

THE ASSOCIATED ETHYL COMPANY LIMITED

Reg. Office: THE ADELPHI, LONDON, W.C.2

Address all communications until further notice to:

~~THE ASSOCIATED ETHYL COMPANY LIMITED, THE ADELPHI, LONDON, W.C.2~~

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YOUR REF.

21st August, 1940.

Dr. R.A. Kehoe,
Dept. of Physiology,
College of Medicine,
University of Cincinnati,
Cincinnati,
Ohio,
U.S.A.

Dear Dr. Kehoe,

As you may well imagine we are experiencing some concern over potential hazards which are likely to be involved in the event of air attack on certain large concentrations of Ethyl Fluid which are at present being stored in this country. The British Air Ministry have had constructed for them directly on their own account many very large underground petrol storage depots. The general planning of these depots has been under the direct control of the Works Department of the Air Ministry, but the actual work of construction has been sub-contracted to the various large individual oil companies. The development, which was initiated several years ago, was naturally covered with a very heavy cloak of secrecy, and we were not directly consulted in the first stages regarding the lead blending facilities. In the original specifications, although the gasoline tanks were placed underground, the Ethyl blending plant was of a normal design and was placed on ground level. Subsequently, but very much later in the development, we came into the picture, and we pointed out the lack of logic in protecting the gasoline but leaving the highly vulnerable Ethyl Fluid completely unprotected from either bomb blast and/or splinters or from anti-aircraft shell splinters, the two phases being quite distinctive.

Following this it was decided to modify the design of the standard open type of building by surrounding the storage area with reinforced 14" concrete blast walls and by providing a concrete roof. This treatment clearly offers a very material degree of protection against bomb blast and small splinters which might fall in a vertical direction. It is assumed that the 14" reinforced concrete walls will give adequate protection against bomb blast should a bomb fall within about 70 ft. of the plant.

I have just described the situation as it exists, and there is little

U.S. AIR FORCE, WASHINGTON, D. C.

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else we can do about it, although we feel that it was very unfortunate we were not consulted in the very initial stages, when naturally we would not have recommended the normal type of plant. My own recommendations would then have been to embody bulk blending facilities, the bulk tanks being buried well below ground level. This would have been perfectly feasible, for all the pump houses are well below ground level and are virtually impregnable even against a direct hit, and, in view of the gasoline hazard in an enclosed underground pump house, an efficient forced ventilation system is in all cases installed. It would thus be perfectly easy to ventilate the underground bulk blending room at the same time. However, as I have said, we did not come into the picture until too late, and we are now faced with the position that all the blending facilities are placed above the ground.

The amount of Fluid held in storage at each point is relatively great, varying from 200 to 500 drums, which are generally split between two platforms. Some platforms, however, contain 300 barrels.

We are naturally concerned as to what would happen in the very unfortunate event of one of these large storage platforms suffering a hit from a heavy bomb. The target is, of course, a small one and the buildings are camouflaged. The possibility is, therefore, a remote one, but naturally it is not impossible for a stray bomb to effect a direct hit. It is a situation which we pray will never happen. All these depots are being operated on behalf of the Air Ministry by the Petroleum Board, and I have had several discussions with the Air Raid Precautions Branch of their Operating Department. The problems are manifold and dependent on local circumstances to such an extent that it is not possible to be more than general in one's recommendations. The individual problems are being discussed with the Superintendent of each depot.

One of the major problems concerns drainage. It is possible for a large number of barrels to be shattered by blast and for the platform itself to remain more or less intact. In these circumstances it would be possible for quantities of Fluid in the order of 5,000 gallons to be discharged into the platform drainage system. The interceptor pit which has been normally provided follows our current practice and is of relatively small capacity. It would certainly overflow in the event of a catastrophe occurring in the order which I have just indicated. In normal peace time conditions it is more or less

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TO Dr. R.A. Kehoe.

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It is inconceivable to expect a spillage to exceed one or two barrels at the utmost, and these would naturally be localised in the interceptor. These plants are governed by greatly varying topographical conditions so far as drainage is concerned. In some instances they may be situated in the midst of isolated country where there is neither a sewage system nor a river or other waterway providing natural drainage. In these circumstances the general drainage at the depot, after passing through a gasoline interceptor, is led into a deep soakaway. In other circumstances the drainage may ultimately be led into a small stream which might pass through a farm and be used by cattle. At other points the final discharge may take place into a sizeable river or direct into the sea, and finally there are positions where the drains discharge into a municipal sewer. You will see that if the Ethyl interceptor should overflow it is by no means inconceivable that large quantities of Ethyl Fluid can be diverted outside the direct control of the depot management. We have given very considerable thought to this possibility, and in the circumstances we decided that a small interceptor can be regarded in the light of a delusion. We are, therefore, proposing to recommend valves being incorporated in the drains leading away from the Ethyl plant, so that the drain system can be isolated in the event of a catastrophe. This would have the effect of collecting the Fluid inside the surrounding curb of the platform. As an immediate treatment after an accident this area could be flooded with water and so minimise the vapour hazard, and the trapped Fluid could then be pumped away by means of a positive pump or by means of the ejector system and discharged into the gasoline tank.

The second very unpleasant possibility would be handling the result of a direct hit which must necessarily destroy the concrete platform and, we assume, a very large proportion of the barrels. To be perfectly frank with you we just do not know what the effect would be, since bombs, though extremely destructive, do behave in a rather peculiar fashion. I have a hunch that if a bomb fell on a platform containing, say, 300 barrels, maybe 50 of these would be completely shattered, but the very solidity of them would probably offer protection to their neighbours and I do not think that the whole 300 drums would be destroyed. It remains certain, however, that the theoretical concrete flake would be shattered and that the Fluid would flow out on to the surrounding ground. I should make it clear at this point that these Ethyl buildings are situated in remote corners of the depots, which, in nearly all cases, are constructed in virgin country, and that large concrete areas or roads are necessarily absent. There is, of course, in all cases a small approach road to the platform along which barrels could be brought, or maybe there is a direct railway siding. We must face the possibility of, say, 5,000 gallons of Fluid being spilled over the surrounding ground. If the affected area should be large it is very difficult to recommend any positive method of treatment other than isolating the area until one's resources can be organised.

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Then I imagine that the only logical method of approach is to obtain a mechanical excavator and make a large pit, bodily remove all the contaminated earth and bury it. This procedure could undoubtedly be put into force, but it would entail delay in obtaining the equipment, the problem again being quite clear, namely that these depots are situated in very isolated districts. At some depots at the moment construction work on extensions is still in progress and large mechanical excavators are on the site. Another factor which might be involved is the question of incendiary bombs. I think that the reinforced concrete roof would undoubtedly give direct protection against penetration of an incendiary bomb, and it is a problem which does not cause too much concern. However, as you probably know, the technique of attacking an oil installation is to drop a wave of high explosive bombs, and then for these to be followed up by a large number of incendiaries. Thus it is just possible that our storage platform may suffer severe damage from high explosives and large quantities of fluid would be lying about upon which an incendiary bomb might fall. I am not at all clear as to exactly what would happen in these circumstances. There should be adequate water supplies for fire fighting, and the platforms themselves (if undamaged) will have sprinkler systems. The point which concerns me is the probability that a pool of Ethyl fluid would be ignited by an incendiary bomb. The temperature is so high that I imagine this would be so. I am afraid I have been rather long-winded in giving you an outline of our problems, but I would very greatly appreciate receiving your views and general observations on the situation. Doubtless you may be able to make many useful suggestions which would be of great value to us.

There is another very important related phase, and this concerns the possibility of the workmen at the depots experiencing a very severe direct exposure to tetraethyl lead. It is obvious that if a major catastrophe occurs something has got to be done about it and somebody has got to do the work. We are recommending that sufficient complete sets of standard Ethyl blending clothing and equipment are kept in the air raid shelters where they will be adequately protected. Even if the standard equipment should be destroyed there is, of course, complete anti-gas equipment provided for each man which should be equally effective. This comprises rubber boots and a completely enclosing suit of oilskin, this embodying a hood covering the head and only exposing the gas mask face piece. It seems clear, therefore, that the men themselves should be completely protected against direct exposure, but they may be forced to work in a heavy concentration of TEL for many days. This probability was discussed at some considerable length between Dr. Robertson and myself during the occasion of a joint tour of inspection of many of these depots. Dr. Robertson felt that although the men should nominally be completely protected he would feel inclined to recommend some prophylactic treatment, purely as an additional precaution. There is another factor which he felt would support this course. It must be quite possible for some of the workmen to suffer a severe exposure with no protection, and

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OT TO Dr. R.A. Kehoe.

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conditions may be so disorganised that it is impossible for us to send skilled medical help. Dr. Robertson has prepared a memorandum expressing his own personal views, and he feels that even in the event of the latter situation the prophylactic treatment recommended would be of some material benefit.

I am sending you herewith a copy of Dr. Robertson's personal memorandum to me on the subject, and also a copy of the form in which I transmitted it to the Petroleum Board, since we decided to follow the suggestions. It was after discussing this aspect with Ray that we made the decision to put forward Dr. Robertson's recommendations as we felt that the situation was assuming a considerable degree of latent urgency.

I have now placed the facts before you and it is quite possible you may disagree with our action. We would naturally value your reactions. On the other hand should they be favourable the knowledge would be of great satisfaction to us as it would give us some indication of the value which could be placed on the proposals.

Yours very truly,


H. ROSSETT.

Original by steamer.

KE 0015785

The Prophylactic Treatment of Blenders
Exposed to Lead After Damage to T.E.L. Plant
by Dr. J. Douglas Robertson.

Memorandum on suggested prophylactic treatment of men having a greater exposure to or contact with tetraethyl lead than in their ordinary blending duties, e.g. dealing with a bombed TEL plant when there is much spilling of fluid.

The following treatment is based on the work of Kehoe (J.A.M.A. 1925, 85, 108 and J. of Med. Cincinnati 1930, March 3.) who has employed some or all of the following measures in the treatment of established lead poisoning. It is suggested that by employing these measures prophylactically the danger of lead poisoning may be minimised.

At the end of each day's work dealing with the damage, workers should observe the following routine:

1. Before leaving the station ingestion of the following powder:

Sodium bicarbonate
Magnesium carbonate
Calcium carbonate aa gr x

This powder achieves its results by preventing the combination of lead and tissue, the lead being left free for excretion in soluble form.

2. During the next half hour to one hour, two pints of water should be drunk. This will provide a diuresis and aid excretion of lead in the urine.
3. Rest quietly at home without undue exercise.
4. Avoid alcohol.
5. First thing the next morning before eating or drinking a dose of Epsom salts should be taken. This aids the free secretion of lead into gut and its subsequent excretion.

These measures should be continued daily and so long as the undue exposure to TEL exists.

I would suggest the following or some such simple notice might be hung up at some convenient place at each plant.

Instructions to workers when any untoward accident to the plant arises and fluid is spilt.

At the end of the day's work carry out the following instructions

carefully.

1. Take the white "alkali" powder mixed with $\frac{1}{2}$ tumbler of water before leaving the station.
2. During the next $\frac{1}{2}$ hour drink 2 pints of water.
3. Rest quietly at home and do not drink alcohol.
4. First thing next morning take a dose of Epsom salts.

Carry out these instructions daily until the lead fluid has been dealt with.

THE ASSOCIATED ETHYL CO. LTD.

MEMORANDUM ON PRECAUTIONS TO BE APPLIED IN THE EVENT OF
SEVERE DAMAGE TO ETHYL BLENDING OR STORAGE PLANTS.

In the event of, say, an air attack, a large store of Ethyl Fluid represents a potential hazard of a considerable degree. It is possible for a very much greater quantity of Ethyl Fluid to be spilt than could possibly be experienced during the course of normal operations.

The workmen detailed to deal with a major leakage will, of course, be provided with the normal protective clothing, including gas masks, and the situation will be handled in accordance with the general regulations promulgated by the Medical Department of the Associated Ethyl Co. governing the handling and blending of Ethyl Fluid. These precautions in themselves should give complete protection to the workmen.

It is conceivable in such an emergency that, for some reason which might not be subject to normal control, workmen might be directly exposed to tetraethyl lead. In any case, with the normal protective measures, several days' work might be involved in disposing of a large quantity of Fluid which might be spilt, giving rise to an abnormal exposure.

The object of this memorandum is to set forth some additional medical precautions to be followed after such an emergency. The measures suggested should be continued daily as long as the undue exposure to Ethyl Fluid exists. It should be emphasised that the measures are purely an added precaution and will exert a prophylactic effect, if through faulty clothing or gas masks the men might experience accidentally a direct exposure. The following instructions should be given to all workmen involved:

Instructions to workers when any untoward accident arises
whereby Ethyl Fluid is spilt.

- (1) At the end of the day's work all the special clothing will be removed and a shower bath taken, strictly in accordance with the normal blending regulations.
- (2) Take the white alkaline powder mixed with half a tumbler of water before leaving the station.
- (3) During the next half hour drink two pints of water.
- (4) Rest quietly at home and do not drink alcohol.
- (5) First thing next morning take a dose of Epsom or Glauber salts or a Seidlitz powder.
- (6) Carry out these instructions daily until the Ethyl Fluid has been disposed of.

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