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FIRE AND EXPLOSION AT THE PREMISES OF MESSRS. OSBORNE STEVENS & CO. LTD., UXBRIDGE.

by

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Introduction

The premises of Messrs. Osborne Stevens & Co. Ltd., (Timber Merchants) were visited on 3rd February, 1954, by Station Officer Ayres of Middlesex Fire Brigade and the authors, A. C. O. Ivall and D. O. Rackliff of Middlesex Fire Brigade were also present. Messrs. Osborne Stevens were represented by Mr. Tatum and Mr. Ayres (works foreman), and the building in which the explosion had taken place was examined in the company of the latter.

Details of the Incident

Building - This was of a steel frame construction divided into a boiler room, storage room for wood waste, motor room, and an end room providing direct access to the storage room (Fig. 1). The storage room was lined internally with corrugated iron sheeting, the dividing walls between it and the boiler and end rooms were also of corrugated iron. The entire building before the explosion was lined externally with corrugated asbestos supported by wooden battens attached to the vertical steel members. There was thus a cavity about 6 in. wide between the inner and outer walls of the storage room on the rear (South) side of the building. The end room had no internal lining and there was a connection between this room and the rear cavity wall of the storage room. The roof was of corrugated iron, sloping slightly, and above it were two cyclones which fed the wood waste into the storage room.

The floor of the storage room was of steel plating and contained a sunken trough, along the length of the room, through which the wood waste was conveyed by a worm feed to the boilers.

There was a central vertical boarded dividing wall in the end room, from ground level to the floor of the motor room, with a door connecting the two compartments.

A sprinkler system was installed in the building.

Material involved - This was wood waste from the workshop machines and consisted chiefly of coarse sawdust mixed with some fine shavings and fine dust. As the material fell from the cyclones to the floor of the storage room the finest fractions of the sawdust were partly elutriated out and there were deposits several inches in depth upon horizontal girders in the end room, in corners of the storage room, and signs of further deposits were visible in the cavity wall where the asbestos was removed. A sample of dust was collected from the storage room dried, and sieved, yielding the following analysis:

	weight per cent
Not passing 12 B.S. mesh	3.5
12-60 B.S. fraction	14.7
60-240 B.S. "	47.7
Passing 240 B.S. mesh	34.1
	100.0

The dust was of a fibrous texture and did not sieve easily. It is probable that the dust which penetrated and settled in the cavity wall contained an even higher proportion of the fine fraction.

From earlier tests made on various samples of wood flour, or fine wood dust, by the Factory Department (1), it is known that such materials have a high explosion hazard, being placed in Class I, (materials which are ignited and explode violently with a small source of ignition).

Fire and Explosion - A fire on the lower edge of the lid of the smaller cyclone was tackled by the workmen who believed it had been extinguished, but called the Fire Brigade as a final precaution. The works foreman, Mr. Ayres, and two firemen went on to the roof of the building and observed dust burning in the rear cavity wall of the storage room (on the South side of the building; Fig. 1). Fires had occurred in this cavity wall on previous occasions. One fireman started to prise off the asbestos covering of the rear wall, with an axe, at the point B (Fig. 1). Immediately, a flash of flame engulfed the men on the roof and a large portion (A, Fig. 1) of the front corrugated asbestos wall of the end room was blown out (i.e. on North side of building). Another Fire Officer standing in the internal doorway between the storage and boiler rooms (D, Fig. 1) was injured in the explosion, and a workman believed to have been standing under the worm feed trough in the boiler room also received slight burns.

The fire was soon controlled and the total amount of damage due directly to fire was small; there was some internal damage in the end room, due to explosion.

Discussion

Origin of fire - The alarm was given when sparks were seen falling from the cover of the smaller cyclone, and the workmen then scraped off the burning dust allowing it to fall on to the roof of the storage room. Some of this burning material then probably fell into the cavity wall, initiating the glowing fire subsequently seen there by the firemen. At the time of the incident, the direction of the wind was such that any sparks, burning wood fragments, etc. flying from the boiler chimneys would be carried over the building to the cyclones; laboratory experiments have shown that the fine dust may readily be made to smoulder and it is likely that the fire originated in this manner.

The primary explosion appears to have occurred in the cavity in the south wall of the building: as already stated, this occurred just as the fireman started to loosen the asbestos sheeting preparatory to dealing with the burning dust in the cavity. This explosion could have been a gas explosion (back draught) due to an explosive mixture formed by heating of the dust in the confined space in the cavity. Alternatively there may have been some dust disturbance, such as dust falling down from the ledges in the cavity setting up an explosive concentration in the space, which was fired by burning dust. It is not possible to decide between these two alternatives. The probable sequence of events then is as follows:

The primary explosion, whatever its cause, travelled through the cavity into the front (North) compartment of the end room, where further dust was stirred up, the resultant explosion venting partially through the asbestos covering of the end room (area A, Fig. 1), but also through the storage room injuring the Fire Officer standing on the far side (point D, Fig. 1).

Hazards of the structure - This incident has demonstrated the hazard which may arise when buildings for processes involving combustible dust are constructed with unsealed cavity walls. This type of wall acts as a trap for very fine dust fractions, which tend to separate out from the main bulk when moved, and cannot be subjected to regular cleaning operations. In the present incident, deposits of fine dust several inches in depth had been observed on some horizontal members when the asbestos covering was removed. It is thus possible to have a fire in the dust not easily

controlled by normal methods and which may lead to a dust explosion; the means of dispersal for the explosion may be provided by the burning of combustible gases, or by disturbance due to movement of the structure as a result of the fire, or by fire-fighting operations.

A further hazard in the present incident involves the construction of the storage room; in this, the dust falls from the cyclones through a distance of about 10 ft through the air, so that a process of winnowing or elutriation can occur. The finer fractions of the dust are thus separated from the coarser material and can collect on girders in the storage room and in the cavity wall.

Conclusions

In reconstructing the plant, therefore, the construction should be modified as follows:-

1. The cavity formed by the double walls of the storage room should be sealed off or, better still, eliminated entirely.

2. The storage room itself should be altered so that the dust is collected without falling through the air from a height, and fed into a sealed hopper without internal ledges, girders etc. on which dust can collect. With the present construction, even if the cavity is eliminated, a dust explosion may occur in the storage chamber itself.

3. It should be emphasized that the actual dust explosion in this incident was a relatively mild one, due probably to the facts that the first explosion was in a narrow space only, and the secondary one was vented easily - under slightly different conditions the explosion might have been much more destructive.

References

1. Factory Memorandum No. 830 (1953) Ministry of Labour and National Service.

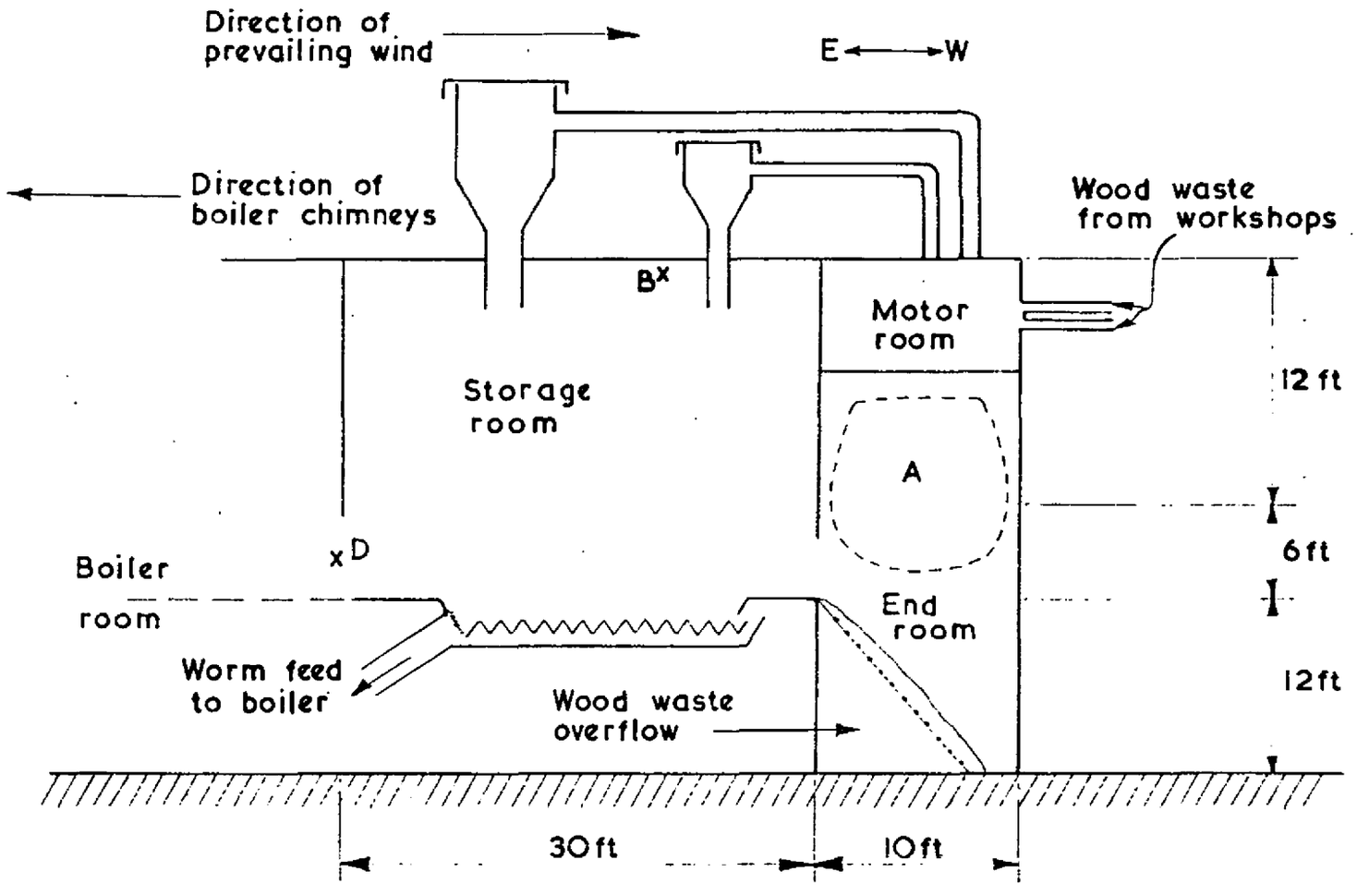

FIG. 1. SECTIONAL SKETCH OF BUILDING IN WHICH EXPLOSION OCCURRED