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**HOME OFFICE (FIRE DEPARTMENT)  
SCOTTISH HOME AND HEALTH DEPARTMENT**

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**TECHNICAL BULLETINS**  
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**DEMOLITION AND REPAIR OF STORAGE TANKS: FIRE PRECAUTIONS AND  
FIRE FIGHTING**

**I INTRODUCTION**

1. This bulletin describes the problems and dangers associated with the demolition or repair of tanks which have contained hazardous or combustible materials; and sets out the action which should be taken by the Fire Service when advising on the precautions to be taken in connection with such operations, or when fighting fires in such tanks. (This bulletin does not apply to the fighting of fires in, or precautionary cooling of, gasholders, which should be carried out in accordance with the advice of the employees of the gas undertaking).

2. It must be borne in mind that substances not normally regarded as presenting an explosion hazard can give off inflammable vapours when heated or as a result of reaction with other substances, and these inflammable vapours can form an explosive or combustible mixture when mixed with air. It is not practicable to give an extensive list, but examples are oils, paints, and even the less volatile solvents etc. In some cases old deposits adhering to the internal surfaces or sludge at the base of a tank may in this way be more hazardous than the original contents. Such deposits may not always be completely removed by cleaning processes. As a consequence, the demolition or repair of tanks which have contained such substances must always be regarded as a hazardous operation—see Technical Data Note 18 issued by H.M. Factory Inspectorate: copy attached for information.

*Types of tanks*

3. Generally, the hazard may vary according to the class of tank involved. Two classes of tank are common:

- a. Vertical tanks which frequently have a roof of light construction, which may be fixed or floating and which in the event of an explosion will shear readily and vent the tank.
- b. Horizontal or spherical tanks of uniform construction and with no lightweight section. These present a greater all-round hazard from lateral blast, a factor which should be borne in mind by fire-fighting officers when disposing their men.

## II ADVICE ON PRECAUTIONS

4. There are two completely separate aspects of the precautions to be taken with regard to the demolition or repair of tanks:

- a. site conditions and precautions;
- b. process safety, e.g. inerting, cleansing and structural operations.

### *Site conditions and precautions*

5. Should it come to the notice of the Fire Service, either during a visit for the purposes of Section 1 (1) (d) or (f) of the Fire Services Act 1947 or otherwise, that storage tanks are about to be demolished or repaired, advice about the fire prevention measures etc. necessary on the site (on the lines indicated in the following paragraph) should be given as quickly as possible. In some cases an immediate visit to the site may be called for, if one has not already been made. Even if demolition or repair is not immediately in prospect the occupier should still be warned to seek advice before such work is undertaken.

6. Advice on fire prevention should:

- a. give details of appropriate first-aid fire-fighting equipment and the extent to which it should be used;
- b. warn the occupier and, where appropriate, the site operator that facilities for calling the fire brigade should be readily available;
- c. stress that the greatest practicable access for fire brigade appliances to all parts of the site should be maintained throughout the operation; and
- d. emphasise the need for cleanliness on the site and the removal of all fire hazards at all times.

### *Process safety*

7. Whether or not the occupier or, in the absence of the occupier, the operator asks for advice about process safety the Fire Service should always:

- a. ensure that he is fully aware of the risks of fire and explosion involved in the demolition or repair of tanks;
- b. ensure that he understands that it is his duty to ensure safety on the site, and advise him to appoint a person specifically to concern himself with this matter, including those aspects mentioned in paragraph 6;
- c. inform him that advice on process safety should be obtained from H.M. District Inspector of Factories, whose responsibility this is under the Factories Act 1961, and recommend, if appropriate, that no demolition or repair work should begin or, if it has begun already, that it should be discontinued until the Inspector of Factories has visited the site. The Fire Service should not undertake to advise on process safety independently of the Inspector of Factories;
- d. inform him that it is his duty to notify the Inspector of Factories and that the Fire Service will also advise the Inspector of the operation being carried out on the site.

### *Follow-up action*

8. Immediately afterwards, the Fire Service should send the occupier or operator, or both if appropriate, written confirmation of the advice given on fire prevention measures (see paragraph 6), and of the advice set out in paragraph 7. A copy of the communication

sent to the occupier/operator should be sent to H.M. District Inspector of Factories. It would be convenient to the Factory Inspector if the notification sent to him could be in the form attached to this bulletin. It may in certain circumstances be desirable to give the Inspector immediate oral advice of the operation. In addition, it may be desirable to make a joint visit with the Inspector.

9. The Fire Service should ascertain whether the site has at any time been licensed under the Petroleum (Consolidation) Acts 1928 and 1936, and, if so, should advise the occupier to contact the Licensing Authority lest the conditions of licence be infringed by the proposed demolition or repair. In addition, the Fire Service should themselves inform the Licensing Authority in writing of the proposed demolition or repair, and send copies of the fire prevention advice given under paragraph 6.

### III FIRE-FIGHTING

#### *Information for operational personnel*

10. In all cases the Fire Officer who gives fire prevention advice should ensure that operational personnel, both in his own brigade and in neighbouring brigades as appropriate, are fully informed of any particular hazard arising, for example, from the nature of the site or from the operations to be carried out there.

11. For this purpose operational officers should be in possession of the following information, which may entail their making visits to the site:

- a. details of the first attendance to be ordered on, including information about additional special appliances or equipment;
- b. means of access to the premises and local topography;
- c. method of demolition or repair being employed;
- d. name of the Safety Officer or other person with whom they should make contact if called to the site;
- e. nearest hydrants and other water supplies;
- f. fire-fighting equipment on the site relevant to the operations;
- g. the types, general condition, history of previous uses, of the tanks, and any special features, including properties and hazards of, and appropriate extinguishing methods for, the substances concerned; if required, advice on the properties etc. of any particular substances may be obtained from H.M. Chief Inspector of Explosives;
- h. potential hazards which may arise at other points as a consequence of demolition or repair work being undertaken.

#### *General Precautions*

12. If the Fire Service is called to a fire which has broken out when a tank is being demolished or repaired it will be clear that the proper safety procedure has not been observed. (Although it is less likely, fire may occur in any empty storage tank not under demolition or repair; but the advice in the following paragraphs is equally relevant). The situation should be treated as potentially extremely hazardous. Normally for a fire to be sustained in a tank there must be openings in the tank to admit air. If these openings are limited the fire is likely to have extinguished itself before the brigade arrives. But even if

the fire has apparently gone out, the vapour mixture in the tank may still be highly dangerous because the fire may have caused decomposition or vaporisation of residue which may produce an inflammable or explosive mixture, probably with toxic hazards as well. It should *always* be assumed that there is a risk of a violent explosion except when the top or end of a tank has been previously removed.

13. In no circumstances should men go on the top of or inside a tank in which there is a fire or in which one has recently occurred unless it is essential for rescue purposes. (If it is essential to enter a tank, the probability of toxic hazards should be borne in mind, and breathing apparatus should be worn). If anyone is on top of a tank, he should be told to come down. Nor should anyone go on top of an adjacent tank unless it is essential for operational reasons. No attempt should be made to open or close manholes or other fittings, because this may adversely affect the atmosphere in a tank. If forced ventilation is being used, e.g. by means of a blower or ejector, it should be switched off if this can be done remotely.

#### *Fire-fighting techniques*

14. Neither water jets nor high or low pressure sprays must be directed into a tank in which there is a fire (or a fire is suspected) because entrainment of inflammable materials—i.e. gases or vapours—by the water can cause rapid mixing to give a potentially explosive mixture. Similarly, the cooling of the outside of a tank in which vapour has been ignited should be avoided, because of the danger of an intake of air following condensation of the vapours inside the tank.

15. The following paragraphs describe alternative situations in which either fire-fighting procedures are recommended (differing according to the system of venting or inerting in use during demolition or repair, the nature and location of the fire, or the size of the tank) or it is suggested that the fire should be allowed to burn out. The advice should be regarded as no more than a general guide, because the action to be taken must in the final analysis depend upon the circumstances of each case.

16. In addition to deciding whether the situation is one in which one of the recommended fire-fighting procedures is appropriate, fire-fighting officers should bear in mind that any attempt to tackle a fire will possibly involve some degree of risk to their men, and they must judge whether the need to save lives and/or to prevent further damage to the tank itself or the spread of fire to surrounding property justifies taking that risk.

17. In any event, whether the fire is fought or allowed to burn out, action should be taken to protect persons in the area from the effects of a possible explosion and to minimise the effect of radiant heat on adjacent property and installations.

18. The alternative situations could be as follows:—

#### *(i) Fire in tank being steamed*

If a fire occurs in a tank which is being steamed, the supply of steam should at least be maintained, and if possible increased, as a means of both inerting the tank and purging it of hazardous vapours. If this is unsuccessful the fire should be allowed to burn out, notwithstanding the possibility of explosion. Water should under no circumstances be used in or on the tank, for the reasons given in paragraph 14 above.

(ii) *Fire in tank not being steamed*

If a fire occurs in a tank not being steamed, then, unless it is clear, when the brigade arrives, that the fire has gone out, one of the following procedures may be appropriate.

a. *If there is a gas or vapour flame burning outside an opening on the top of the tank*, an attempt should be made to achieve quick extinction by means of a high pressure jet from a distance in order to remove the risk of a flash-back. The jet should be swept quickly across the aperture, care being taken to avoid as far as possible large quantities of water either entering the tank or cooling the outside surfaces, for the reasons given in paragraph 14. If the attempt shows no sign of immediate success, or, after initial success, the flame re-appears, the attempt should be discontinued since the implication is that the primary source of the fire is inside the tank, and in these circumstances the fire should be allowed to burn out notwithstanding the possibility of explosion.

b. *If there are signs of fire but no external flames are visible*, the fire may have to be allowed to burn out notwithstanding the possibility of explosion. But, *if a bottom manhole is open*, and it is felt that, e.g. because of surrounding risks, the fire must be tackled, this may be practicable in the following circumstances. Although assessment of the location of the fire within the tank will be difficult because only a very restricted view of the inside of the tank can be obtained from a distance, and even this is likely to be obscured by smoke, it is still possible that the source of the fire inside the tank may either be visible or can be confidently estimated from a safe distance. If so, and if the fire is at the base of the tank, low expansion foam may be introduced. If, however, the fire is higher up and high expansion foam is available, it can be used, provided its application does not entail undue risk to personnel and is operationally feasible. If available, the use of carbon dioxide may be considered as an alternative to foam, *but only if the tank is known to be on fire*, because of possible static hazards during discharge operations which may themselves give rise to fire or explosion. Even if the foam or carbon dioxide does not succeed in extinguishing the fire it should have the effect of restricting it. Whatever extinguishing agent is used, it must be introduced only at any points that are already open at the base of the tank.

(iii) *Fire in a small tank*

If a fire occurs in a small tank (which as a general rule should be regarded as one having a maximum capacity of approximately 2,000 cu.ft. (about 60 cu.m.) or 12,500 gallons) which has only one manhole open, the fire can only be attacked by playing a low expansion foam jet through the manhole from a distance. It should be appreciated that this is a difficult operation to carry out.

(iv) *Fire in tank with top or end off*

If the top or end of the tank has been completely removed, normal fire-fighting procedure with low expansion foam or water spray should be effective, and there should be no risk of a disruptive explosion. Water should not be used if light residues are likely to float out.

*Subsequent action*

19. In all cases the situation should be treated as hazardous. The period of danger must be regarded as lasting until the whole of the tank and its contents are cold—24 hours should be sufficient for this. It will not always be easy to tell whether the fire has in fact been extinguished. It must also be remembered that the atmosphere in a tank in which a fire has occurred may still be both explosive and toxic and strict precautions must be observed before such tanks are entered.

20. The operator should be warned that it is essential that all materials involved in a fire should be removed from the tank or other positions before demolition or repair work is resumed. He should also be advised to get expert guidance on what to do next and to consult the District Inspector of Factories as to sources of advice. He should be particularly warned against further use of any heating device until expert advice has been obtained.

HOME OFFICE (FIRE DEPARTMENT)  
SCOTTISH HOME AND HEALTH DEPARTMENT  
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*To H.M. District Inspector of Factories*

**DEMOLITION AND REPAIR OF STORAGE TANKS**

1. The following operation has come to the notice of the Fire Service . . . . .  
(state the nature of the operation and the location of the site).
  
2. A copy of the advice on fire prevention which has been sent to the operator is attached.
  
3. You will see that the occupier/operator has been told:—
  - a. that it is his duty to ensure safety on the site;
  - b. that he should obtain any advice on process safety from you;
  - c. that the Fire Service would inform you of the operation forthwith.

