6" O/Dia. x 11' 0" O/All approx. designed and constructed in accordance with BS1515 requirements for a working pressure of 230 p.s.i.g. Hydro-static test pressure 345 p.s.i.g. Shell, dished and flanged ends from BS1501 - 151 grade 'C' material and complete with support cradles for mounting at ground level in a horizontal position 16" x 12" McNeil type manhole and various openings for services. Vessel inspected during stages of manufacture and spot radiographed on completion.

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2.3. Compressed Air Vessel (Cont'd)

The capacity of the Air Vessel is approximately 5.5 m^3 and at the design pressure, 4 continuous tone signals (all clear) of 1 minute duration can be issued without re-fill.

2.4. Machinery Vessel

1 - Machinery Vessel for underground installation, 6' 6" I/Dia. x 13' 0" O/All constructed from ½" thick BS15 plate. The internal layout of the vessel similar to the Harrogate installation with a few improvements on design to allow more space inside the vessel for personnel. As suggested by Mr. Potter, we have increased the shell length by 2' 0" approximately to allow two men reasonable accommodation in comfort for a limited period.

The vessel provided with a large rectangular access door to facillitate the complete diesel compressor removal for any major repairs, access ladder, fuel tank condensate vessel and ancilliary equipment.

Vessel mounted on fabricated support cradles to stabilize the vessel when installed underground and suitably protected externally to withstand corrosive elements in the ground.

2.5. Diesel Engine and Compressor

1 - Petter Air-Cooled Diesel Engine with electric starter mounted complete with Broomwade type TM20 two stage, air-cooled air compressor displacing 20.4 cu.ft. per minute and capable of charging the air storage vessel to 15.5 atu. The unit supplied complete with oil pressure switch, intercooler, veerope drive, filters, safety valves and ancilliary equipment for operation with a 24 volt starting system. The complete unit mounted inside the machinery vessel on anti-vibration pads.

2.6. Switch Gear and Electrical Equipment

1 - Complete set of switch gear and controls for the operation of the high performance siren generally as specified herewith:-

2.6.1. Power Source

We recommend a 24V 105 AH 19 cell nickel-cadmium battery for the power source. You will appreciate that this type of battery is very expensive by comparison with the conventional lead-acid, but proven more efficient in operation and requiring limited maintenance. The charging of the battery is monitored and would be re-charged by the machine unit generator when necessary. The output

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2.6.1. Power Source (Cont'd)

is sufficient to start the diesel engine when the plant is idle. The price for the battery is shown separately in our price summary.

2.6.2. Switch Cabinet

The switch cabinet constructed from sheet metal is splash waterproof and contains all necessary instruments for the control and monitoring of the plant. The electric equipment designed to minimise maintenance and for reliability in operation includes the switch gear for starting the diesel engine when monitored for re-charging the compressed air reservoir.and re-charging the battery; battery charging equipment; 7 day time control switch and relays which can be set to allow for a trial run of the diesel at a certain time and days of each week, blocking of the diesel during night time, limitation of diesel operation, and also on a false start, starting procedure is repeated a second time; visual fault indication panel to determine fault by automatons with red code signals; pause and pulse transmitter for typhoon signals also electronic equipment for air and oil pressure switches etc.

3. PRICES EX-WORKS

1 - Installation as covered by Item 2 (Extend of Supply)	£4,600	Ex-Works

Discount for quantity supply would be as follows:-

5 - Units	Less 3%
10 - Units	Less 6%
25 - Units	Less 8%
50 - Units	Less 10%

Import Duty

In addition to our quoted price approximately £100 should be added for Duty on the Imported items which we have assumed would be payable by the Home Office.

Optional Extras

Lattice Tower

Special Type Ladder of conventional design	£100
Galvanised or Zinc Sprayed Finish	£ 75

Battery

Nickel - Cadmium Battery	£250

4. DELIVERY FROM OUR WORKS TO SITE

Provide transport and deliveryto sites in the South West of England a complete siren plant assuming good accessability and hard standing services.

Our price would be subject to confirmation of site location and inspection by our engineer.

As a provisional estimate this would be in the order of approximately £100 per siren installation.

5. SITE PREPARATION AND CIVIL WORK

5.1. Site Preparation

Provide all necessary machinery and equipment to excavate and prepare foundations for the lattice mast, air vessel and machinery vessel.

Remove top layer of soil over an area of approximately 25' 0" by 18' 0" to provide a working area, excavate ground to a depth of 10' 0" to form machinery vessel chamber 13' 0" x 6' 6". Excavate to a depth of 5' 0" to form foundation for lattice tower and 12" plinth foundations for air vessel.

5.2. Civil Work

Provide all necessary machinery and equipment to form concrete foundations, Cast 6" concrete slab at base of machinery vessel chamber to facilitate correct alignment of vessel, and backfill with earth after erectors have lowered vessel into chamber.

Form block foundation for lattice tower approximately 5' 0" deep x 5' 0" x 5' 0" and concrete slab over working area 25' 0" x 18' 0" x 6" thick with concrete plinths for air vessel foundations.

Our estimate is based on open level sites free and accessible for road transport within reasonable distance from contractors depots in the South West of England and suitable for heavy vehicles to operate without special road preparation.

Our estimate would be subject to confirmation after our engineers site survey to ascertain ground conditions etc.

As a provisional estimate this would be in the order of £400 per siren installation. This excludes the cost of any fencing on security arrangements.

6. ERECTION AND COMMISSIONING

6.1. Erection

Provide a mobile crane with 100' 0" jib together with steeplejacks labour tools and tackle, receive and off-load from road transport Machinery Vessel, Air Vessel, Lattice Tower, Siren Head and ancillary equipment.

Assemble lattice tower with Siren Head and erect on prepared foundations.

Lower Machinery Vessel into underground chamber, erect fresh air inlet, warm air and exhaust gas vents, pack up as necessary for correct alignment for civil contractors to backfill with excavated soil.

Erect compressed air vessel on prepared concrete plinths, connect air, condensate, and drains pipework. Run electrical cables to Siren Head in conduit and leave Site ready for commissioning. Our Engineer would be in attendance to supervise the installation during the complete erection operation. Our estimate is based on Sites in the South West of England, free and accessible for road transport and a lorry mounted mobile crane of 20 tons approximate weight and our estimate is subject to confirmation of locality and our Engineers examination of Site prior to erection.

6.2. Commissioning

Provide Engineers service for a period of 5 days to commission the complete installation, carry out full scale tests to prove efficiency of the plant and hand over to your personnel in operating condition to your entire satisfaction.

As a provisional estimate this would be in the order of £400 per siren installation.

7. MAINTENANCE

7.1. General

The efficiency of the warning system as a whole depends to a great extent on systematic maintenance and the immediate availability of spares. Our view is that no major repair work should be conducted on site. Any component which has failed, or is suspect should be immediately replaced and the repair and proving test carried out at works. For the purpose of this study, we have assumed that a minimum of 50 sirens would be under the maintenance contract, and the Company responsible for the contract would hold the necessary spares. It is vital for the efficiency of the warning system that staff and spares are immediately available. The staff therefore, would have to be fully conversant with all the plant items, their maintenance and repair.

7.2. Recommended Maintenance

Each siren would require 4 maintenance checks in the 12 months period.

Maintenance Schedule 'A' Three Quarterly Inspections

(a) General condition of external surfaces (visual inspection)
(b) General condition of interior surfaces (visual inspection)
(c) Testing of signal alarms in control cabinet.
(d) Performance test.
(e) Plant venting.
(f) Compressed air flow into receiver.
(g) Siren motor control.
(h) Signal valve control.
(i) Testing of automatic system.
(j) Counter check for compressor and diesel engine operating hours.
(k) Fuel tank level. Refill if required.
(l) Compressor and diesel engine oil levels.
(m) Battery - solution density, solution level, battery voltage and refill with distilled water as required.
(n) Drain condensate from system.
(o) Check fault indication.
(p) Ensure that the system operates correctly.

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7.2. Recommended Maintenance (Cont'd)

Maintenance Schedule 'B' Yearly Inspection

Test as Schedule 'A' (quarterly test) and also the following checks to be made:-

(a) Leakage test - Compressed Air Receiver, Compressed Air Siren, Valves and Gate Valves.
(b) Oil Change - Diesel Engine and Compressor.
(c) V-Belt drive check - Compressor, Diesel Engine.
(d) Cleaning - Air Filter, Diesel Engine, Compressor, Fuel Tank Filter, Lubricant Cap, Fine Filter, Cartridge of Setter Aeration, Grease Cap.
(e) Check oil supply to tipping levers and valve lubrication.
(f) Earthing resistance.
(g) Check manual control unit and remove wire from terminal, run the programs consecutively, fix wire in terminal.
(h) Remove rust and repaint if required - paint components in machinery room, and any surfaces readily accessible.

7.3. Special Equipment

Four wheel drive Land Rover, equipped with small hand operated crane for removing diesel engine and oil storage tank 100 gal. capacity, with transfer pump.

7.4. Maintenance Cost 50 Sirens

The yearly cost would be in the order of £3,750 and a contract would have to be placed for a minimum of 3 years. A review of costs would have to be made every 12 months.

7.5. Maintenance Cost 50 - 75 Sirens

We estimate that the yearly cost per installation could be reduced to approximately £60 for a group of Sirens numbering up to 75.

8. SPARES

8.1. Recommended Spares

Requirement for 50 siren installations

2 - Diesel Engines and Compressors	Cost	£850
1 - Distribution Board complete	"	£450
7 - Air Motors	"	£400
Various small parts	"	£500
TOTAL ...	£2,200	Approx.

8.2. Workshop Facilities

We estimate that the responsible contractor would have to make available, workshop and storage with an area of approximately 600 sq.ft.

9. REMOTE CONTROL SYSTEM

The equipment specified in our Tender is designed for operating the tone signals by manual control. It is however possible to actuate the sirens by telephone cable lines or by a wireless signal, and we would be pleased to prepare a full specification and tender for the additional electronics required.

In order to prepare a specification you would have to provide us with details of the telemetry system required, site location and range from the point of operation to the siren equipment.

10. GUARANTEE AND CONDITIONS OF CONTRACT

10.1. Guarantee

Our guarantee on the complete installation will take effect from the date the installation is complete, and will be for the period of 12 months from that date. A completion certificate will be issued at the time and the Ministry must confirm acceptance within 7 days.

10.2. Conditions of Contract

Subject to negotiation.

11. PROGRAMME OF DELIVERY

On the assumption that an order would be placed for multiple units, we estimate that delivery can commence 18 weeks from the date of order and settlement of all technical details.

With our present facilities we can despatch one complete installation to site every 5-7 working days.

DESCRIPTION

of

HIGH PERFORMANCE SIREN

System Pintsch Bamag

CUSTOMER: HOME OFFICE

INSTALLED: ARMY APPRENTICES COLLEGE HARROGATE

1. Duty, System, Design and Construction

1.1 Duty

The high performance siren system PINTSCH BAMAG is highly suited for application in public or private warning systems to warn the population in case of catastrophe, fire hazards, air-raids by aircraft, rockets or to communicate other information by way of particular signals. Different signals are available for different type of alarms. Owing to its sound level the siren is suited for cities having a high noise level and for rural districts as well.

1.2 System

The high performance siren system uses compressed air as motive power. The air is generated by a compressor unit driven by a Farryman diesel engine and is stored in a compressed air receiver from which it is drawn for issuing signals. The air intake is controlled by a electromagnetic valve which responds to the selected signal. The valve receives the control pulses by way of a manually controlled unit located inside the machinery vessel. Normally the control signals would be operated from a central siren control unit by way of a micro-wave signal.

The compressed air flows to the sound generator which consists of a case in which a perforated disc is revolved by an electric motor at such a speed as necessary to interrupt the air flow corresponding to the desired signal frequency. The interrupted air flow is routed through 4 exponential horns to atmosphere. The sound signal is similar to the conventional electric sirens. The sound level of the signal tone amounts to 122 db at a horizontal distance of 30 m from the horn outlet. The 4 horns uniformly distribute the sound radially.

The motor driving the perforated disc is operated by the same control signal which operates the electromagnetic valve.

1.3 Design

The design consists of a tubular tower fixed to tripod legs on top of which is mounted the siren head. The overall height is approximately 80 ft. The compressed air receiver is suspended within the tripod legs and the machinery vessel mounted alongside.

1.4 Construction

All equipment for the generation of compressed air together with control equipment is located in the machinery vessel. It is recommended for general installation that the machinery vessel and air receiver or room should be below ground level.

This can either be constructed of concrete or a perfabricated M.S. Vessel.

The air receiver as supplied is constructed to BS1500 Class II requirements with a 10% radiograph examination of all welded seems.

2. Main Units

2.1 Siren Head

The siren head contains all components required for the sound generation. It consists of a three-part casing, the sound generator and the electromagnetic valve for the control of the compressed air.

The bottom part of the casing is conical and the inside of the siren head is accessible through a door located in the conical wall.

The center part of the casing consists of the 4 exponential horns which convert with high efficiency the compressed air energy into sound energy with a uniform radially sound propagation.

The exponential horns are alluminium alloy castings welded together to form one unit. (This construction has proved itself over many years under varying climatic conditions).

The top part of the casing incorporates a hood to protect the internal equipment against weather. The design shape improves the propagation of sound.

2.2 Sound Generator

The sound generator consists of a three-part light metal casting.

The perforated disc and the electric motor driving it are housed in the center part of the casing. The perforated disc is provided with 4 holes, their cross section being adopted to the operational requirements. 4 identical bores having a pitch identical to that of the perforated disc are provided in the bottom part of the casing. They connect the inside via the perforated disc with one exponential horn each.

When a signal is issued, compressed air flows to the exponential horn for the period when the perforated disc revolves and the holes in the disc match with the holes in the casing cover either partly or in full. Timing of the hole cross section exposed issues the signal tone as is usual for sirens.

The electric motor is a speed-regulated D.C. motor with operation on 24 V and 180 W rated output. This motor is driving the perforated disc at such a speed that for YELLOW ALERT a frequency of 420±20 cycles is achieved. For wailing tones (RED ALERT) the frequency changes periodically from 420 cycles to approx. 300 cycles and less and back to 420 cycles within 4 seconds.

The changes in the frequency are obtained by cutting the motor in and out periodically. A whistling tone signal of 12 seconds can be obtained with a pause of 12 seconds. This is achieved by connecting and disconnecting the electric motor and the compressed air valve periodically. It is also possible to issue a continuous tone signal. On some existing installations in Europe these signals are used for Radioactive fall-out alarms.

The sound level produced by the siren head and the sound generator is in 30 m horizontal distance from the siren head 122±1 db above 2×10^{-4}/u bar. For this purpose the air pressure upstream the sound generator must be at least 7 atm (100 p.s.i.g. approx.). The air consumption is approx. 15 Nm^3 (525 A.C.F. approx.) for each 60 seconds continuous tone signal. For other types of signals the air consumption is lower.

The siren is installed in a suitable terrain in an unobstructed area where measurements of the sound level may be checked by using officially approved sonometers.

With a sound level of approximately 122 db the radius of propagation can be determined from the diagram as shown in the Appendix.

2.3 Machine Unit and Fuel Tank

The machine unit consists of:-

1 air-cooled Farryman Diesel engine with electric starter

1 air-cooled two-stage compressor with air cooler

delivery: 25 Nm^3/hr. (880 A.C.F./hr. approximately)

maximum delivery pressure 15.5 atm. (227 p.s.i.g. approximately)

speed: 1,800 r.p.m.

1 generator: N=1,000W rated voltage U=24V

Motor, compressor and generator are assembled on a common frame which is flexibly supported in the machinery room. The motor drives the compressor through a centrifugal clutch and V-be Thereby it is possible for the Diesel to be started and to reach full speed without operation of the compressor.

The generator is also driven by the Diesel engine through a V-belt, but without a centrifugal clutch.

The generator charges the 24 V battery which is the power supply to the plant and controls the speed of the Diesel engine during starting and operation. Apart from the moror speed the oil pressure of the motor and the compressor is monitored. In case of any deviations from the rated value of the speed or the oil pressures the Diesel engine is cut out. Air enters the machinery vessel through a fresh air inlet pipe to supply service air for the Diesel engine and compressor. The exhaust gases and warm air are dispersed to atmosphere through an outlet pipe. This comprises of a double walled tubular fabrication with the exhaust gases passing through the inner tube and the hot air through the outer tube.

The fuel tank storage capacity is sufficient for approximately 100 operating hours, and a fuel indicator is provided.

Faults on the oil pressure to the diesel engine, failure to start the diesel and failure of the compressed air vessel reaching minimum charge level are monitored in the switch cabinet.

2.4 Compressed Air Receiver

The compressed air receiver has a storage capacity of 5.6 cubic meters and is designed and constructed to British Standard requirements for pressure vessels.

The receiver is fitted with a drain valve. The safety valve and pressure gauge are fitted in the machinery vessel and as soon as the pressure drops to 13.5 atmospheres the pressure gauge transmitter issues a continuous pulse initiating refilling of compressed air until the operating pressure of 15.5 atmospheres is restored.

The volume of the receiver is sufficient to issue 4 continuous tone signals of 60 seconds each at a sound level of 122 $\pm$ 1 db without having to refill the receiver, the 4th signal may decrease by a maximum of 5 db as compared with the 1st signal.

2.5 Compressed Air Line and Valves

The compressed air from the compressor flows via the check valve to the compressed air receiver. On starting the diesel engine the pipe line is vented for approximately 20 seconds by means of an electromagnetic valve to facilitate starting of the diesel engine. A flexible hose is fitted between the compressor and the delivery pipe line to allow for the vibration of the machine unit. A pipeline is installed between the compressed air receiver and the sound generator with the electromagnetic control valve being installed in this line. By means of this valve the pressure of the air receiver is reduced upstream of the sound generator in order to achieve the desired sound level and to minimise the air consumption.

2.6 Battery

It is recommended that the power supply for the siren installation should be from a 19 cell Nickel-Cadmium battery with a rated voltage of 24 V 105 AH. The output of the battery would be sufficient to cover the power requirement of the plant when idle without having to charge it and also to start the diesel engine during that period.

The charging condition is monitored. If required, the battery is recharged by the generator of the machine unit. Recharging may be also effected from the line via a rectifier which may be installed in the control cabinet.

2.7 Control Cabinet

All instruments required for the operation and the control of the plant and for processing the pulses from the manual control unit are installed in the control cabinet. The control cabinet is constructed in accordance with the latest technical advances from sheet-metal and it is splash-waterproof.

The electric devices are of a proven design for reliability and long life, also minimum maintenance is required.

2.8 Fault Finding Indicator

Faults are indicated in the control cabinet by automatic fuses, with a push button control, which responds to plant failure.

Installations in Germany are usually equiped with a remote indicator, usually fitted at the Siren Operators home. This issues a visual and audible signal for one minutes in the case of failure. The electric pulses are transmitted to the indicator via the control panel in the machinery vessel.

2.9 Manual Control Unit

By means of the manual control unit the intended signals may be issued by hand, in any sequence, if need should arise. For this purpose it is required to start a clockwork motor prior to issuing a signal, operate a switch for the selection of the signal and initiate signalling by pressing a push button. The manual control unit is located in the machinery vessel.

It is also possible to obtain Typhoon-like signals which can be varied by means of the control in the switch cabinet by adjusting the pause and pulse timing.

3. Monitoring, Control, Testing and Maintenance of the Plant

3.1 Monitoring

The plant is automatically monitored, in particular for the following operations and operating conditions:-

3.1.A Machine Unit

Diesel Engine:

Oil pressure & Speed:	In case the oil pressure or the speed are too low, the engine is disconnected and the fault indicated by the fault indicator in the control cabinet.
Operating hours:	A counter on the control cabinet continuously registers operating hours.

Compressor:

Oil pressure:	If oil pressure is too low the Diesel engine is disconnected and the fault indicated by the fault indicator in the control cabinet.

3.1.B Fuel Tank

Fuellevel:	Continuous visual check by level indicator and fault indicated by the fault indicator in the control cabinet. Plant remains in operation.

3.1.C Compressed Air Receiver

Air pressure:
15.5 atm)
13.5 atm) Monitored by pressure transmitter in machinery
8 atm) vessel.

On reaching 13.5 atm : Refilling is initiated
On reaching 15.5 atm : Refilling is stopped
On reaching 8 atm : Fault indicated by the fault indicator in the control cabinet. Plant remains in operation.

3.1.D Battery

The charging condition is continuously monitored, recharging being initiated, if charge becomes too low.

3.2 Control

A time switch is installed inside the switch cabinet which can be set to perform various functions as follows:-

3.2.A Limitation of the Diesel engine to 5 hours operation

3.2.B Isolation of Diesel engine during night time.

3.2.C Operation of the Diesel engine for a 2 minute trial period, three times a week.

3.2.D Re-starting of the Diesel engine should it fail to start at the first attempt. N.B. If the engine fails to start at the second attempt, the automatic fuse in the switch cabinet would respond.

3.3 Testing

During maintenance work or other inspections to the plant the following functions of the plant may be tested.

3.3.A Starting and running of machine unit.

3.3.B Performance of monitors and instruments.

3.3.C Start and running of motor of sound generator.

3.3.D Opening and closing of electromagnetic valves used for compressed air control.

3.3.E Solution level in battery.

3.4 Maintenance

The PINTSCH RAMAG high performance sirens have been in operation for over 10 years. It has been found advisable to maintain the installations quarterly to Maintenance Schedule 'A' and in addition to maintain them once a year to Maintenance Schedule 'B'.

Maintenance Schedule 'A'

A. General Condition of external surfaces (visual inspection)

B. General Condition of interior surfaces (visual inspection)

C. Testing of signal alarms in control cabinet

D. Performance test

E. Plant venting

F. Compressed air flow into receiver

G. Siren motor control

H. Signal valve control

I. Testing of automatic system

J. Counter check for compressor and diesel engine operating hours

K. Fuel tank level. Re-fill if required.

L. Compressor and diesel engine oil levels

M. Battery - solution density, solution level, battery voltage and refil with distilled water as required.

N. Drain condensate from system

O. Check fault indication

P. Ensure that the system operates correctly.

Maintenance Schedule 'B'

Test as Schedule 'A' (quarterly test) and also the following checks to be made:-

A. Leakage test - Compressed Air Receiver, Compressed Air Siren, Valves and Gate Valves.

B. Oil change - Diesel Engine and Compressor.

C. V-Belt drive check - Compressor, diesel engine.

D. Cleaning - Air filter, diesel engine, compressor, fuel tank filter, lubricant gap, fine filter, cartridge of setter aeration, grease cap.

E. Check oil supply to tipping levers and valve lubrication.

F. Earthing resistance.

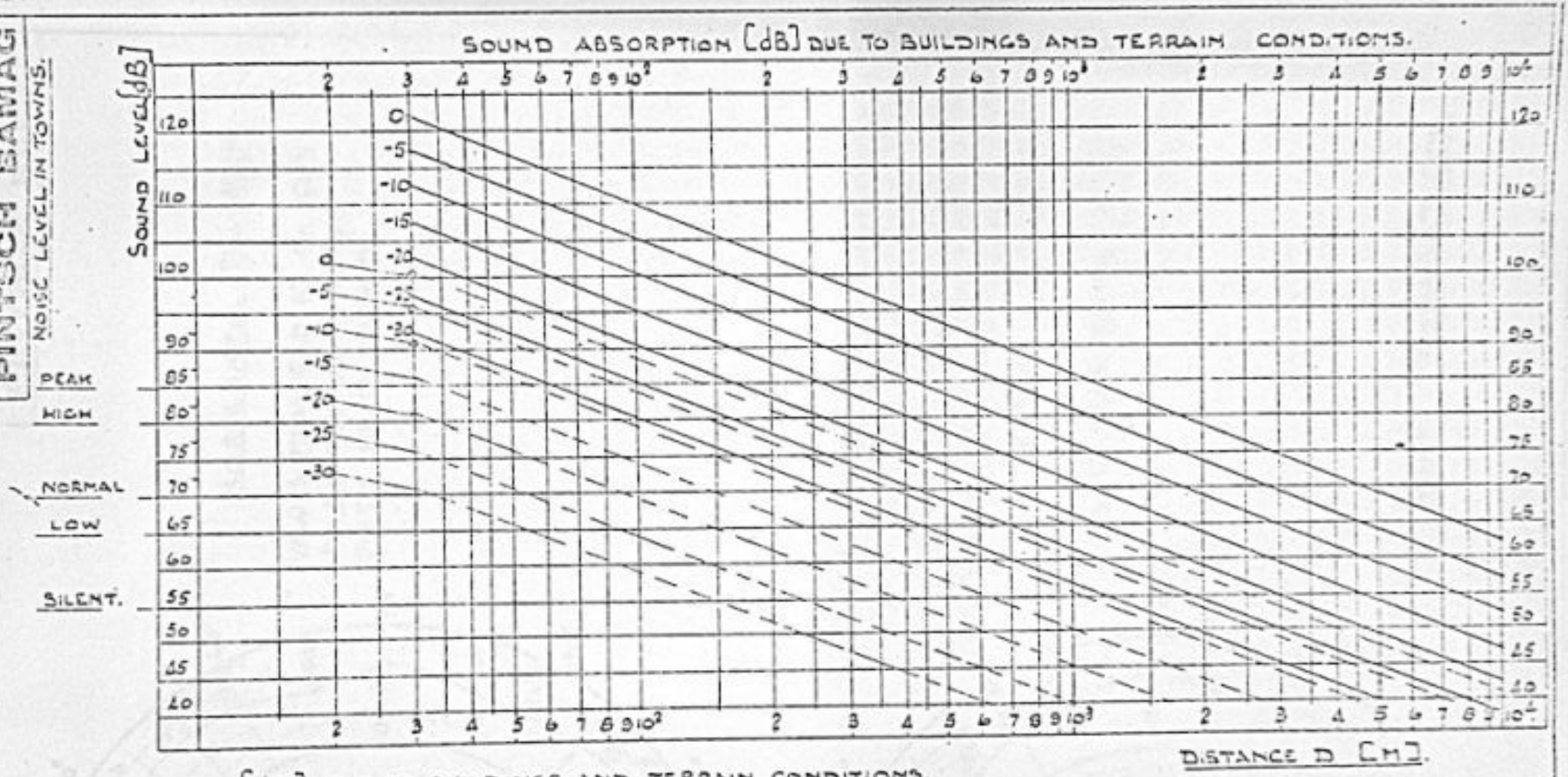
G. Check manual control unit and remove wire from terminal, run the programs consecutively, fix wire in terminal.

H. Remove rust and repaint if required - paint components in machinery room, also interior and exterior surfaces.

I. Refill fuel tank.

PINTSCH BAMAG

NOISE LEVEL IN TOWNS.



SOUND ABSORPTION [dB] DUE TO BUILDINGS AND TERRAIN CONDITIONS.

-5 dB : RURAL DISTRICT AND SMALL TOWNS.

-10dB ÷ 15 dB : MEDIUM-SIZE TOWN.

-20dB ÷ 25dB : CITY WITHOUT CENTRE.

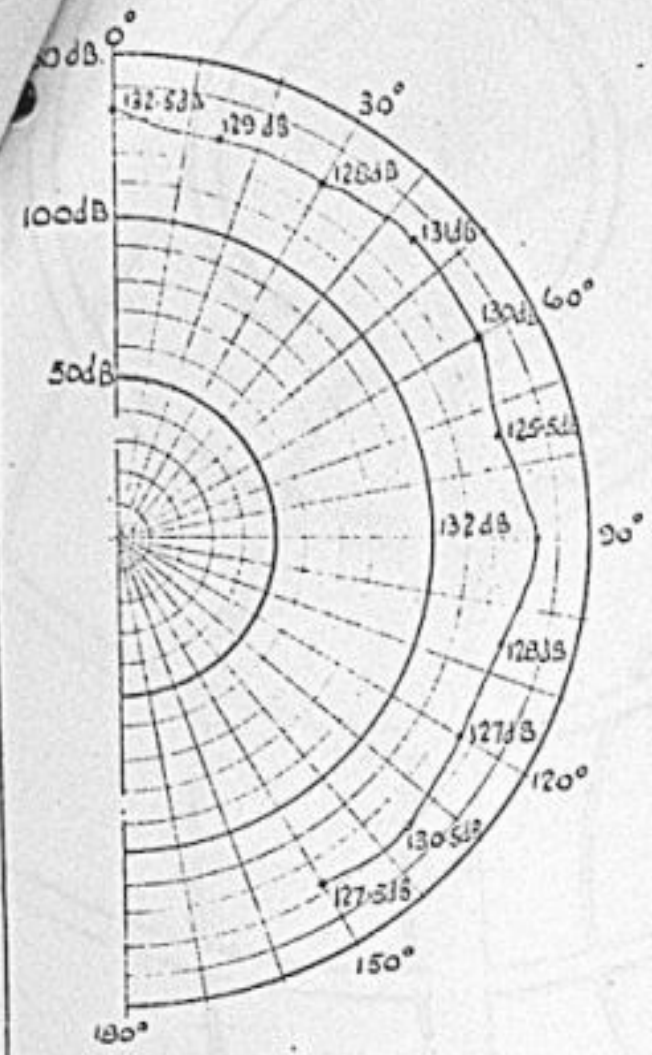
-30dB. : CITY CENTRE.

HIGH PERFORMANCE SIREN ————————

ELECTRICAL SIREN. — — — — —

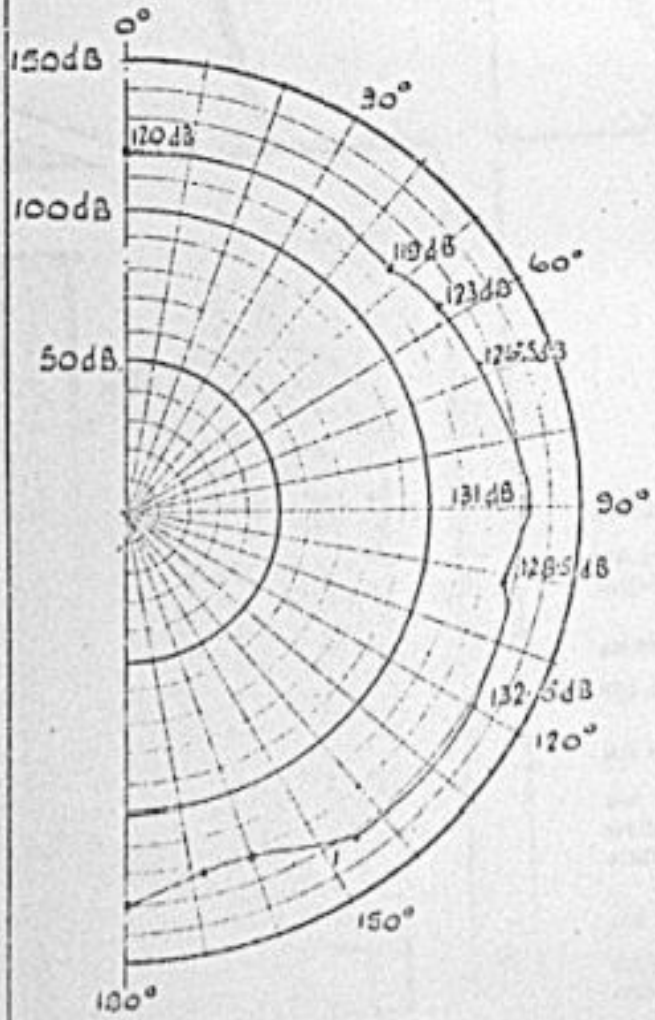
HIGH PERFORMANCE SIREN. SOUND LEVEL AS A FUNCTION OF DISTANCE TO SITE AND SOUND ABSORPTION.

PINTSCH BAMAG



HORIZONTAL DIAGRAM.

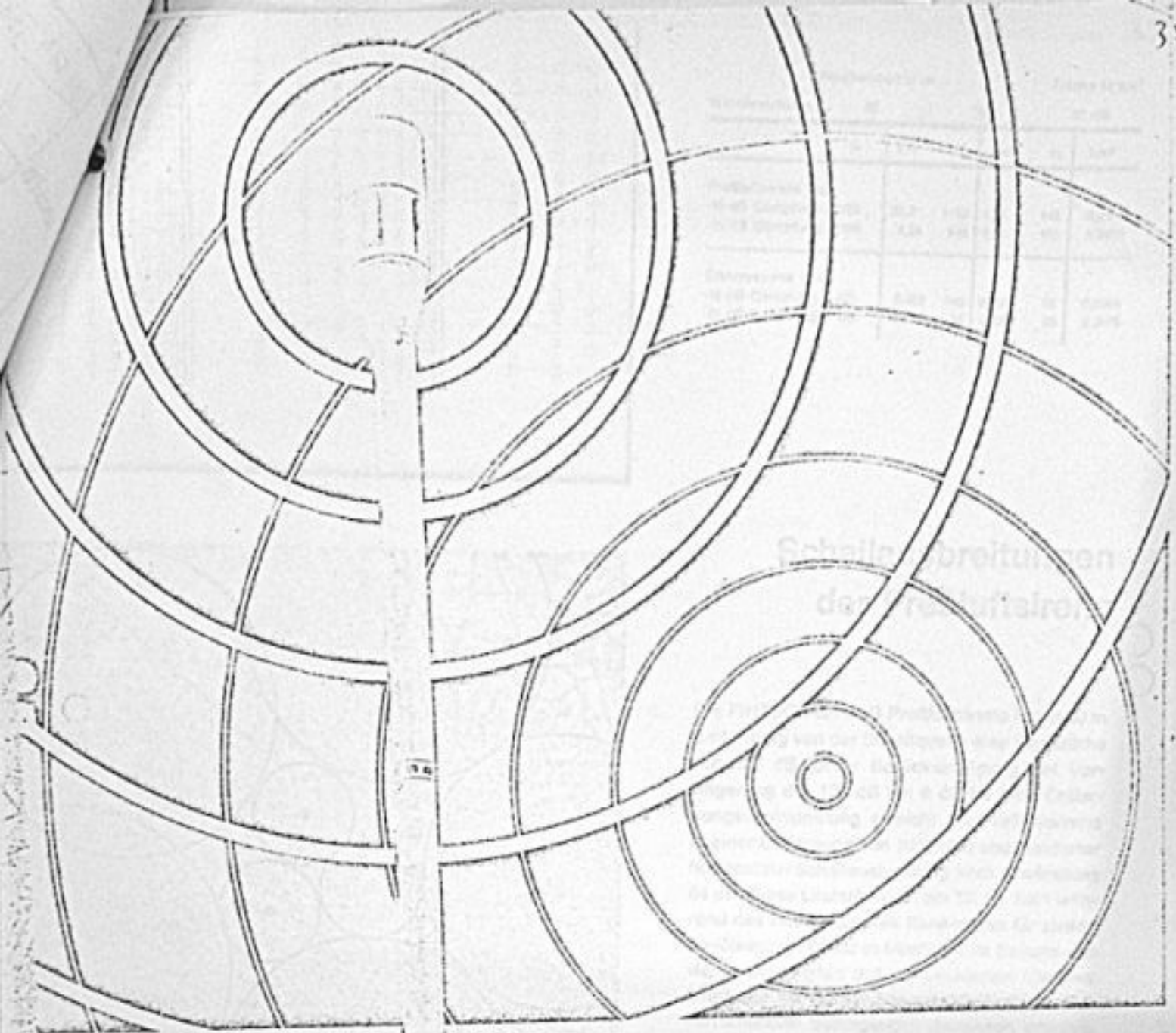
VALUES MEASURED AT r = 10M.
FIXED MEASURING POINT.
SIREN HEAD TURNED.



VERTICAL DIAGRAM.

VALUES MEASURED AT r = 10M.

SOUND PROPAGATION.



Wenn Gefahren drohen warnen

PINTSCH BAMAG

Preßluftsirenen

netzunabhängig

bei evtl. Ausfall des elektrischen Stromnetzes wird die Preßluftsirene automatisch über einen Dieselmotor betrieben

schallstark

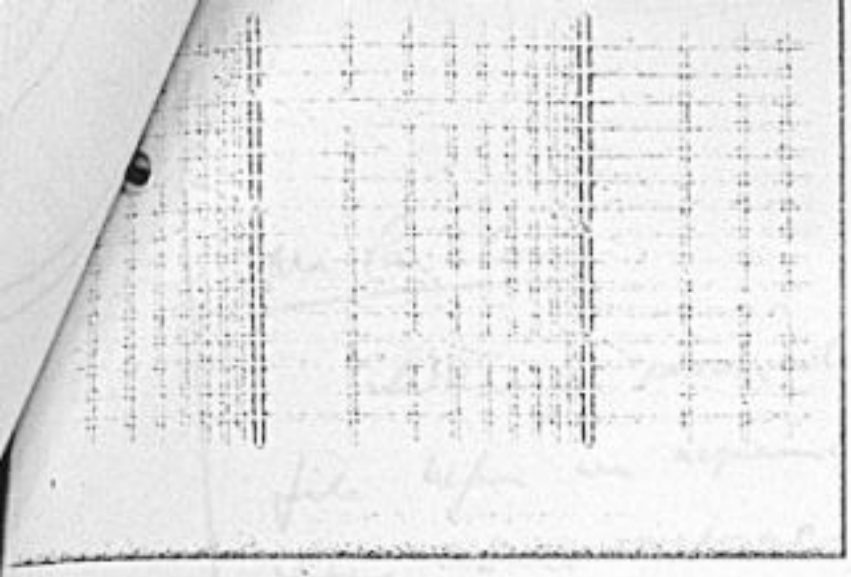
122 dB in 30 m Entfernung von der Schallquelle

mit variablen Schallsignalen

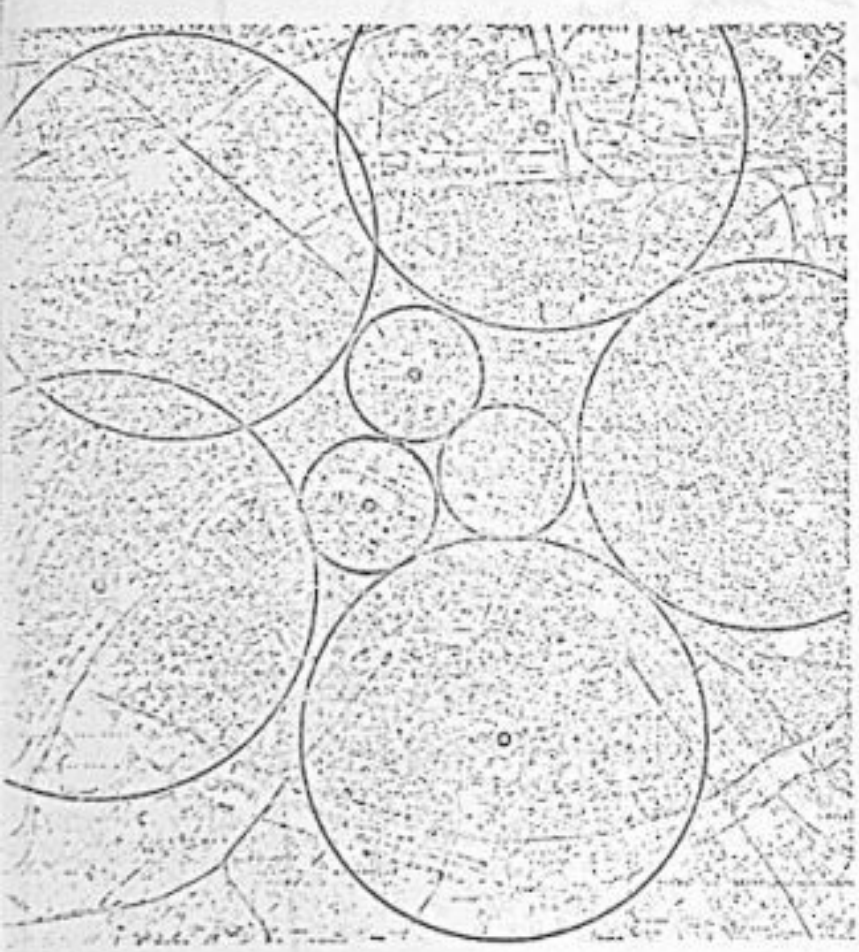
auf- und abschwellende Heultöne sowie Dauertöne in beliebiger Folge, weitere andersartige Signale sind möglich, da Frequenzgang und Lautstärke unabhängig voneinander steuerbar sind

auf Gebäuden oder Rohrtürmen

entsprechend den örtlichen Gegebenheiten kann die Sirene auf Gebäuden angebracht werden bzw. als Rohrturmanlage aufgestellt werden



	Reichweiten in m				Fläche in km²	
Warnlautstärke	60		70		60 dB	
	m	km²	m	km²	m	km²
Preßluftsirene bei						
-15 dB Dämpfung:	3200	32,2	1160	4,24	440	0,61
-25 dB Dämpfung:	1160	4,24	440	0,61	160	0,0805
Elektrosirene bei						
-15 dB Dämpfung:	400	0,503	145	0,066	55	0,0094
-25 dB Dämpfung:	145	0,066	55	0,0094	20	0,0013

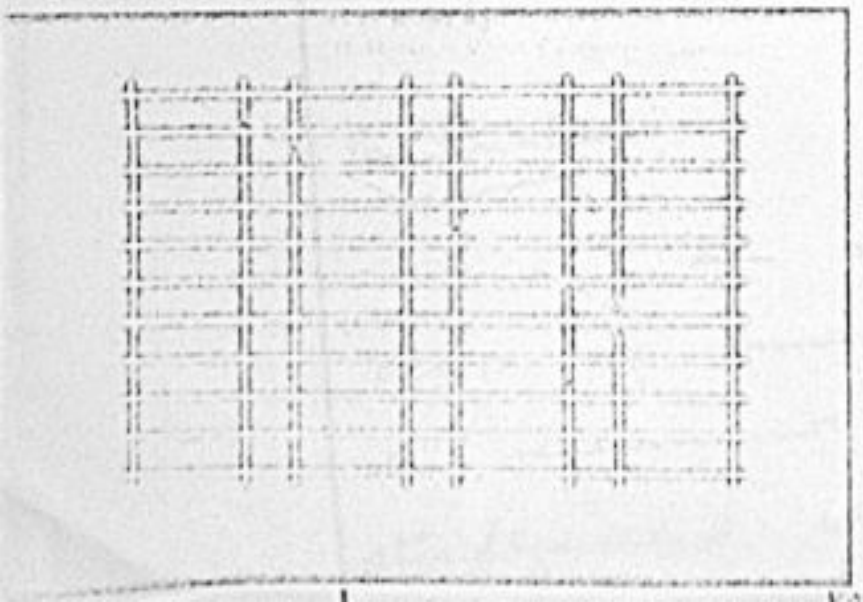


Schallausbreitungen der Preßluftsirene

Die PINTSCH BAMAG Preßluftsirene hat in 30 m Entfernung von der Schallquelle eine Lautstärke von 122 dB. Unter Berücksichtigung der Verringerung der 122 dB um 6 dB für jede Entfernungsverdoppelung erreicht die Preßluftsirene in einer Entfernung von 10 km bei ungehinderter horizontaler Schallausbreitung noch mindestens 64 dB. Diese Lautstärke ist am 12. 10. 1961 während des internationalen Konkresses für zivilen Bevölkerungsschutz in Montreux im Beisein von vielen Delegierten aus verschiedenen Ländern unter den am Genfer See an diesem Tage vorherrschenden Bedingungen gemessen worden. Die Warnlautstärke, bezogen auf die Warnfläche, geht aus Abb. oben dieses Prospektes hervor. Die in Abzug gebrachte Dämpfung von 15 dB und 25 dB entspricht einer örtlichen Bebauung mit einer Häuserhöhe bis 20 m, respektive einer cityartigen Bebauung mit einer Häuserhöhe über 20 m.

Bevor Preßluftsirenen-Anlagen zur Aufstellung gelangen können, ist eine gründliche Planung zur Auswahl der Standorte und der damit verbundenen lückenlosen Schallüberdeckung des zu warnenden Gebietes erforderlich. Auch diese Aufgaben werden durch die PINTSCH BAMAG AG von einem bewährten und in jahrelanger Entwicklungsarbeit geschulten Fachpersonal im In- und Ausland ausgeführt.

Die links in der Mitte abgebildete schematische Darstellung zeigt die theoretische Beschallung der Sechsmillionenstadt Paris.



PINTSCH BAMAG
AKTIENGESELLSCHAFT
6308 Butzbach · Telefon 4101 · FS: 4-10211

MO/69 14/5/13

Note of a meeting held on 18 November 1970 at Horseferry House to discuss the siting, installation and maintenance of compressed air sirens.

Present:

Home Office — Mr G P Gelly (Chairman)
Mr G A Potter
Miss J E Clarke

Department of the Environment
Mr G Cook
Mr C E Parkhouse
Mr G P Fraser

1 Sites

Mr Gelly explained that in 1963, the responsibility for giving public warning in an emergency had been removed from the Local Authorities and made a function of the Secretary of State. The police acted as Home Office agents in carrying out this work locally but there could be no question of involving the Local Authorities in the acquisition of sites, since they had no power to hold land for this purpose.

It was intended that overall planning of the system would be done in the Home Office and the police asked to find sites in suggested localities. The Home Office would consult the appropriate planning officers informally, if necessary by local meetings, before any firm decisions about particular sites were taken. The Department of the Environment would be asked only to undertake the formal application for planning consent and the conveyancing of the sites. There was no intention at the present time of installing the sirens in urban areas.

It was proposed to install the sirens by Carrier Area in various parts of the country. The complete installation programme would take at least 10 years and would start with a pilot scheme of 10 sirens, probably in the South East area.

Mr Cook undertook to discuss the matter with DOE Estates Division.

2 Purchase of Sirens

Mr Cook said that if the DOE agreed to install and maintain the sirens, they would wish also to purchase the equipment. DOE was looking at the mast desi-

submitted by one of the two firms which manufactured equipment for the trials. It was agreed that the Ministry of Technology should be allowed to complete their work on the specification for the remainder of the equipment.

3 Installation and Maintenance

Mr Gelly pointed out that the Ministry of Technology had agreed that for the first two years, tenders would be invited only from the two firms which had supplied and installed the sirens for the trials. One of these firms were unlikely to be interested in supplying the sirens unless they also received a contract for installation and maintenance. Mr Cook said that this would no doubt emerge when tenders were invited by DOE.

Mr Gelly said the Home Office would very much prefer the installation and maintenance to be dealt with on a national basis and oversight if possible not devolved to Regional level. Experience with the teleprinter conversion scheme at Group headquarters had shown that even with a specification provided by headquarters, considerable local deviations occurred. Mr Cook said that it would be possible to let one contract and leave the oversight to DOE Regions. However, the matter would be considered as a result of the experience gained in the proposed pilot scheme. Mr Parkhouse said that DOE contracts already existed for the maintenance of masts and pressure vessels and that these could be extended as necessary. He thought it likely that maintenance of the sirens could be included in the supply contract for the first year.

4 Inspection

Mr Parkhouse agreed that DOE could give an Inspection service. This would cover inspection of goods during manufacture, on delivery to sites, on installation and as necessary following contract maintenance visits.

Mr Cook agreed that when the Home Office received Treasury Authority to the scheme, the DOE would undertake the acquisition of sites - insofar as planning consent and conveyancing was concerned - the purchase, installation, inspection and maintenance of the masts and equipment for the proposed pilot scheme.

Mr H A Cridland
ADHRS(A)

HOME OFFICE SIRENS

Will you please glance through the attached file. Briefly, it is a £12M 10-year programme for installing 2,000 sirens all over the UK.

2 These are specialist items and may be of foreign manufacture. I agree that they should be built, installed and maintained on a "national" basis. This indicates a central control of manufacture, installation and maintenance.

2 Our present policy is to do directly only what we cannot let out practically and economically to agents or consultants. This extra commitment, for which extra staff cannot be hoped for, seems entirely suitable for complete installation and maintenance by contractors. The maintenance should, I think, be done by the manufacturers as in the case of motor cars, particularly as the question of replacement parts is important (more so if they are of foreign make - I have in mind my Volkswagen).

3 I think, therefore, that this would best be a comprehensive contract to one firm for manufacture, installation and maintenance, without trying to get bits and pieces from other contracts. I think the contract should be let by DSRS. Regional involvement on the construction and maintenance side could be limited to:-

(a) Informing them of the work within the Region, and requesting Site Control as necessary.

(b) Keeping a check that periodic planned maintenance is executed by the contractor. This might only entail a report to the Depot concerned that maintenance had been carried out. This would be checked against a list held by the Depot who would report cases when maintenance had not been carried out by the scheduled date. The Depot should also witness the final test to ensure that the installation was working.

4 I think this might be the limit of DHRS/Regional involvement. I am quite prepared to have a discussion with Mr Atkins and yourself.

A. F. J. Grant.

A F J GRANT
Director Home Regional Services

22 January 1971

Copy to: Mr L E Atkins

Reference AR 400/8

Mr H A Cridland
A/DHRS (A)

COMPRESSED AIR SIRENS

1 From a contractual point of view there is merit in dividing the activities proposed between:-

(1) Supply and Installation

(2) Maintenance.

2 (1) Without knowledge of the firms it is impossible to say whether they will be able to carry out the civil engineering works necessary to bury the air vessel and machinery vessel and provide the concrete bases for the masts, or whether the work will have to be sub-contracted. It is almost always preferable to have all the site works (bases etc and erection) under the control of one contractor since the problems of co-ordination, together with responsibility for, and rectification of faults can be costly in both time and money if there is a divided responsibility. For my part it would be sufficient if the contract could be worded so that the civil engineering works connected with the site were to be carried out by a firm, selected after competition, from a list to be supplied by DOE (ie nominated sub-contract). of civil engineering contractors could be involved in the experimental programme. (If the sites are widely scattered a number)

3 (2) Whilst initial maintenance will be included in the supply and erect contract it is better to have a maintenance contract for periods of three years using standard documentation, thereafter. These contracts will be arranged by the Region initially since only the SE Region will be involved. One can envisage a national contract in due course for the inspection of the whole installation. We may have a duty to ensure that the pressure vessels are examined by a "competent person". If so the design of the underground installation must take his requirements into consideration. For example he may be required to examine the whole of the outside of the pressure vessel in which case space must be left for this to be done. This in turn may affect the siting and design of the base.
Mr Parkhouse has pointed out that there are existing contracts for the inspection of masts and towers and also for the services of a competent person. Neither of these two contracts would cover the siren itself or the machinery vessel and its contents. It would seem therefore that if possible the inspections should be limited to:-

i The installation including the tower.

ii The necessary services of a competent person.

4 Contractually one imagines the only vital piece of equipment is the siren itself. How it is supported and the type of diesel engine and generator which activates it are matters of less concern. For ease of maintenance all the equipment should ideally be of one standard make.

Whether this can be guaranteed by the manufacturers for a period of over ten years (the programme of installations envisages at least ten years) is not known.

Reference

Is it the intention to buy one standard siren head with sufficient spares to cover all eventualities? Clearly they should be interchangeable (and readily available). What guarantee can there be of this if purchases are to be made piecemeal over a number of years? Which leads to the thought that we ought to consider bulk purchase of the sirens whatever we do about the rest of the equipment.

There appears to be no reason why, once the sites have been purchased, the Regional Contracts branch should not let the contract for supply and installation as well as the eventual contract for their maintenance.

Agree
[illegible]
4/3

D H TURNER
HOC/DHPS
29 January 1971

WARNING & MONITORING BRANCH.

345

WMO/69 14/5/12
2-SS 99/709/02

24th February 1971.

J.D. Skinner Esq.
Treasury Chambers
Gt. George Street
S.W.1.

Dear Skinner

COMPRESSED AIR SIRENS

In his letter of 4 May 1967 Roy mentioned the review which we were carrying out of the whole range of our warning instruments, and on 12 July 1968 Arnold gave us authority to spend £10,450 on an experimental installation of two sirens for testing purposes.

The result of the trials completed in the summer of 1970 has confirmed conclusively the superiority of the compressed air siren over other warning devices available, and that a prima facie case has been made out for the introduction of this type of siren to replace the existing power siren, hand siren and maroon.

The cost of providing national coverage is high and for that reason we feel the scheme ought to be considered by the Home Defence Review Committee when it deliberates on the whole range of home defence measures. To this end a paper as an appendix to the main submission on Warning and Monitoring has been prepared setting out the reasons for the proposal, the cost and a programme for its implementation. I enclose a copy for your information. Provision has been made in the PESC figures as follows:

	England & Wales	Scotland	Total
	£	£	£
1971/72	57,000	-	57,000
1972/73	250,000	30,000	280,000
1973/74	350,000	40,000	390,000
1974/75	500,000	50,000	550,000
1975/76	750,000	75,000	825,000

The scheme represents a considerable advance in our operational planning and would give us a much more effective warning system. The current means of getting the warning to the carrier control points is effective and efficient. Below this level, the inadequacy of the present equipment and the doubtful reliability of civilian warning point operators is a matter of continued concern and it is doubtful whether the current cost of £800,000 a year to warn the populace of attack and fallout is being spent to the best effect.

/If

If approval in principle to the conversion to a system of compressed air sirens is agreed we would propose to phase the installation by Carrier Areas. This would enable the existing system to remain fully operational whilst the new system is being superimposed.

We would propose, therefore, in the first instance to proceed with a pilot scheme to enable both ourselves and the Department of the Environment to evaluate the difficulties and to establish the basis for national planning and installation. It would be our intention, wherever practicable, to use existing or redundant ROC post sites for the siren installation, since many of these will be admirably suited for the purpose.

I should perhaps mention that should approval of a ten-year programme not be forthcoming it would be our intention to proceed with the conversion, using the money which would otherwise be needed for the replacement of marcons (around £50,000 annually) and the power sirens (£10,000 annually) - both from 1974/75. This would naturally mean a much longer phasing, but the surplus marcons and sirens would be used in such a way as to prevent any extra expenditure on these items.

I would be glad, therefore, to receive your approval to an expenditure of £57,000 in 1971/72 for the introduction of a pilot scheme in one Carrier Area.

The Finance Officer of the Home Office concurs in the terms of this letter.

Yours sincerely,

W.J. CARNEY

WMO/69 14/5/12

Compressed air sirens for the warning system

The warnings

The attack and fallout warnings are currently given by the following means:

Attack warning (RED)

a. Electric sirens (approximately 7,000) in areas with population density of at least 3,000 per square mile

b. Hand sirens (approximately 13,000) in areas with lower population densities

Fallout warning (BLACK)

Maroons.

Because of the distribution of warning points, something less than 90% of the population is within hearing distance at present.

The equipment

Electric sirens

These have a range of $\frac{3}{4}$ to $1\frac{1}{2}$ miles and are dependent upon public power supplies. They could not therefore be relied upon to give other than the initial RED warning and if an attack on this country was launched from outside the surveillance of the BMEW system even this warning could be placed in jeopardy through the disruption of public power supply. Further, a large number of these sirens are old, as they were manufactured before or during the last war: their condition is suspect to the extent that, in the interests of public safety, sound trials of the warning system have been discontinued until they are replaced.

Hand sirens

The initial distribution of hand sirens to the police was completed in 1967 and tests carried out in 1968 established that the range of these instruments was considerably less than had been assumed when rural coverage was originally planned. Furthermore, the physical effort to produce the necessary volume of sound for the required period of one minute is beyond the capacity of anyone but a very strong and fit person. To provide additional sirens on a scale sufficient to give effective warning coverage would be uneconomic.

Maroons

These are an effective warning instrument but they are complex and sensitive pyrotechnics and present many storage and transport difficulties. Because of storage difficulties these instruments cannot be distributed to warning points until immediately before the onset of an emergency: this places an unnecessary burden on the police, who are responsible for these warning points. Also,

/certain

certain proportion need to be proof-fired at regular intervals - thus reducing the available stocks - at an estimated cost of £50,000 annually.

The existing warning equipment is limited to giving two warnings only, and the all-clear; if a warning of biological and chemical threat were required modification of existing equipment, or additional equipment, would be necessary.

A further general complication which is giving grounds for concern is the introduction of unit beat policing and the consequent closure of many rural police stations: this, coupled with the likely withdrawal in an emergency of the remaining rural police manpower into the urban areas, would seriously diminish the number of public warning points, particularly in rural areas, which could be established on official premises. To re-site these public warning points on private premises, which would be the only alternative, manned by members of the public whose reliability in an emergency must always be suspect and whose training places a considerable burden on the police, would be a retrograde step: the problems of testing the carrier equipment at these warning points in peacetime would also be magnified.

,t present
lesignated as
warning points

The compressed air siren

A recent study was directed to finding a piece of equipment which would give the full range of warnings required, including additional warnings - should this be necessary - in connection with biological and chemical warfare. Ideally, the equipment should work independently of public power supplies. With the assistance of an accustics expert at the National Physical Laboratory, and Scientific Advisory Branch, and in consultation with other bodies whose business is to warn (e.g. Trinity House), the only known equipment (after extensive enquiries in Europe, USA and Japan) suited to our needs was a compressed air siren already extensively used in Germany; and although developments in the technological field of sound propagation are being kept under review, this appreciation remains currently valid.

Practical trials

The sirens are of German manufacture and two complete installations were obtained. Trials held in November 1969 and April 1970 served to confirm the findings set out in a comprehensive paper prepared by the German government on the sirens' performance. The sirens demonstrated a mean range of about 3½ miles: to establish a complete warning coverage throughout the country requires that sirens should be based on a five-mile grid. While this would allow for some overlap in the more built-up urban areas it would also provide for the variables of climatic conditions, e.g. wind speeds and directions etc. which have an effect on audibility. On this basis it is estimated that not more than 2,000 sirens (probably considerably less) would be required.

Costings

For estimating purposes it would be reasonable to take £4,500 as the mean likely cost per siren. The total capital cost would therefore be in the region of £9m. Installation costs are additional.

/Against

Against the capital expenditure (all figures quoted are at current prices) of £9m which it is suggested should be phased over ten years, will be a capital saving of around £750,000, mostly for new electric sirens and maroon replacements during that period which will be required if the compressed air siren is not adopted. Savings in annually recurring expenditure, including maintenance, will start modestly at about £6,000 progressively increasing to £200,000 when the system is fully operational. No account has been taken, however, of what must be not inconsiderable hidden savings as regards manpower etc. within the police and Post Office. Unlike previous improvements in warning and monitoring, the case on financial grounds alone is far from strong, but on operational grounds it is overwhelming.

Operational needs

The primary purpose of the Organisation is to warn the populace of attack and fallout: this costs around £800,000 a year. The system from the identification of the threat at BMEWS/ADCC to alerting the carrier control points (at major police stations) is effective and efficient. Below this level, because of the inadequacy of some of the equipment and the questionable reliability of the civilian warning point operators, there are doubts about the efficacy of the system.

Compressed air siren

The advantages of the compressed air siren can be summarised as follows:-

i. It is independent of mains power supply and capable of sounding more than the existing three warnings if required without additional cost.

ii. The country can be covered by a greatly reduced number, which in administrative and technical terms will be simpler, cheaper and more efficient to operate and run.

iii. The police will be relieved of considerable administrative work in peacetime and operational tasks in war, particularly at a time when the demand on their services will be at its highest.

iv. The compressed air siren is capable of housing in its equipment-room one or two persons. The potential of this equipment is considerable in terms of providing additional monitoring points or communications posts or, where suitably sited, control points, and should not be overlooked.

Warning and Monitoring Branch
Horseferry House

Reference AR 400/8

Mr A J Isaac (through Mr A F Peterson)
DMRS

COMPRESSED AIR SIRENS

1 This is a major proposition involving as it does a ten year programme for the provision and installation of some 2,000 sirens all over the UK at a total cost of some £12M.

2 The first question arising on it seems to have been answered, ie that DOE should be involved in the matter and, in the terms of the notes of the meeting held on 18 November 1970, "undertake the acquisition of sites - in so far as planning consents and conveyancing was concerned - the purchase, installation, inspection and maintenance of the masts and equipment for the proposed pilot scheme". If these words mean what they seem to mean we are so far committed only on the pilot scheme (for 10 sirens in the South East) and the position on the main scheme remains open.

3 For the rest we seem to be more at the stage of asking questions than providing answers to them. It would be possible in the short term to look only at the proposed pilot scheme but that does not seem to be the most advantageous way of proceeding and before anything is done about the pilot scheme it would seem worthwhile clearing our minds on what should be done for the scheme as a whole.

4 POSSIBLE CONTRACT ARRANGEMENTS

Minutes by Mr Grant and Mr Turner are attached. There is quite a range of possibilities:

(1) A comprehensive national contract (or perhaps contracts) for the pilot scheme and then, if necessary, the main scheme. Such a contract or contracts could provide for the supply of the sirens and other components, installation, inspection and maintenance.

(2) Comprehensive regional contracts on the lines of (1) but made by the Regions for installations within their own boundaries.

(3) A separate supply contract or separate supply contracts for the sirens and perhaps other clearly identifiable components. These could presumably best be on a national basis with suitable call-off arrangements.

(4) In conjunction with (3) a separate contract or separate contracts for installation, and later inspection and maintenance; these contracts could be either on a national or a regional basis.

(5) In conjunction with (3) a separate contract or contracts for installation and a separate contract or contracts for inspection and maintenance; the contracts again could be either on a national or a regional basis.

(6) In conjunction with (3) a separate contract or contracts for installation, use of the Department's existing arrangements for the inspection of masts and pressure vessels and a separate contract for maintenance; the contracts again could be either on a national or a regional basis.

5 It seems that a good deal of discussion is required on these possibilities and that a meeting should be called either by DSRS or DMRS with representatives from the other and from D of C, Supplies Division and the Regions.

6 DHRS PARTICIPATION

There are again several possible solutions to this part of the problem:

(1) Co-ordination of the arrangements for site control and ensuring that regular inspection and maintenance is carried through.

(2) Negotiation of inspection and maintenance arrangements under a central contract similar in kind to that already in existence for masts and towers. The negotiation of the contract and amendments to it could be the responsibility of D of C and DHRS; the notification of new installations to be brought within the scope of the contract (and of any necessary deletions) and the placing of orders under the contract would be the responsibility of the Regions as would the provision of site control and confirmation that all necessary inspections, maintenance operations and tests had been properly carried out.

(3) Negotiation of a central contract covering installation of the sirens either with provisions for their subsequent inspection and maintenance; or with provisions for maintenance only; or excluding all subsequent responsibilities.

(4) Negotiation of a comprehensive contract for supply and installation with or without provisions for later inspection and maintenance.

The decision between these possibilities would clearly largely depend on the decisions made on the points referred to in the preceding paragraph.

7 PARTICIPATION BY THE REGIONS

The same range of participation seems possible for the Regions as for DHRS. In other words they could either place regional contracts for supply, installation, inspection and maintenance or for such of those requirements as was thought best. The weakest item would seem to be that for supply of the sirens and perhaps other components; the arguments for a central contract for this part of the scheme seem incontravertible.

8 DIVISION OF RESPONSIBILITY AS BETWEEN DSRS AND DHRS

Many views are possible on this but as I see things any comprehensive national contract should be the responsibility of DSRS and, similarly, any national contract or contracts for supply and installation only should be the responsibility of that Directorate. If inspection and maintenance were segregated then it would be reasonable for DHRS to operate in those fields in one way or another as we have recently agreed to do for masts and towers. If regional contracts were found to be the solution then clearly there would be a good deal of co-ordination work to be undertaken in DHRS.

H A Cridland.

H A CRIDLAND
A/DHRS 'A'

26 February 1971

Copies to: Mr L E Atkins ADHRS(B)
Mr D H Turner HCC/DHRS

Reference AR 400/8

Mr H A Cridland
ADHRS(A)

COMPRESSED AIR SIRENS

Thank you for your minute of 26 February. I am afraid I am not at all happy about this scheme.

It seems to me that inadequate consideration has been given to the problems which the Department faces if it becomes involved in this. As Department of the Environment, we shall find ourselves torn between the need to erect 2,000 pieces of apparatus for the benefit of the Home Office and the population at large while, on the other hand, an unknown but possibly high proportion of the population may regard us as being the perpetrators of 2,000 instances of damage to the visual and aural environment. If the siting requirements are exacting, there may be problems of compulsory purchase. If, as I suspect, these are to replace existing sirens, there may be problems of demolition, reinstatement and compensation etc. for existing sites. If it is to be carried out as an allied service, DOE (through DHEM) will no doubt find it necessary to insist on good title to sites on which it proposes to spend public money.

Added to all this is the drain on our resources. We can assume that the problem might involve roughly £1M a year over 10 years. If staff salaries accounted for only 2% of this (and experience suggests they might be much more), the annual cost would be £20,000, i.e. about 10 men full-time on installation. In addition, there is the quarterly and annual preventive maintenance requirement, together with ad hoc maintenance such as re-setting time clocks which have started up the engine in the middle of the night. If these in total amount to one day per installation per year, we shall need by the end of the ten years 10 men full-time on maintenance.

Nevertheless, I assume that the exercise must be done, and it is highly probable that we are the best people to do it. I agree, therefore, to the proposal to carry out a pilot scheme on 10 sites in the South East Region provided the Regional Director has no objection. During the period of the pilot scheme, we ought to be thrashing out the organisation etc. needed if the whole scheme is to go ahead. We ought not to leave out of consideration the probability that a major firm of engineering consultants would be prepared to take the whole thing out of our hands and work direct to the Home Office. Since this is a one-off operation, I think that kind of hiving-off ought to be considered before we are committed to undertaking anything other than a small pilot scheme. Incidentally, I do not accept as valid the objection by the Home Office that Local Authorities have no power to hold land for this purpose. Local Authorities could still run the scheme (if it were decided that they should do so) carrying out all the necessary work as agents for the Home Office and holding the land in the name of the Home Secretary or, if he does not have powers, the Secretary of State for the Environment.

I doubt if DHRS need to be concerned in detail in the pilot scheme, if it goes ahead, which should be well within Regional capacity. It might, however, be sensible for us to ask, before the scheme starts, to be provided with a copy of the assessment of the scheme (or to be involved in the assessment) and to ask that those questions which are pertinent to the extension of the scheme from 10 sites to 2,000 sites be answered.

Finally, two points which are not formally my responsibility. Since most people live in built-up areas, it seems likely that there will be a need for an arrangement

/different

different from the proposed towers for siting sirens on top of buildings. Second, I would have thought that it would be cheaper and simpler to power these things by liquified gas, which can be brought to the site in containers, rather than by stationing 2,000 diesel engines round the country. But I am quite prepared to accept the decision of DSRS in engineering matters.

A J ISAAC
DHPS
9 March 1971

Copy to: Mr A F Peterson

1st Draft Spec for Air Blast Sirens

C O N T E N T S

GENERAL DESCRIPTION

The high performance siren installation is to consist of three main units:-

a A mast on which is mounted the siren head.

b A compressed air reservoir.

c A machinery vessel.

Briefly the system is to operate as follows.

Compressed air from the reservoir is fed to the siren head, where it passes through the sound generator which consists of a device (driven by a dc motor) for interrupting the airflow at the required sound frequency. The interrupted airflow is then routed to atmosphere through the horns of the sound distributor. Control of the compressed air fed from the reservoir to the siren head is by means of an electromagnetic valve. The electromagnetic valve and the dc motor are switched on and off by a control unit in such a sequence as to produce the required alarm signal. Selection of the type of alarm signal required and the initiation of it will be by manual control at the siren installation or remotely from the point from which several sirens can be controlled referred to as the Carrier Control Point (CCP).

SIREN REQUIREMENTS

3.1 The sound output is to be from a suitable sound distributor mounted on the mast at a height of 20m above the ground.

3.2 The sound intensity is to be at least 122dB above a level of $2.10^{-5}Nm^{-2}$ at a horizontal distance from the distributor of 30m.

3.3 The range diagram should be approximately circular, maximum deviation up to 3dB.

3.4 The sound frequency for a steady note should be 420Hz ± 10Hz.

3.5 The siren must be capable of sounding any one of the following alarms automatically when initiated either locally or at the CCP.

a Air Raid Alarm = howling sound within a range of frequencies of 300 - 420Hz ± 10Hz alternating every 2 seconds. Duration of signal 1 minute.

b Fall-out warning = To be defined. 12 seconds howling sound
Alarm

c All Clear = Steady note of 420Hz ± 10Hz.
Duration 1 minute.

3.6 The installation must remain operational:

a under all normal weather conditions prevailing in the UK;

b after pressure wave of up to ..... caused by explosions.

3.7 The installation is to be independent of external power supplies, deriving its supply from a power plant consisting of an engine driven, air compressor and dc generator.

3.8 The fuel tank for the engine should be adequate for 100 hours continuous operation.

3.9 The supply of lubrication oil for engine and compressor should be adequate for a minimum of 100 hours running.

3.10 The compressed air container should be so dimensioned as to permit the sounding of at least four steady note signals each one minute duration without needing replenishment. The difference in sound intensity between the first and fourth signal period must not exceed 5dB.

The battery capacity should be such that it will be adequate for the installation for one week when the siren is not sounded and will still ensure immediate starting of the engine.

3.12 The design should allow for the siren head to be mounted on a short mast in turn mounted on top of a building, the remainder of the equipment being housed in the building basement.

3.13 The installation is to be designed to have:

a a total life of 30 years;

b 3000 hours operational life or 5 years operational and standby life, whichever is the sooner, between major overhauls of the power plant and dc motor;

c a mean time between failures (MTBF) of at least 6 months.

The above is on the assumption that periodic preventative maintenance as specified by the designer, has been carried out.

3.14 The control unit must be capable of the following functions. The control equipment must automatically maintain the battery in a fully charged state and the pressure of the compressed air in the reservoir above a minimum pressure.

3.15 As far as is practicable the existence of a fault is to be signalled to the CCP and an indication of the nature of the fault is to be displayed on the control unit.

3.16 An emergency switch to terminate any false alarm signal that has been initiated is to be fitted. The emergency switch is to be operative only during the signal cycle which has been stopped. Any further initiating signal must operate the siren. It should be easily accessible but protected against inadvertent operation. It must be capable of being operated locally or at the CCP.

4 DESIGN DETAILS

4.1 MAST

4.1.1 The mast used to carry the siren head should be 20m high.

4.1.2 Normally the mast should be of lattice work construction. Where possible no concrete base should be required. Under special local conditions some other type of mast may be found necessary, in this case the type of mast will be separately specified.

4.1.3 The mast should be constructed so as to be easily transportable.

4.1.4 It should be possible to climb the mast for maintenance and inspection purposes. Attention should be paid in the design to Industrial Accident Regulations. The mast should be carefully protected against unauthorised interference.

4.1.5 High pressure air pipes should be to Specification ..... and fully protected against damage.

4.1.6 Electric cables should be to Specification ..... and fully protected against damage.

4.1.7 (Specification for mast material).

4.1.8 (Specification for protective finishes).

4.1.9 The design is to include precautions taken to prevent water trapped in the pipework from impairing the efficiency or safety of the installation during cold weather.

4.2 SIREN HEAD

4.2.1 The siren head is to consist of a casing containing a 24V dc motor driving the sound disc and an electromagnetic valve for the control of the compressed air. The casing is to be shaped to form the horns by which the compressed air energy is converted into sound energy with a radially uniform sound distribution.

4.2.2 The casing is to be oscillation proof in against siren motor or sound frequencies.

4.2.3 Equipment should be incorporated in the siren head in such a manner as to facilitate maintenance. Any access point must be sealed with a weatherproof cover.

4.2.4 Safety precautions for operating personnel should be provided.

4.3 COMPRESSED AIR RESERVOIR

4.3.1 The air reservoir should be of standard commercial pattern. It should be fitted with a safety valve which should be automatic and fully tested.

4.3.2 The air reservoir should be firmly fixed and accessible for regular inspection.

4.3.3 Where a surplus moisture draining device in fitted this should lead to the open air.

4.3.4 A pressure gauge should be fitted in a prominent position. A red mark should indicate the maximum pressure.

4.3.5 The interior of the reservoir should be protected against rust and corrosion to Specification .....

4.3.6 The pipeline from the compressor (apart from the compressor cooling device) to the air reservoir should be to Specification .....

4.4 MACHINERY VESSEL

4.4.1 All equipment for the generation of compressed air together with control equipment, fuel and oil storage and fault indication equipment is to be located in the machinery vessel. The vessel will be sunk into the ground and should, if necessary, be proofed against subsoil water.

4.4.2 A lockable access shaft to the vessel should be fitted. It should be of adequate dimensions to permit single appliances to be removed for replacement.

The minimum height above ground of the access shaft entry should be 400mm. The shaft may be used for ventilation. Ventilation should be adequate to obviate condensation. When the plant is run for long periods the temperature in the vessel should not be permitted to reach a danger level.

4.4.4 The bottom of the vessel must be covered with a flat metal grating mounted clear from the bottom of the vessel. The hollow resulting from this to serve as a bilge in which the oil spillage and condensed water may collect, a bilge pump for this accumulated waste is to be provided.

4.4.5 The following equipment is to be housed in the machinery vessel:-

a The power plant - consisting of a diesel engine driven compressor and dc generator.

b Control unit - a unit containing the necessary electrical and electronic equipment to control the siren operation and to monitor and indicate the operational status of the complete installation.

c Fuel and oil supplies.

d Battery.

In the case of building installations (see Design Requirements para 12) the above equipment will be stored in the building basement and the machinery vessel as such will not be required.

4.4.6 A 24 volt protected light should be fitted, automatically operated by a switch fixed to the access shaft cover.

4.4.7 (Specification for the vessel material).

4.4.8 (Specification for protective finishes on the inside and outside of the vessel).

4.4.9 A wall mounted socket suitable for a 24 volt lamp should be fitted.

4.4.10 Access for the GPO telephone wires is to be provided.

4.5 POWER PLANT

4.5.1 An air cooled diesel engine is to be used to power the compressor. It should be low in height ie horizontal design. Its output should be suitable to meet the compressor requirements plus the requirements of a 1 kW output generator.

It should be capable of being started up manually without priming. The nominal revolutions of the engine should be matched to the needs of the compressor. The engine should be fitted with a standard 24 volt electric starter motor.

4.5.2 The diesel engine and compressor should be so coupled that the engine alone can be started up and the compressor drive engaged only when the engine reaches 75% of its nominal speed.

4.5.3 The compressor should be a 2 cylinder, 2 stage piston compressor delivering a minimum of 25 cubic metres per hour at 1800 rpm. At a working pressure of 16 atmospheres its power requirement should not exceed 8.5 hp. The crankshaft should have oil bearings. All operating parts should be accessible and easy to replace. To obviate pressure variations behind the pressure valve of the high pressure stage, an air chamber should be provided which will simultaneously service to cut off the oil and water supply. A non-return valve should be fitted between the compressor and the air reservoir. A compressor should be selected in which the idling speed oil consumption is not markedly higher than when operating under power. When idling or running under power no oil spray will emerge from the compressor into the ambient air.

4.5.4 The engine and compressor should be mounted on a base framework of steel girders. Adequate ground clearance should be allowed for the purpose of changing oil and general accessibility.

4.5.5 Air for ventilation and cooling of the power plant should be drawn from outside the machinery vessel.

4.5.6 Exhaust gases and cooling air from the power plant are to be discharged outside the machinery vessel.

4.5.7 An operating time recorder for the power plant should be provided.

4.5.8 An emergency cut out for the diesel engine should be fitted, and an indicator sign for this prominently displayed.

5 TESTING

A Contractor tendering against this specification is to provide a test schedule under each of the headings below.

a FACTORY TESTS

Tests to be carried out on components of the system at the manufacturing contractors works prior to despatch to the site.

b COMMISSIONING TESTS

Tests to be carried out on site on the completed system.

c PERIODIC TESTS

Tests to be carried out, after acceptance by the customer, at specified intervals to give assurance of continuing serviceability of the system.

6 PREVENTATIVE MAINTENANCE

A Contractor tendering against this specification is to provide a schedule detailing the periodic maintenance that he considers necessary to achieve the required system reliability.

WMO/66 14/5/11

MINUTES OF A MEETING HELD ON 29 JULY 1970 IN ROOM 530 HORSEFERRY HOUSE TO DISCUSS THE PREPARATION OF A SPECIFICATION FOR COMPRESSED AIR SIRENS

Present:

Mr J P Gelly (Chairman)	Warning and Monitoring Branch
Mr G A Potter	" " " "
Mr W J Carney	" " " "
Mr J Arnot	Home Office Supply and Transport Branch
Mr E J Smith	Home Office Directorate of Telecommunications
Mr R H Cutts	MPBW (DCED/SE1)
Mr L F Croft	Ministry of Technology MP(T)1B Contracts
Mr A.G. Glover	" " IP(T)1B
Mr E G Hitch	Ministry of Technology EQD
Mr T A Smith	" " "
Mr C R Spillett	" " "
Mr P L Dalling	Post Office (Marketing)
Mr T Cattell	" " THQ/TDD
Mr B R Freer	" "
Miss J E Clarke (Secretary)	Warning and Monitoring Branch

1. The Chairman explained that, in consultation with the Home Office Scientific Advisory Branch and National Physical Laboratory, the Warning and Monitoring Branch had conducted a critical review of warning coverage and instruments with a view to improving this and dispensing with the use of hand sirens - known to be inadequate - and maroons, which presented storage and costly replacement problems.

It had been found, after intensive study, that a compressed air siren, manufactured in Germany and used by the German government for their warning system, was the most effective instrument available. Since it worked independently of public power supplies and could produce a number of signals it could be used to give warning of fall-out and would enable the maroon to be dispensed with as well as the mains and hand sirens. Two complete installations had been bought and trials held in Yorkshire had confirmed that they were suitable.

The sirens cost approximately £5,000 - £6,000 each including installation - depending on the number ordered - and it was estimated that some 2,000 would be required to give effective coverage over the whole of the UK. It was proposed to seek Treasury approval for the £11m - £12m programme to be spread over something like 10 years. Provision had been made in estimates for 1971/72 and it was important that, if Treasury approval was forthcoming, the whole of this provision was spent. The meeting had, therefore, been called to discuss the measures which would be necessary so that orders could be placed in time for completion in 1971/72.

2. CONTRACTING PROCEDURE Mr Croft said that in the long term, it would be necessary to seek tenders from as wide a field as possible. However, in order to meet the time-scale described by the Chairman, the Ministry of Technology would be prepared to limit their invitations for the initial order to the two firms who had provided the two sirens already bought.

3. TYPE OF CONTRACT The Chairman said that the contract for the experimental sirens had been on a supply and install basis. Mr Cutts felt that the firms concerned would probably sub-let the installation work and that it would be

WMO/69 14/5/13

Note of a meeting held on 18 November 1970 at Horseferry House to discuss the siting, installation and maintenance of compressed air sirens.

Present:

Home Office — Mr G P Gelly (Chairman)
Mr G A Potter
Miss J E Clarke

Department of the Environment
Mr G Cook
Mr C E Parkhouse
Mr G P Fraser

1 Sites

Mr Gelly explained that in 1963, the responsibility for giving public warning in an emergency had been removed from the Local Authorities and made a function of the Secretary of State. The police acted as Home Office agents in carrying out this work locally but there could be no question of involving the Local Authorities in the acquisition of sites, since they had no power to hold land for this purpose.

It was intended that overall planning of the system would be done in the Home Office and the police asked to find sites in suggested localities. The Home Office would consult the appropriate planning officers informally, if necessary by local meetings, before any firm decisions about particular sites were taken. The Department of the Environment would be asked only to undertake the formal application for planning consent and the conveyancing of the sites. There was no intention at the present time of installing the sirens in urban areas.

It was proposed to install the sirens by Carrier Area in various parts of the country. The complete installation programme would take at least 10 years and would start with a pilot scheme of 10 sirens, probably in the South East area.

Mr Cook undertook to discuss the matter with DOE Estates Division.

2 Purchase of Sirens

Mr Cook said that if the DOE agreed to install and maintain the sirens, they would wish also to purchase the equipment. DOE was looking at the mast design

submitted by one of the two firms which manufactured equipment for the trials. It was agreed that the Ministry of Technology should be allowed to complete their work on the specification for the remainder of the equipment.

3 Installation and Maintenance

Mr Gelly pointed out that the Ministry of Technology had agreed that for the first two years, tenders would be invited only from the two firms which had supplied and installed the sirens for the trials. One of these firms were unlikely to be interested in supplying the sirens unless they also received a contract for installation and maintenance. Mr Cook said that this would no doubt emerge when tenders were invited by DOE.

Mr Gelly said the Home Office would very much prefer the installation and maintenance to be dealt with on a national basis and oversight if possible not devolved to Regional level. Experience with the teleprinter conversion scheme at Group headquarters had shown that even with a specification provided by headquarters, considerable local deviations occurred. Mr Cook said that it would be possible to let one contract and leave the oversight to DOE Regions. However, the matter would be considered as a result of the experience gained in the proposed pilot scheme. Mr Parkhouse said that DOE contracts already existed for the maintenance of masts and pressure vessels and that these could be extended as necessary. He thought it likely that maintenance of the sirens could be included in the supply contract for the first year.

4 Inspection

Mr Parkhouse agreed that DOE could give an Inspection service. This would cover inspection of goods during manufacture, on delivery to sites, on installation and as necessary following contract maintenance visits.

Mr Cook agreed that when the Home Office received Treasury Authority to the scheme, the DOE would undertake the acquisition of sites - insofar as planning consent and conveyancing was concerned - the purchase, installation, inspection and maintenance of the masts and equipment for the proposed pilot scheme.

Warning and Monitoring Branch

HOME OFFICE

Horseferry House, Dean Ryle Street, LONDON S.W.1

Telex: 24986

Telephone: 01-834 6655, *ext.* 23

Reference: WMO/69 14/5/13

Your reference:

11th August 1970.

Dear Mr Sampson

I have mentioned to you informally that following a review of the cover given by our various warning instruments and trials conducted with two compressed air sirens in the Harrogate area, we have decided to go to the Treasury for authority to embark on a long-term (10 years or more) programme to install about 2,000 compressed air sirens throughout England and Wales and, to a limited degree, in Scotland.

2. We have already had a preliminary meeting with the Ministry of Technology and with Mr Cutts of your DCED/SE1 to discuss the preparation of a specification for the sirens and work on this has started in advance of Treasury Authority for the general project.

3. There are, however, a number of other matters in connection with the installation of these sirens on which we would appreciate your views.

i. SITES At the present time, electrically driven sirens - to which the compressed air sirens can most closely be equated - are mounted on poles or on roofs of buildings at sites found and acquired on varying terms by the police who act as our agents in this work. To our knowledge, none of these sites is bought. The vast majority are acquired either formally or informally on goodwill terms or on peppercorn or nominal annual rentals. The compressed air siren will, however, present a different problem.

As you will see from the enclosed literature, the installation includes a compressed air storage vessel and a 'machinery room' which, with the tower, make up a considerable installation and for this a site of some 20 feet square will be required. In addition easements may be required for access during installation. The likelihood of our siting these on buildings is at this stage remote and can be ignored.

It does seem to us, therefore, that we cannot ask the police to negotiate and acquire these sites - for which we will require some security of tenure - on our behalf and that, once the police have located a suitable site and made preliminary enquiries about its likely availability, the remaining negotiations should be conducted as they would be for any other site required for Home Office purposes.

We would be grateful if you would consider whether it would be possible for the MPBW to undertake these negotiations for us, and also make application for planning permission for the erection of the sirens. As I have said earlier, the installation programme will be spread over many years and the additional work involved in acquiring the sites should not prove onerous.

ii. INSTALLATION The two sirens which were installed at Harrogate for our trials were installed by the firms which supplied them. At the meeting which I have mentioned above, however, the Ministry of Technology made it clear that they would prefer to let a contract for the supply of the sirens only (although, of course, the installation could be the subject of a separate contract). Mr Cutts said that it might be possible for the installation work to be carried out by MPBW and we would be glad of your views on this. It would clearly be of

assistance to the Ministry of Technology in deciding whether or not to let an installation contract to know whether your Ministry could undertake the work and, if so, at what approximate cost. Sections 5 and 6 of the enclosed Design Study done by one of the two firms who will be invited to tender for the supply shows that they estimate £800 for this - including erection and commissioning. I would be grateful if you would consider whether all, or part, of this - including erection and commissioning. ~~I would be grateful if you would consider whether all, or part, of this work~~ could be undertaken by MPBW. A visit to one of the sirens at Harrogate can easily be arranged at short notice if this would assist.

DSRS/DCED

iii. INSPECTION Mr Cutts offered the services of MPBW Inspectors both during the manufacturing contract and subsequently of the completed installations. May I assume that you would have no comment on this arrangement?

DMRS.

iv. MAINTENANCE This is shown in Section 7 of the Design Study enclosed. Clearly it is of utmost importance that the sirens be properly maintained and that it be done on a national basis rather than it is now for the present electrical sirens by local contracts made by the police. We would be glad of your views on whether this too is something which the MPBW could undertake on our behalf.

All these questions, except that of site acquisition and planning applications, have a bearing on the contract which will be offered by the Ministry of Technology and it is important therefore that we have your views as soon as possible. If it would help to have a discussion, we shall of course, be pleased to arrange this, or, alternatively to supply any further information we are able.

Yours sincerely

F.R.

WMO/69 14/5/12

Compressed air sirens for the warning system

The warnings

The attack and fallout warnings are currently given by the following means:

Attack warning (RED)

a. Electric sirens (approximately 7,000) in areas with population density of at least 3,000 per square mile

b. Hand sirens (approximately 13,000) in areas with lower population densities

Fallout warning (BLACK)

Maroons.

Because of the distribution of warning points, something less than 90% of the population is within hearing distance at present.

The equipment

Electric sirens

These have a range of $\frac{3}{4}$ to $1\frac{1}{4}$ miles and are dependent upon public power supplies. They could not therefore be relied upon to give other than the initial RED warning and if an attack on this country was launched from outside the surveillance of the BMEW system even this warning could be placed in jeopardy through the disruption of public power supply. Further, a large number of these sirens are old, as they were manufactured before or during the last war: their condition is suspect to the extent that, in the interests of public safety, sound trials of the warning system have been discontinued until they are replaced.

Hand sirens

The initial distribution of hand sirens to the police was completed in 1967 and tests carried out in 1968 established that the range of these instruments was considerably less than had been assumed when rural coverage was originally planned. Furthermore, the physical effort to produce the necessary volume of sound for the required period of one minute is beyond the capacity of anyone but a very strong and fit person. To provide additional sirens on a scale sufficient to give effective warning coverage would be uneconomic.

Maroons

These are an effective warning instrument but they are complex and sensitive pyrotechnics and present many storage and transport difficulties. Because of storage difficulties these instruments cannot be distributed to warning points until immediately before the onset of an emergency: this places an unnecessary burden on the police, who are responsible for these warning points. Also,

/certain

certain proportion need to be proof-fired at regular intervals - thus reducing the available stocks - at an estimated cost of £50,000 annually.

The existing warning equipment is limited to giving two warnings only, and the all-clear; if a warning of biological and chemical threat were required modification of existing equipment, or additional equipment, would be necessary.

A further general complication which is giving grounds for concern is the introduction of unit beat policing and the consequent closure of many rural police stations: this, coupled with the likely withdrawal in an emergency of the remaining rural police manpower into the urban areas, would seriously diminish the number of public warning points, particularly in rural areas, which could be established on official premises. To re-site these public warning points on private premises, which would be the only alternative, manned by members of the public whose reliability in an emergency must always be suspect and whose training places a considerable burden on the police, would be a retrograde step: the problems of testing the carrier equipment at these warning points in peacetime would also be magnified.

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The compressed air siren

A recent study was directed to finding a piece of equipment which would give the full range of warnings required, including additional warnings - should this be necessary - in connection with biological and chemical warfare. Ideally, the equipment should work independently of public power supplies. With the assistance of an acoustics expert at the National Physical Laboratory, and Scientific Advisory Branch, and in consultation with other bodies whose business is to warn (e.g. Trinity House), the only known equipment (after extensive enquiries in Europe, USA and Japan) suited to our needs was a compressed air siren already extensively used in Germany: and although developments in the technological field of sound propagation are being kept under review, this appreciation remains currently valid.

Practical trials

The sirens are of German manufacture and two complete installations were obtained. Trials held in November 1969 and April 1970 served to confirm the findings set out in a comprehensive paper prepared by the German government on the sirens' performance. The sirens demonstrated a mean range of about 3½ miles: to establish a complete warning coverage throughout the country requires that sirens should be based on a five-mile grid. While this would allow for some overlap in the more built-up urban areas it would also provide for the variables of climatic conditions, e.g. wind speeds and directions etc. which have an effect on audibility. On this basis it is estimated that not more than 2,000 sirens (probably considerably less) would be required.

Costings

For estimating purposes it would be reasonable to take £4,500 as the mean likely cost per siren. The total capital cost would therefore be in the region of £9m. Installation costs are additional.

/Against

Against the capital expenditure (all figures quoted are at current prices) of £9m which it is suggested should be phased over ten years, will be a capital saving of around £750,000, mostly for new electric sirens and maroon replacements during that period which will be required if the compressed air siren is not adopted. Savings in annually recurring expenditure, including maintenance, will start modestly at about £6,000 progressively increasing to £200,000 when the system is fully operational. No account has been taken, however, of what must be not inconsiderable hidden savings as regards manpower etc. within the police and Post Office. Unlike previous improvements in warning and monitoring, the case on financial grounds alone is far from strong, but on operational grounds it is overwhelming.

Operational needs

The primary purpose of the Organisation is to warn the populace of attack and fallout: this costs around £800,000 a year. The system from the identification of the threat at BMEWS/ADOC to alerting the carrier control points (at major police stations) is effective and efficient. Below this level, because of the inadequacy of some of the equipment and the questionable reliability of the civilia warning point operators, there are doubts about the efficacy of the system.

Compressed air siren

The advantages of the compressed air siren can be summarised as follows:-

i. It is independent of mains power supply and capable of sounding more than the existing three warnings if required without additional cost.

ii. The country can be covered by a greatly reduced number, which in administrative and technical terms will be simpler, cheaper and more efficient to operate and run.

iii. The police will be relieved of considerable administrative work in peacetime and operational tasks in war, particularly at a time when the demand on their services will be at its highest.

iv. The compressed air siren is capable of housing in its equipment-room one or two persons. The potential of this equipment is considerable in terms of providing additional monitoring points or communications posts or, where suitably sited, control points, and should not be overlooked.

Warning and Monitoring Branch
Horseferry House

Reference AR 400/8

Mr H A Cridland
ADHRS(A)

COMPRESSED AIR SIRENS

Thank you for your minute of 26 February. I am afraid I am not at all happy about this scheme.

It seems to me that inadequate consideration has been given to the problems which the Department faces if it becomes involved in this. As Department of the Environment, we shall find ourselves torn between the need to erect 2,000 pieces of apparatus for the benefit of the Home Office and the population at large while, on the other hand, an unknown but possibly high proportion of the population may regard us as being the perpetrators of 2,000 instances of damage to the visual and aural environment. If the siting requirements are exacting, there may be problems of compulsory purchase. If, as I suspect, these are to replace existing sirens, there may be problems of demolition, reinstatement and compensation etc. for existing sites. If it is to be carried out as an allied service, DOE (through DHEM) will no doubt find it necessary to insist on good title to sites on which it proposes to spend public money.

Added to all this is the drain on our resources. We can assume that the problem might involve roughly £1M a year over 10 years. If staff salaries accounted for only 2% of this (and experience suggests they might be much more), the annual cost would be £20,000, i.e. about 10 men full-time on installation. In addition, there is the quarterly and annual preventive maintenance requirement, together with ad hoc maintenance such as re-setting time clocks which have started up the engine in the middle of the night. If these in total amount to one day per installation per year, we shall need by the end of the ten years 10 men full-time on maintenance.

Nevertheless, I assume that the exercise must be done, and it is highly probable that we are the best people to do it. I agree, therefore, to the proposal to carry out a pilot scheme on 10 sites in the South East Region provided the Regional Director has no objection. During the period of the pilot scheme, we ought to be thrashing out the organisation etc. needed if the whole scheme is to go ahead. We ought not to leave out of consideration the probability that a major firm of engineering consultants would be prepared to take the whole thing out of our hands and work direct to the Home Office. Since this is a one-off operation, I think that kind of hiving-off ought to be considered before we are committed to undertaking anything other than a small pilot scheme. Incidentally, I do not accept as valid the objection by the Home Office that Local Authorities have no power to hold land for this purpose. Local Authorities could still run the scheme (if it were decided that they should do so) carrying out all the necessary work as agents for the Home Office and holding the land in the name of the Home Secretary or, if he does not have powers, the Secretary of State for the Environment.

I doubt if DHRS need to be concerned in detail in the pilot scheme, if it goes ahead, which should be well within Regional capacity. It might, however, be sensible for us to ask, before the scheme starts, to be provided with a copy of the assessment of the scheme (or to be involved in the assessment) and to ask that those questions which are pertinent to the extension of the scheme from 10 sites to 2,000 sites be answered.

Finally, two points which are not formally my responsibility. Since most people live in built-up areas, it seems likely that there will be a need for an arrangement

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different from the proposed towers for siting sirens on top of buildings. Second, I would have thought that it would be cheaper and simpler to power these things by liquified gas, which can be brought to the site in containers rather than by stationing 2,000 diesel engines round the country. But I am quite prepared to accept the decision of DSRS in engineering matters.

A J ISAAC
DHRS
9 March 1971

Copy to: Mr A F Peterson

HIGH PERFORMANCE SIREN.

HOME OFFICE.

PINTSCH BAMAG