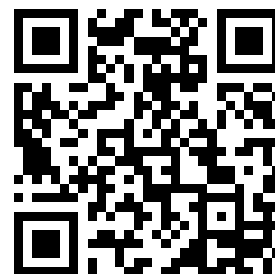

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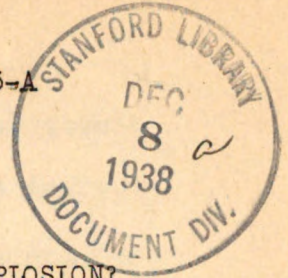
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WHAT HAVE WE LEARNED FROM THE NEW LONDON, TEXAS, SCHOOL EXPLOSION?

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IMPORTANCE OF NEW LONDON, TEXAS, SCHOOL EXPLOSION

The explosion in the Consolidated School Building at New London, Texas, on March 18, 1937, was the most serious school disaster that has ever occurred in America. As the result of this explosion approximately 300 boys and girls, ranging from fifth grade to high school age, were either instantly killed or died from the effects of injuries received in the explosion. This tragic occurrence has created nation-wide interest in the development and application of all possible safety measures for the prevention of explosions of this character in schoolhouses and other public institutions.

At the personal request of Governor James V. Allred the writer was detailed by Secretary Henry A. Wallace of the Department of Agriculture to cooperate with Texas State officials in the investigation of this explosion.

DESCRIPTION OF SCHOOL BUILDING

The Consolidated School of the district was located near New London and many of the pupils were brought to the school in busses from the various points in the district. The estimated average enrollment for the district at the time of the disaster was more than 700 pupils.

The building was of reasonably good construction with brick walls backed with hollow tile and having steel beam columns and girders. The auditorium was located in the center of the building, with the high school rooms at the north end of the building and the grade school rooms at the south end. The main building extended from north to south for a total distance of 254 feet, with wings at each end about 136 feet in length. Although most of the class recitation rooms and offices, as well as the auditorium,

were on the upper or what was commonly known as the first floor, there were also classrooms on the lower or basement floor on the east side of the building at the end of both wings.

The space on the lower floor on the west side of the building and directly under the rooms on the floor above was practically unoccupied "dead space," used principally for storage.

The school building was heated by 72 individual gas steam radiators, and the gas for heating at the time the explosion occurred was obtained from a nearby residue gas-pipe line owned by one of the oil companies.

CAUSE OF THE EXPLOSION

The explosion which occurred about 3:10 p.m., shortly after the classes had begun work in the last period of the day, appeared to be on the lower floor underneath the classrooms on the first floor. The concrete floor was blown upward and many of the pupils were hurled up into the air. The walls collapsed and the roof fell, burying large numbers of boys and girls in the mass of brick, concrete, and steel debris. The investigation showed that the explosion was caused by the ignition of an accumulation of natural gas in the unoccupied space under the class recitation rooms, when a portable plug electric connection was made to start the operation of a sanding machine in the adjoining manual training shop. The complete report of the investigation of the explosion, which includes recommendations for the prevention of similar occurrences, has been published as U. S. Senate Document No. 56. Copies can be obtained without charge from the Chemical Engineering Research Division of the Bureau of Chemistry and Soils, U. S. Department of Agriculture, Washington, D. C., as long as the present limited supply is available.

FIRE RECORD OF SCHOOLS

In presenting the important aspects of the Texas schoolhouse explosion and the relation of the general public to the importance of constructive action looking toward the prevention of tragedies of this character, it is of interest to give consideration to available reports on the fire record of schools and other types of educational buildings.

It is very unfortunate that many school and municipal officials seem to believe that there is little or no danger of school fires, and that no precautions against fire are necessary, even in some instances to the extent of not carrying any fire insurance on school property.

The files of the Department of Fire Record of the National Fire Protection Association contain reports of more than 1200 school fires, including buildings of all classes used for educational purposes, only about 50 of which occurred prior to 1917. The writer is therefore indebted to the National Fire Protection Association, with Executive Offices at 60 Batterymarch Street, Boston, Mass., for the material in this article relating to school fires and disasters. The officials of the Association state that the fire record is by no means complete and does not include many of the smaller fires which have occurred from time to time in school property. Figures compiled by the National Board of Fire Underwriters indicate that fires occur in school property at the average rate of five a day, and that the annual loss on school and college property in the United States is well over \$5,000,000, if the usual allowance is made for unreported fires.

Nearly every kind of school is included in this record. The following is an analysis of 875 school fires taken from the N.F.P.A. record, according to the types of school:

<u>Kind of School</u>	<u>No. of Fires</u>
College or university	248
Normal schools	25
Boarding schools and convents	97
Business and trade schools	41
Public high and junior high schools	183
Public elementary schools	257
Parochial high or elementary schools	24
	<hr/>
Total	875

CLASSIFICATION OF BUILDINGS IN WHICH FIRES OCCURRED

Certain types of schools have similar fire hazards and may be grouped together. It is the building and the character of its occupancy which are important rather than the kind of school. The fires in this record are grouped as follows for purposes of study:

High school buildings	183
Elementary school buildings	281
Dormitories	167
Classroom and office buildings of private schools and universities	105
Workshop and laboratory buildings	52
Miscellaneous (stores, offices, power plant, gymnasiums, etc.)	<hr/> 87
Total	875

GENERAL LOCATION OF ORIGIN OF FIRE

The following table gives the general location of the origin of the fires in the 875 school fires analyzed. It can be readily seen that the basement stands out as the most frequent source of the fires, and this must therefore be recognized as the most hazardous portion of a school building.

ROOM IN WHICH FIRE ORIGINATED

	NUMBER OF FIRES						All
	High	Elementary	Classroom Buildings	Dormitories	Shops & Labs.	Misc.	
Basement, various portions	22	31	15	15	1	5	89
Boiler or furnace room	17	44	3	12	0	11	87
Attic	13	18	6	15	1	4	57
Roof	8	23	7	9	1	2	50
Chemical or similar lab.	10	0	7	0	30	0	47
Classroom	9	29	7	0	0	2	47
Assembly room	19	8	7	0	0	0	34
Students' room	0	0	0	33	0	0	33
In walls or partitions	6	7	4	4	0	1	22
Closet	7	4	2	6	0	1	20
Waste paper room or chute	2	5	3	6	1	0	17
Storeroom	1	5	4	2	1	4	17
Gymnasium	0	2	0	0	0	14	16
Manual training room	10	3	2	0	0	0	15
Kitchen or restaurant	0	0	2	11	1	0	14
Hallway or corridor	4	4	1	2	0	1	12
Office or administration dept.	1	3	6	0	0	0	10
Domestic science room	7	2	1	0	0	0	10
Outside of building	0	6	0	2	0	1	9
Under stairway	3	1	0	1	0	3	8
Mechanical laboratory	0	0	0	0	7	1	8
Locker room	0	3	1	0	0	3	7
Social room	0	0	0	7	0	0	7
Coal bin	3	3	0	0	0	0	6
Belfry or cupola	1	3	1	0	0	0	5
Garage or stable	0	0	0	0	1	4	5
Miscellaneous known locations	6	10	7	3	3	3	32
No data	<u>33</u>	<u>67</u>	<u>19</u>	<u>39</u>	<u>6</u>	<u>27</u>	<u>191</u>
Total	182	281	105	167	52	87	875

The above table shows that the basement and boiler or furnace room of an elementary school is a relatively greater hazard than similar portions of a high school. Does this mean that the heating equipment and appliances of elementary schools are not so well installed as in the larger high school buildings, or that there are more fire hazards present in the basement areas?

LOSS OF LIFE IN SCHOOL FIRES

There have been more than 30 fires in school buildings involving loss of life. In these fires approximately 800 people have been killed and several hundred injured. The loss of life in the Texas school explosion - approximately 300 - was the greatest in any schoolhouse disaster.

A number of school fires have occurred in which firemen or employees rather than children were the victims. The number of recorded deaths among those fighting school fires is far greater than in other similar occupancies, perhaps because of a special feeling of responsibility for the safety of schools.

SOME MAJOR SCHOOL DISASTERS

All of the following schoolhouse disasters have attracted considerable public attention:

1. Lekeview School, Collinwood, Ohio, March 4, 1908. (Cleveland)

This school building was destroyed while the school was in session and resulted in the loss of the lives of two teachers and 173 children - a total of 175. The Collinwood schoolhouse was considered a modern building, the construction being that of the average school. The lighting and heating equipment was modern and apparently well installed. The investigation revealed that in the basement, under the front stairway, a closet was used for miscellaneous storage purposes. The fact that smoke and fire were seen coming from the stairs directly over the closet led to the theory that the fire may have originated at that point.

Reports indicate that the children in the rooms on the first floor, by means of the fire drill signals, were safely ushered out of the building. The children on the upper floors, however, in some manner became panicky

and all of them made a rush for the rear stairway exit. In the mad rush for safety the children became wedged against the inner side of a vestibule partition located a few feet from the outer entrance to the building, and were found there jammed in a heap. The children were so tightly wedged at this point that early rescuers could offer little assistance, with the result that the children perished.

2. Cleveland School, Camden, S. C., May 17, 1923.

While a play was being presented by the children as a part of the commencement exercises, fire broke out in the second floor auditorium of the Cleveland district school. This fire resulted in the loss of 77 lives.

The cause of the fire was attributed to the heat from an oil lamp igniting the wooden ceiling above the lamp. The lack of adequate exits and the resulting panic caused the heavy loss of life.

3. Rural School, Babbs Switch, Oklahoma, December 24, 1924.

Thirty-six people lost their lives in this rural school tragedy at Babbs Switch, near Hobart, Oklahoma. The fire started from a lighted candle on a tree during a Christmas eve celebration. An overcrowded frame building, lighted candles on the tree, kerosene bowl lights for illumination, inadequate exits and resulting panic made this a striking rural tragedy.

4. Hope Development School, Playa del Rey, California, May 31, 1924.

As a result of this fire the matron and 23 of the 41 girls in the school lost their lives. This was a privately-operated school for subnormal girls, and the fire was attributed to malicious activity on the part of one of the inmates. The matron and the 23 feeble-minded girls were burned in their beds.

5. Parochial School, Peabody, Mass., October 28, 1915.

In this fire 22 pupils were burned to death when a fire, coming from the basement stairway, cut off their exit. The fire evidently started in a closet under the rear stairs or in the barrels kept in the corridor for rubbish as indicated by the burning at those points. There was nothing to show how the fire started, but after it gained headway it spread very quickly.

6. St. Boniface College, Manitoba, November 25, 1922.

As the result of this fire 10 lives were lost. The fire was discovered about 2:15 a.m., but the cause was not definitely determined. Although most of the boys in the dormitories appeared to have used the fire escapes, nine of them and one member of the staff lost their lives and a few others were injured.

7. Beauval Mission School, September, 1927.

This fire in an Indian Mission School at Beauval, Lac LaPlonge, Saskatchewan, in the north country of Canada, resulted in the death of 20 persons. Reports indicate that the fire may have started from the furnace and heating system. Nineteen boys, between the ages of seven and fourteen, and the sister in charge of them were burned to death while attempting to escape from the burning building.

Many other tragic school fires are on record involving loss of life. In analyzing the 875 school fire records it will be found that the loss of life per school fire is higher than in other types of public institutions.

* * * * *

WHAT WILL RESULT FROM THE NEW LONDON, TEXAS, EXPLOSION?

The important question at the present time is what will result from the New London, Texas, explosion insofar as the adoption and application of

safety measures in the schools of America are concerned. Tragic as the occurrence was, we must recognize that the Iroquois Theatre fire in Chicago on December 30, 1903, in which more than 600 people lost their lives, resulted in the development of many safety measures for the protection of people in public buildings. Adequate exit facilities, fire-resistive stage materials, fire escapes, fire drills, systematic inspection and similar measures for the protection of life have been applied with incalculable value.

What are we going to get out of the Texas schoolhouse explosion? What have we learned from this tragedy to bring about further protection for our boys and girls in the many other consolidated school buildings in the United States, particularly in the rural areas?

IMPORTANT DEVELOPMENTS IN TEXAS SCHOOL EXPLOSION

The most important developments in the investigation of the explosion in the Texas schoolhouse can be summarized as follows:

1. It must be recognized that open or unoccupied spaces underneath class recitation rooms are dangerous. Such spaces are too readily available for the storage of combustible materials or explosives, or for the accumulation of dangerous gases and vapors.
2. Inspection and supervision of school buildings, during construction and before and during occupancy, by competent officials is vitally necessary. This must include the inspection of heating and lighting equipment and appliances and similar installations from the standpoint of safety before boys and girls are allowed to occupy the building. The safety of occupancy is of the most fundamental importance.
3. Hazardous processes should not be carried on under or adjoining class recitation rooms. The isolation of manual training room operations, smith

and forging operations, carpenter shop work, automobile, motor, and engine repair work, and the location of these operations in buildings separate from the main school building is desirable.

4. The inherent danger of using the basement under class recitation rooms as a garage for busses, automobiles, trucks, etc., must be recognized. The necessary storage of gasoline, oils, and other flammable liquids in connection with the operation and maintenance of garages introduces a serious hazard in the development of consolidated high schools, particularly in rural areas.
5. The use of effective malodorants for detection of escaping combustible gases due to leaking equipment or other causes, when the gas used for heating or lighting has no odor or toxic effect, is vitally necessary.
6. The importance of the further development of alarm and warning devices, in connection with the operation of combustible gas indicators as adapted to school buildings and other institutions where large numbers of people are exposed to explosion hazards, has been clearly shown by this disaster.

SELF-INSPECTION OF SCHOOL BUILDINGS

The National Board of Fire Underwriters has developed a Self-Inspection Blank for Schools which has been approved and adopted by the National Association of Public School Business Officials. This form recommends that the inspections be made each month by a group consisting of a member of the teaching staff, the building custodian, and a member of the local fire department. The completed reports should be filed with the local Board of Education.

The National Board also has developed a booklet entitled, "Fire Prevention and Protection as Applied to the Public and Parochial Schools," which explains the salient features pertaining to proper maintenance and safety conditions of schools. This booklet is particularly useful for school principals and building custodians.

The tragic New London, Texas, disaster has renewed interest in inspection plans for school buildings. One outstanding example is the action taken by the Department of Public Instruction, Commonwealth of Pennsylvania. On March 13, 1937, that department sent out 13,000 copies of this self-inspection form with an urgent request that the local school officials throughout the State make immediate check of school conditions.

The Texas Inspection Bureau has been actively conducting a campaign for the self-inspection of public schools since the disaster at New London. A special letter with the caption, "Can It Happen in Your School?", and emphasizing the importance and value of regular inspections, has been sent to every school district in the State. This campaign already has given encouraging results.

The Oklahoma Inspection Bureau has prepared a special pamphlet on school fire hazards, and has done splendid work in bringing this matter to the attention of school officials in that State.

Doubtless corresponding agencies in other States have taken similar action since the Texas disaster to guard against a repetition of this tragic occurrence.

The National Board of Fire Underwriters advised the Department of Agriculture under date of September 11, 1937, that self-inspection methods have proved both practical and effective in American schools. Since September, 1934, the National Board has been called upon to furnish, without charge, more than 425,000 copies of the Self-Inspection Blank for Schools, and their records indicate that the plan has been used in approximately 1100 communities throughout the country. These self-inspection forms and booklets are available to local school and fire officials. Requests should be addressed to the National Board of Fire Underwriters, 85 John Street, New York, N. Y.; 222 West Adams Street, Chicago, Ill.; 1014 Merchants Exchange Building, San Francisco, Cal., according to the location of the community concerned.

PROGRAM OF RECOMMENDED CONCERTED ACTION

In order that the tragic explosion in the New London schoolhouse may not be just another "unusual disaster," the following concerted action program is recommended to all responsible and interested agencies in order to prevent similar occurrences in other school districts:

1. Arrange for immediate inspection of school buildings, with special attention to basements, unoccupied spaces, open and dead spaces under classrooms. All combustible material should be promptly removed and steps taken to prevent the future storage and collection of flammable and other dangerous materials.
2. Provide proper agencies for passing on construction plans for new school buildings or improvements and additions to existing buildings with respect to safety for occupancy. See that all heating and lighting equipment and appliances are installed by properly trained workmen in compliance with requirements of recognized standard codes, and that all possible safety measures are adopted before school children are allowed to occupy the building.
3. Arrange to isolate all processes involving fire or explosion hazards from underneath class recitation rooms or in close proximity thereto.
4. Make provision for extension of methods for inspection and supervision of school buildings and similar institutions as now applied in urban centers to consolidated and other schools in rural areas.
5. Provide for systematic and regular fire drills under supervision of competent and qualified authorities.

CONCLUSION

The tragic explosion in the New London, Texas, school, in which approximately 300 fine boys and girls were sacrificed, should not be just another "historical event." It should arouse every responsible agency in America in a safety campaign to assure all possible protection to students in our educational institutions. We compel our children by law to attend school, and the responsibility for their safety rests with the organizations having jurisdiction. Local officials must maintain close contact with conditions existing in their schools if hazardous conditions are to be eliminated. The parents directly concerned as well as the public at large should see that the knowledge now available for the safety and protection of our boys and girls is applied in every possible manner.

If America will use this disaster in the Texas schoolhouse as an object lesson in bringing about added protection to the students in our educational institutions, then the boys and girls who lost their lives in this tragedy will not have died in vain. Are we going to measure up to this opportunity?

CHAPTER I

The first part of the book is devoted to a general survey of the subject. It is divided into three main sections: the first deals with the history of the subject, the second with its present state, and the third with its future prospects. The author's aim is to provide a comprehensive and up-to-date account of the subject, and to show how it has developed over the years. He begins by tracing the roots of the subject back to the earliest times, and then follows the thread of its development through the various stages of its history. He then turns to a consideration of the present state of the subject, and discusses the various methods and techniques which are now employed in its study. Finally, he looks forward to the future, and suggests some of the lines in which the subject may be expected to develop in the years to come. The book is written in a clear and concise style, and is intended for the use of students and researchers alike. It is a valuable contribution to the literature of the subject, and is highly recommended to all who are interested in its study.