

**TAXPAYER FIRES****CONTENTS**

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## GLOSSARY

<b>Axial load</b>	is a force perpendicular to the supporting member. An axial load is straight and true and is evenly applied to the bearing structure.
<b>Built up roof</b>	is the roofing material applied in sealed water-proof layers on the structural members of the roof.
<b>Canopy</b>	a supported, rooflike covering which projects from a wall as an ornamental feature.
<b>Cantilever</b>	a horizontal structural member supported on one end only.
<b>Corbelling</b>	is a course of brick built out from the face of a wall, as steps in reverse.
<b>Eccentric load</b>	is a force whose resultant is perpendicular to the supporting member but does not pass through the center of the mass. The load is not evenly applied to the supporting or bearing member.
<b>Fire retarding</b>	any material or substance that is used to hold back the spread of fire for a rated period of time.
<b>Gypsum plank</b>	consists of steel reinforced gypsum units with tongue and grooved galvanized steel edges. Standard planks are two inches thick, two feet wide and eight feet long. They are supported at four foot intervals under normal roof loads. A heavier gauge steel edged plate may be used for spans up to seven feet.
<b>Impact load</b>	are loads delivered, in a short time, on structural members and produce stresses on structural members that may not have been provided for in design and may cause collapse.
<b>Lateral load</b>	are loads that are exerted outwardly on a horizontal plane. These forces may take place during a collapse or an explosion. Walls are not usually designed to withstand severe lateral loads.
<b>Marquee</b>	a permanent hood which projects over an entrance to a building and is not supported by posts or columns.
<b>Parapet</b>	is that portion of a wall continued above the roof line.
<b>Spall</b>	the process by which masonry surfaces lose successive layers of their mass when exposed to excessive heat.

## **1. INTRODUCTION**

### **1.1 BACKGROUND**

- 1.1.1 Fires in taxpayer type structures are difficult and fast spreading. They have resulted in heavy, and at times complete, loss of structure and contents.
- 1.1.2 The collapse of roofs, floors and walls have caused the deaths of several firefighters and exacted a high toll of injuries to members.
- 1.1.3 Fire operations in these structures often demand a heavy commitment of resources and time.
- 1.1.4 Why do we have such losses? What can be done at fire operations to reduce same? This book attempts to address these problems, and hopefully provide the answers.

### **1.2 THE PURPOSE OF THIS BOOK IS:**

- 1.2.1 To describe taxpayer buildings which comprise a large portion of commercial buildings throughout the City of New York.
- 1.2.2 To point out the problems and features of such buildings with regard to fires.
- 1.2.3 To establish methods of operating at fires in such buildings, and recommend precautions which should be taken.
- 1.2.4 To provide essential information for members which in conjunction with their job knowledge and fire experience will be an aid to:
  - A. The fire commander to plan and implement an effective strategy.
  - B. The unit commander to successfully carry out assigned tasks.
  - C. The individual members to effectively perform their duties.
- 1.2.5 Our ultimate goal is to reduce the losses in human and economic resources.

## **2. DESCRIPTION**

- 2.1 The term "Taxpayer" is not defined or recognized in the building code. The term originally referred to the practice of real estate investors who, while holding land for speculation, resorted to minimal investment in construction to produce income to offset the cost of taxes. These structures were usually of cheap and flimsy construction with little or no fire retarding features.
  - 2.1.1 Supermarkets and one-story shopping centers of more recent construction do not fit the above description but contain many of the inherent hazards associated with taxpayers. For the purpose of this book, they shall be considered "taxpayers."
- 2.2 A taxpayer building is commonly taken to mean a business structure one or two stories in height of Class 3 construction (exterior firewalls with wooden interior structural members).

- 2.2.1 Their areas vary from 20' x 50' to areas of whole city blocks; the most common size being approximately 100' x 100'. They can be built on one or more lots with adjoining structures of greater heights on three sides.
- 2.2.2 These buildings are usually single structures commonly sheltering from one to as many as 15 different businesses with weak non-fire resistive partitions and no fire stops in the cocklofts.
- 2.3 THERE ARE THREE BROAD CATEGORIES OF TAXPAYERS:
- 2.3.1 The older type built from the turn of the century until the 1920's. This type is usually one story in height but there are some that have two stories. Some of the older structures have partitions, girders, beams and columns of wood and may be considered wood frame buildings although most have masonry exteriors. This makes them susceptible to rapid fire involvement.
- The original ceilings may be tin, nailed directly to the beams or to furring strips. Original lath and plaster and wood ceilings could be covered with tin. When renovating these buildings, hanging ceilings are installed which create a plenum area for fire travel. In this plenum area are installed pipes, wiring, air handling ducts and recessed lighting fixtures.
- Decorative metal cornices, through which fire can spread may be found on the front of some buildings. When there is a heavy fire in the front of the building, the supports of these cornices can be weakened and the cornice can fall to the ground unexpectedly. They can be removed to provide access to the cockloft area.
- 2.3.2 The most prevalent type built from the 1920's into the 1960's. They are usually larger in area than the older types and many are one-tenant occupancies, such as supermarkets, bowling alleys, restaurants, factories, etc. If the area is large, fire walls may have been installed for subdivision of the building. The integrity of these may be questionable because of alterations and openings made in them. The upper termination points of these walls vary. Some end just above or below the ceilings, others at the underside of the roof boards and still others may extend over the roof forming parapet walls.
- Many are two stories in height with various stores on the first floor. The second floor may house large meeting halls, dancehalls, restaurants, factories, etc., or the floor may be broken up into small offices and rooms. (See Figs. 1 and 2). Egress from the upper floor may be via one or more interior stairways or fire escapes. Cornices, of the facade type, and signs are often attached to the front of the building outside off the brick walls. Removing the cornice or sign in most cases will not provide access to the cockloft area.

2.3.3 The newer type construction built since the 1960's.

These contain the same type of occupancies and the structural features will be similar to the previous types except that the use of combustible construction material has been reduced.

In many of these buildings the difference will be the steel bar joists that are used to support the floors and roof in place of wood beams. These steel joists are being used more often because of their lower cost and lighter weight. (See Fig. 5).

In the newest type of taxpayers the floor and roof may be concrete poured on top of metal decking, which is supported by the metal joists. The roofs may also be concrete slabs between bar joists or fibrous material slabs supported in metal channels. All of these surfaces will have a poured pitch and gravel covering.

2.4 MEZZANINE AREA

2.4.1 Mezzanine areas will be found in some taxpayers. Their location, area and use will differ. Some are found in the rear of the store or building, some along one side from front to rear or along part of one side, and a few have been erected in the center of the premises.

2.4.2 Since these areas have probably been added to the premises after the original construction date, the load bearing components can be of light construction. These supports may be loaded beyond their safe load bearing capabilities.

2.4.3 The mezzanine area is in most cases used for storage of goods, but it can contain offices (predominant in supermarkets and factories) and also sales areas to which the public will have access.

2.4.4 The height of the ceilings in the mezzanine and the area below will be below average.

2.4.5 Access to this area may be via small wooden stairs or just a ladder. Very seldom will there be another means of access.

2.4.6 In the majority of the mezzanines this area will not be enclosed and there will be a railing at the edge.

2.5 AUXILIARY FIRE PROTECTION SYSTEMS

2.5.1 Generally the only auxiliary fire protection that may be found in these buildings will be automatic sprinkler systems where they are required by the Code. In some cases due to variances, sprinklers may only be found in the cellar areas.

Rules for sprinkler protection:

Old Code (1938)	Area of 10,000 square feet or more.
New Code (1968)	Area of 7,500 square feet or more.

## 2.6 SUMMARY

2.6.1 Few effective fire protection and building laws have been enacted for taxpayers. Economic considerations and high labor costs necessitate cheap and rapid construction and mitigate any substantial fire resistive design.

2.6.2 All taxpayers, regardless of when built, present us with a serious challenge in a heavy fire situation. The features that are present and the problems they create will be discussed in this book.

It is only through knowledge, training and experience that we will be able to deal with the inherent problems and accomplish our mission.

## 3. CONSTRUCTION

3.1 Taxpayer construction contains many features which contribute to the instability of the structure. These may not be obvious during fire operations because structural elements are covered by finishing material or obscured by smoke conditions. A knowledge of the effects of fire on the various structural members is necessary to know what to expect, and to develop tactics to accomplish rapid fire control and provide for the safety of members.

### 3.2 COCKLOFTS

3.2.1 The cockloft is the space above the finished ceiling and the underside of the roof sheathing. It usually is a common area extending over all the stores in the structure and can vary in height from four inches to more than six feet. A large amount of exposed wood, such as roof boards, bridging and wood lath is present. These factors of wide open area and heavy fire loading result in rapid fire spread. Fire may enter the cockloft through recesses, voids and ducts.

### 3.3 ROOFS

3.3.1 There are many types of roofs on taxpayers but the most common is constructed of wood joists covered with either tongue and groove boards or plywood. The roof is then covered with combustible waterproofing material commonly called "tarpaper" or "built up roofing" which may be several layers thick. Sometimes a layer of tin is found under the tarpaper in old taxpayers. The roof joists may be supported at approximately 20 foot intervals, by exterior brick bearing walls, interior load bearing studded partitions, wood or steel girders supported by steel lally columns or wood columns. The roof may have skylights and scuttle openings, signs, air conditioners and heating units. (See Fig. 6)

3.3.2 Inverted, raised or reversed roof construction is used to create a pitch to provide drainage. (See Fig.11, P.61 Multiple Dwelling Fires). Sometimes an inverted roof is constructed over an existing roof and forms an additional cockloft. (See Fig. 3)

### 3.3.3 Trusses:

Truss construction is used where large areas, free of roof support columns, are desired. As spans and loads increase, structural components must increase in size to absorb and transmit to bearing surfaces the stresses of tension and compression. The truss was developed to allow greater spans while minimizing the increase in the size of the spanning members. Basically, the truss is composed of two major members -the top one is called the TOP CHORD and the lower one called the BOTTOM CHORD. Shorter members, called WEBS, connect the top and bottom chords. The WEBS are placed vertically and diagonally, forming triangular configurations with the CHORD members. There are many variations but all are essentially the same; a combination of interdependent components used to span large distances through the use of smaller pieces fastened together. Trusses can be either wood or steel. (See Fig. 4). The open web joist or steel bar joist (See Fig. 5) prevalent in modern taxpayer construction is a light weight parallel chord truss. The type of truss and the material used varies with the needs of the particular application.

- A. The wooden bow string truss is found in older commercial structures in New York City. It is common in supermarkets, bowling alleys, lumber yards, auto storage garages, and in buildings that originally housed such occupancies. These structures have a characteristic hump-like roof profile where the roof appears to rise up from below the parapet wall to tower above it. The longer the span, the higher the bow. This easily recognized silhouette, if not obscured by signs, built up parapets or smoke conditions, gives notice of truss construction. Other types of truss construction are not as easily discerned from the exterior of the building.
- B. Failure of one truss element can cause a failure of the entire truss. This in turn may pull down a number of trusses, in a domino effect which will cause the entire roof, or a large portion, to collapse. Failure can occur in the early stages of the fire.
- C. In older type truss roof buildings, the trusses may be spaced 10 or 20 feet apart with roof beams installed between the trusses to support the roof coverings.
- D. Also, in the older wooden truss roof buildings, there is a possibility of rotting at the ends of the trusses where they rest on the walls, due to water leaking through the roof covering. To prevent this leakage, a small section of roofing is placed at an angle between the wall and the roof to form a trough for drainage.
- E.
  1. Wood truss roofs appear to fail without warning. The roof does not sag or get "spongy." Steel trusses tend to "stretch" when losing their strength because of elevated temperatures, but wood tends to "snap." (See Fig. 5 and 10).
  2. Trusses are composed of smaller and lighter weight members and they span greater distances than the conventional roof beam construction. Fire will affect them more rapidly.



- F. Steel open web joists, found in modern taxpayer construction, have no fire resistance rating. Fire rating depends upon the ceiling finish and finish roofing. Open web steel joists come in standardized lengths, depths and carrying capacities. They are used to span long distances up to 60 feet.
1. Open web steel joists may be covered with various roof decks: solid wood; steel deck cementitious roof plank (wood fibers chemically processed and pressure bonded with portland cement); precast concrete or gypsum plank; gypsum concrete (factory controlled mixture of gypsum and wood chips) poured over form boards and steel wire mesh; usually 2" minimum thickness.  
**Note:** End joints of planks are staggered and may not end on roof supports. (See Fig. 5A)
  2. Unprotected open web steel joists are particularly vulnerable to elevated temperatures of a fire and may collapse after only 5 or 10 minutes.

3.3.4 Additional roof features: (See Fig. 6).

- A. "I" beams protruding above the roof surface or roofs built in step fashion with one store roof slightly higher than another sometimes give the false impression of fire division walls. The side walls of such protrusions are made of wood sheathing and are easily detected by striking them with a tool to differentiate them from a masonry wall. They can be opened for inspection or stream operation. A good working knowledge of these features will allow members on roofs to determine the size and shape of the fire building for the information of operating forces on the first floor.
- B. Skylights.
1. On some roofs the skylights, scuttles and other openings have additional security materials placed at the ceiling levels of these openings, such as, heavy metal grates, heavy steel plates and electrically charged grids.
  2. If any of these appurtenances are removed and the area covered over, the supports for these coverings may be of very light weight (sometimes wooden 2 x 4's covered with thin sheets of plywood). In a fire situation these supports will fail much more rapidly than the regular beams. Therefore, caution must be exercised in placing any added weight on these sections
  3. In some cases heavy steel plates are being used to cover these openings.
- C. Scuttles.  
Small scuttle covers, possibly with iron ladders to the interior, may also be opened to vent rooms below.
- D. Ventilators or Exhaust Ducts.  
Ventilators or exhaust ducts which may vent store areas or the cockloft are sometimes found on the roof.

E. Signs.

Large display signs on rods or front walls can present a collapse hazard in a well-involved structure. Smaller signs attached to the front wall over stores sometimes cover openings into the cockloft and can be removed for early stream operation into the cockloft.

3.4 WALLS

3.4.1 Exterior bearing walls are constructed of brick, stone, concrete block and mortar. In some cases brick walls are only two courses wide in taxpayers. Differential thermal expansion may cause a wall to bulge. (As mentioned in Section 3.6.1, expanding "I" beams can easily upset masonry or stone walls which inherently have little lateral strength. A close watch should be kept on such walls).

Stone or block may spall due to heat or subsequent stream application, thus reducing the effective load bearing area of the wall.

3.4.2 The stability of masonry walls is very much dependent on the integrity of the roof. The roof acts as a monolithic brace which ties the walls together. In effect the roof is holding up the walls by providing lateral support. A collapse or disintegration of the roof removes this support and may impart a lateral load, either pushing out, or pulling in, on the wall as stresses are formed. Concrete block walls sometimes hinge at ground level and an entire side or rear wall may remain intact and fall out flat. Brick walls usually crumble or break as they fall, but large sections can be projected a good distance due to the impact as the wall hits the ground.

3.4.3 A parapet wall is a continuation of an exterior wall, fire wall or party wall above the roof line. The parapet section of the exterior walls may extend around the entire perimeter of a building roof area.

A. A particularly hazardous condition is the possible collapse of the front parapet wall (e.g., any parapet wall facing a street; a corner building facing one, two or three streets). This parapet wall is often unsupported laterally for a long distance, receiving its support only at the ends where they tie into crosswalls.

1. The weight of the parapet wall is supported by steel "I" beams or angle shapes which span the openings for the display windows and entrance doors. Rust formation and normal expansion and contraction of these steel lintels and frost action in the parapet, weaken the mortar joints. "I" beams which support the roof joists often butt against the front parapet. An uncontrolled fire in a remote portion of the taxpayer or in the cockloft may be heating these "I" beams causing their expansion and steadily pushing the parapet outward. (See Fig. 7)

2. Stability of masonry walls depends on the load being concentrated in a vertical direction through the wall. Any degree of tilting which causes this load to be eccentric to the vertical may cause collapse. A close watch must be kept for parapet walls out of plumb or bowed. A member stationed at the corner can sight along this wall to detect such conditions but this may be difficult due to smoke conditions and the numerous signs and awnings present.
3. Operations within the stores or operations at the front of the store such as forcible entry, cellar pipe or hand lines, may have to be discontinued because of the condition of the parapet wall.
4. A long section of this wall often remains intact as the wall topples onto the sidewalk. Members have been killed or injured by such wall collapses.

3.4.4 Interior partition walls between stores are usually of wood stud construction, with plaster or sheetrock covering, and are usually firestopped at the floor and the ceiling by wood sills and plates. The plaster or sheetrock provides longitudinal rigidity for these partition walls between the front and rear walls and roof. Removal of large sections of plaster will weaken this bracing.

### 3.5 CANOPIES OR MARQUEES

A canopy or marquee that is cantilevered over the sidewalk can act as a lever on the parapet wall pulling down a long section of it. These extensions are generally supported by cables, steel tie rods or steel beams that go through the wall and are attached inside the building, probably to combustible members in the cockloft. A fire in the cockloft can weaken these attachments or supports, causing sudden collapse of the canopy or marquee and a long section of the parapet wall, without any warning. Six firefighters lost their lives in the collapse of such a marquee and parapet wall at a furniture store fire in 1956.

Marquees are hollow boxes that can fill up with run-off water at a fire operation due to use of heavy streams. A 12' x 24' marquee, 4' deep, when filled would contain approximately 35 tons of water. In effect, a hanging swimming pool.

Marquees are required by the building code to have drainage facilities. Many have been found to have roof type gutters and down spouts blocked with debris, rubbish and rubber balls.

### 3.6 "I" BEAMS

3.6.1 Exposed steel "I" beams are commonly used in taxpayer construction to support roof and floor joists. "I" beams will absorb heat from the fire at a rate dependent on many factors, such as, the temperature of the fire, the extent of the fire, and the mass (weight and size) of the beam. A large, heavy "I" beam will be able to absorb more heat and its temperature will rise more slowly than a lightweight beam.

Because of the conductivity of the steel, this temperature will diffuse into the beam causing its expansion. An average 50 foot long steel beam, heated uniformly over its length to 970 F will extend in length approximately four inches. A longer "I" beam will expand a proportionately greater distance, and as the temperature increases, the rate of expansion increases. At 1000 F a 100 foot long beam will have extended in length nine-and-a-half inches. It is this process of expansion in length that causes exterior walls to be pushed out so quickly at a taxpayer operation.

3.6.2 These "I" beams are often built into side or rear masonry walls, or butt the front parapet wall, where they are supported by masonry piers or iron columns at the store fronts. A close watch must be kept for walls out of plumb or bowed, or cracks appearing in mortar joints due to "I" beams forcing bearing or parapet walls outward. (See section 3.4.3). If the "I" beams are restrained from expanding (an unlikely occurrence at roof level in taxpayers), they will buckle. Sometimes an "I" beam will push out a small section of bricks and allow fire to extend to exposures.

3.6.3 When these steel beams are heated from 1000 F to 1500 F, their yield strength drops dramatically and they start to soften and fail. This temperature can be reached in five to ten minutes at a fire and it is only a matter of time at an uncontrolled fire (thirty minutes for the smaller beam sections), until these beams can be heated beyond their strength limitations.

3.6.4 There is a false impression that hot steel beams or columns cooled by hose streams will crack or fail. Tests have shown that cooling a steel member will cause it to regain its strength and load carrying ability, and under normal circumstances, there should be no hesitation in cooling these members. If the beam has already sagged under the weight of floors or roof, firefighters should not be allowed in the possible collapse zone, whether these beams are cooled or not. The steel will contract to its original length as it is cooled and if the beam has sagged, this shortening may pull the end of the beams off their supports or twist the beam allowing the joists to drop.

### 3.7 COLUMNS

Columns in taxpayers can be made from wood, cast iron, lally columns (steel or cast iron) or masonry piers which support the beams. Cast iron columns are unpredictable and fail, on the average, in about thirty (30) minutes in fire endurance tests. Some columns fail sooner than cast iron columns. The failure of a column is generally more serious than the failure of a girder or beam. The failure of a column in the cellar can cause the subsequent collapse of the floors and roof. Coating or spraying the columns with fire proofing material on new type construction is often a haphazard process, because of shoddy workmanship and on-the-job alterations made after application.

### 3.8 SUSPENDED CEILINGS

- 3.8.1 As many as two or three dropped ceilings may be found in a particular store. (See Fig. 8). These suspended ceilings offer their own collapse potential when loaded with water or weakened by fire and are sometimes blown down by a backdraft in the cockloft. They are suspended by light wood strips, steel wire or steel bars, all of which are quickly affected by fire. Special care must be exercised when these ceilings are constructed of heavy wire lath and plaster or tin, as these ceilings often fail and fall in one piece over the entire area of a store. Besides inflicting injury, these ceilings can trap members beneath, if they fall intact.
- 3.8.2 These ceilings should be "punched" with a hook for water detection, to check construction and fire conditions. Multiple layers of tin, sheetrock or tiles may have been affixed together on supports which were not intended to carry such weight. (See Fig. 9) A slight amount of water or fire can cause failure and the weight of such a ceiling increases chance of entrapment and injury. When initially pulling suspended ceilings members should be in a safe area in case of total failure.
- 3.8.3 When pulling sheetrock ceilings, large pieces often "hinge" at one side as they swing down and can inflict injury if they come down edge first.
- 3.8.4 Long ceiling ducts often have a minimum of supporting ties and chain reaction can pull the entire duct down. They may be sandwiched between hanging ceilings or suspended beneath them.
- 3.8.5 Lighting fixtures offer another hazard as they may swing down if the support breaks at one end.

### 3.9 FLOORS

- 3.9.1 Flooring can vary in taxpayers. The most common type floors are tongue and groove boards or plywood, supported by wood floor joists.
- 3.9.2 Heavy terrazzo or concrete is sometimes placed over wood joist floor construction, an exceptionally hazardous condition. A fire in the cellar may weaken floor supports with little evidence of heat conditions on the first floor. These floors are difficult to ventilate to allow early advance of cellar lines or use of cellar pipes and distributors. Sudden failure due to weight on the floor is possible.
- 3.9.3 Paneling under display windows at street fronts can sometimes be removed to offer easy ventilation and stream operation points for cellar fires. The flooring under the raised display platform is sometimes omitted behind these panels.
- 3.9.4 In newer type taxpayer slab construction, concrete floors are prevalent on ground level with no basements or cellars in the buildings.

### 3.10 CELLAR AREAS

3.10.1 Cellar areas are often divided into a maze of storage spaces. The layout often does not necessarily conform to the store layout. One occupancy may use a large section of the cellar with openings through partitions, while other occupancies may use smaller areas or none at all.

3.10.2 Cellar ceilings are required to be fire retarded but the plaster covering may be deficient. Partition walls between cellars are usually of combustible or flimsy construction and joist channels at cellar ceilings are often not firestopped allowing fire, combustible gas and smoke extension from cellar to cellar.

3.10.3 Access to cellar areas.

- A. Outside sidewalk trap doors in front of the stores give access to wooden, iron or masonry stairs, straight iron ladders and chutes or conveyors for stock delivery. The chutes, when not in use, may be folded against the wall alongside the cellar stairs. After units have been committed to cellar operations down such stairs, these chutes can fall, covering the stairs. This will make it difficult to evacuate the cellar in an emergency.
- B. Outside cellar stairs are usually found in the rear of taxpayers. When there are several stores in the building, these stairs may lead to a passageway along the rear cellar wall from which access can be gained to the various storage areas.
- C. Outside sidewalk or interior elevators.
- D. Interior open stairs, stairs covered with trapdoors or enclosed in light walls.
- E. Interior openings for chutes and conveyors.
- F. Windows to cellars and basement in taxpayers are usually below grade in depressed areas that are covered with gratings.
- G. In the older type taxpayers, the flooring of the first floor may not be extended under the raised front window display area. By removing the paneling under these windows an opening for ventilation and water application can be gained.

3.10.4 Cellar contents.

- A. Stock for the various stores, which may include flammable, fast burning or poisonous materials, and pressurized containers, all of which are hazardous. Large amounts of stock piled to the ceiling with very little aisle space.
- B. Refrigeration machinery and piping.
- C. Walk-in refrigerated areas.
- D. Heating furnace rooms and oil storage tanks.
- E. Electrical supply entrance points with panel boxes and large amounts of wiring.
- F. Gas supply with gas meters and piping.

### 3.11 SECURITY DOORS

- 3.11.1 A. As a result of increased burglary and vandalism incidents in the past years, store owners now provide greater security for their premises. Typical of these installations are the familiar metal overhead rolling doors which cover the entire store or building front. Previously these were only found on some commercial and industrial occupancies.
- B. The owners now use extensive and strong means for securing such doors in the closed position. It is common to find six case hardened padlocks securing one of these doors. The locks defy our conventional methods for forcing them open, and they must be cut with a power saw or a torch.
- C. The weight that is added to the front walls, especially when these doors are in the open position, can cause the lintel over the store front to fail and the wall and door assembly may fall during a fire.

3.11.2 Deleted.

3.11.3 Store fronts covered by overhead doors have presented the following problems:

- A. Delayed discovery of the fire causing:
1. Greater severity of fire upon arrival with possible extension to:
    - a. The entire floor area of the store.
    - b. Other stores in the building through the concealed spaces of ceilings, partitions and cocklofts.
    - c. Upper floors by burning through floors, and vertical arteries.
    - d. Exposures when the fire vents itself.
  2. Possible early collapse in parts of the structure.
  3. Possibility of a smoke explosion (backdraft) when entry is made, causing a collapse with resulting injuries to members and fire involvement of the entire structure.
- B. Delay in operations due to the following:
1. Difficulty in determining the exact location of the fire.
  2. Time consumed in gaining entry.
  3. Water application and ventilating operation delays.
  4. Examination for fire extension and stopping fire spread.
  5. Need for special tools to gain entry, power saws, torches, etc.
  6. The bottom bar of some overhead doors, when they are closed, may rest on the sidewalk entrance doors to the cellar.
  7. Where a store covers a large area or there are a number of stores in a building all with overhead doors, it may be difficult to determine the exact location of the entrance door or doors to the stores. Overhead signs might give a clue.
  8. These doors may cover the exterior entrances to the upper floors and also flush type fire department sprinkler siamese connections.
  9. Extensive and punishing operations requiring additional manpower and apparatus.

3.11.4 Doors in the rear will be equipped with many strong security devices, such as the same type overhead doors as are found in the front. Conventional doors will have two or three strong door locks, plus strong metal bars across the inside of the door with strong anchor supports, which are securely attached to the walls, and the doors.

3.11.5 Problems with overhead type doors that depend on spring tension to counter balance their weight will be encountered in structures as well as trucks. At fires in warehouses, garages etc., heat can cause springs to loose tension. If these doors start down without the counterbalance of fully tensioned springs they will come down with tremendous force. Doors used in residential installations range in weight from 150 - 400 pounds. Larger commercial occupancies will have much larger and heavier doors.

If the spring tension is gone, motor or hoist devices usually will not prevent the door from coming down hard once it starts down. In addition, at more advanced fires the steel track on either side can warp, pulling out the rollers and allowing the door to drop flat.

When dealing with doors that may have been affected by fire the following is suggested:

1. Avoid standing in door path.
2. Secure door from rolling by clamping vise grip pliers in track under roller or place a ladder as a stop.
3. Check the integrity of overhead track as soon as conditions permit.
4. Attempting to force large overhead doors that have lost spring tension will require lifting dead weight and normally may be futile. If door can be opened electrically it should be serviced immediately.
5. Treat every open overhead door for what it is - a heavy overhead hazard like air conditioners, machinery trucks, etc

### 3.12 EXIT FACILITIES

3.12.1 In both the older and newer taxpayer, exit facilities are poor.

- A. In the smaller type store establishments there is usually only one means of entrance and exit, that is the main store opening.
- B. In the larger type occupancy (supermarkets, etc.), there are two means of egress. The customers, however, are aware of the main entrance only, since the secondary exit is usually remote or obscure. The entrance may consist of only two doors to as many as six doors. Some of the newer types are automatic in operation, opening inward and outward for the customers use.



- C. Depending on access, use and location, there may be a second means of egress in the rear of the store from a storage, utility or delivery area. This exit is not readily available or accessible for public use.
- D. In supermarket and discount type store occupancies the obstruction of exit accessibility can be anticipated due to the presence of checkout counters, stock displays and shopping carts.

### 3.13 NEW TYPE CONSTRUCTION

3.13.1 The new type of construction (supermarkets, etc.) is much better than the traditional or older type from a fire protection view point.

3.13.2 Many of the newer type taxpayers are built on a concrete slab foundation, which removes a major problem of cellar and basement fires. The partition walls are usually better constructed due to the use of the steel and aluminum stud system which employs gypsum blocks and sheathing as a bearing or nonbearing wall system.

3.13.3 The roof system will remain a major fire fighting factor because, for the most part, the roofs are constructed of "Bar Joists," light weight steel or flat wood trusses. These features, and how they behave under fire conditions, have been covered under "Truss Roofs," Section 3.3.3. (See Figs. 5 & 10).

## 4. HAZARDS

### 4.1 LIFE HAZARDS

4.1.1 "Taxpayers" cover such a broad spectrum it is impossible to evaluate the life hazard in a general statement.

#### 4.1.2 Occupants

- A. Life hazard will vary with the type of occupancies found in individual buildings.
- B. The life hazard in a one story taxpayer may present a problem during the day since occupants could be trapped in the rear areas and cellars of these stores. During night hours these premises, for the most part, are unoccupied but the possibility of some workers being in the premises must not be overlooked.
- C. Life hazard in two story taxpayers can be a serious problem on the second floor. Occupancies such as restaurants, private clubs, dance halls, etc., open to large numbers of people may be found on the upper floor.
- D. The second story of some taxpayers is divided into many small office or business spaces. These will contain the working occupants and transient occupants. The latter will be unfamiliar with the means of egress. Security measures may also be a factor effecting means of egress.

### 4.2 COLLAPSE

- 4.2.1
- A. In assessing the possibility of a structural collapse, consideration must be given to the type of construction involved in the fire, the intensity of the fire and the time that the structural members have been burning or subjected to the heat of the fire.
  - B. Though the officer in command may have a thorough knowledge of the reasons why buildings collapse and may anticipate or prevent such a collapse, there are occasions when the building will collapse suddenly with little or no warning.
  - C. The commanding officer at a fire must draw on his knowledge and experience to detect the warning signs of collapse as early as possible and vacate the affected structure in sufficient time.

- D. The following may be causes of collapse during fire operations in taxpayers:
1. Backdrafts blowing out walls or floor.
  2. Weakened and burned out structural members.
  3. Heating of unprotected structural members resulting in:
    - a. Expansion: walls pushed out; columns out of plumb.
    - b. Loss of strength and failure to support: Girders, beams and columns being twisted out of shape due to excessive heat and in turn causing floor joists to lose their bearing support and fall free.
  4. Accumulation of a large volume of water on a floor or in a ceiling.
  5. Presence of water absorbent materials such as rags, paper, clothing, which increase floor loads when wet and which may push out walls by expansion from the absorbed water.
  6. Impact load: An object such as a gas heater falling from the ceiling, or a firefighter jumping onto a roof or floor which has been weakened by fire may be enough to cause collapse. An impact load has a much greater effect than the same weight carried as a static (stationary) load.
  7. Vibration or movement in or near a weakened building.
  8. Water, ice or snow loads on the roof.
- E. Some of the warning signs that will signal a potential structural collapse during firefighting operations are:
1. Heavy body of fire which has been burning out of control for 20 minutes or more, particularly in a large open floor area.
  2. Walls leaking smoke or water.
  3. Walls or columns out of plumb.
  4. Unsupported walls.
  5. Sagging or bulging walls. One cubic foot of brickwork weighs about 100 pounds. Multiply this by the expected area of wall collapse and we are dealing with a vast total weight.
  6. Cracks in exterior walls.
  7. Movement in or on any floor or the roof.
  8. Rumbling noises or heavy puffs of smoke.
  9. Cracking or groaning noises which may indicate strain being placed on structural members.
  10. Inability to make successful headway against a heavy fire condition within 20 minutes into the operation at the fire.
  11. Presence of heavy equipment or signs on the roof. These are examples of static loads. They pose especially dangerous collapse potential when their supporting structural members are subject to heavy fire conditions.

12. Heavy floor loading. Floor loads vary with the occupancies. Display cases loaded with merchandise or the presence of heavy stock or equipment such as ice boxes, freezers, and counter must be taken into account.
13. Spongy or soft feeling as you walk on the roof. The inverted or raised roof is inherently spongy. A realistic appraisal must be made.

#### 4.3 HAZARDOUS MATERIALS

- 4.3.1 Whether a taxpayer is a single or multi-occupancy structure, many and varied hazardous materials may be present that can be a danger to the operating forces.
- 4.3.2 By looking at the occupancy signs, or through knowledge gained during building inspection, units should be aware of the presence of hazardous materials. This will alert them to the precautions that must be taken before starting operations.
- 4.3.3 Some occupancies containing hazardous materials are:
  - A. Drug Stores. The presence of combustible, explosive, and flammable materials, which if mixed with each other, or if water is applied, or if exposed to the heat of a fire, may unleash poisonous or corrosive fumes or create an explosion or an explosive atmosphere.
  - B. Paint Stores. They present the problems of various combustibles or flammables such as paints, lacquers, varnishes, etc., in containers of various sizes.
  - C. Supermarkets. They have many different aerosol sprays, refrigerants, compressed cylinders, lye in containers and other corrosives and caustics.
  - D. Bakeries. They have large ovens. The potential for extensive gas leaks from broken or burned away piping presents the potential for a highly combustible atmosphere and a gas explosion.
  - E. Swimming Pool Supply Stores. They have large stocks of oxidizing agents which in the presence of fire and limited water supply pose the possibility of rapid fire involvement and the release of gases such as chlorine.
  - F. Smoke Shops are prevalent in many areas of the city. Various drug paraphernalia are commonly stored and sold out of these shops. Among the substances stored and sold are: ether in pint bottles, small butane cylinders (packed in cases) and in some cases acetone in small bottles. Most of the stores have roll down security doors, but can be identified by advertising signs denoting them as Smoke Shops.

It is recommended that any units encountering a fire in these occupancies stretch 2 1/2" line and proceed with extreme caution. Consideration should be given to knocking down the fire from sidewalk area before entry is attempted

#### 4.4 BACKDRAFTS

- 4.4.1 A backdraft, smoke explosion, or a hot air explosion as it is sometimes called is essentially the ignition and rapid combustion of a mixture of flammable gas or dust and air which flashes back through openings around the fire area.
- A. Three basic factors necessary for ordinary combustion are also necessary for a backdraft:
    - 1. combustible,
    - 2. oxygen, and
    - 3. heat.
  - B. When a fire burns within a structure, particularly a sealed or closed occupancy and the fire is unable to vent itself to the outer air, the available air supply within the structure is used up quickly and since very little seeps in from the outside the flames begin to subside.
  - C. In the meantime there is a transfer of heat from the interior atmosphere to the contents and the structure of the building.
  - D. Various amounts of gaseous combustibles are produced and drawn upward into the upper portions of the structure by the draft. Due to the convection currents these combustible gases are suspended in the upper atmosphere of the fire area and throughout the structure.
  - E. It must be remembered that a high heat condition, combustible gases and highly heated contents are now present in the structure. All that is missing is a source of air or oxygen to create an explosive fire.
  - F. Since there is no way of determining the exact gas and air conditions that prevail, it is advisable to regard these accumulations of smoke and gas as dangerous.
  - G. The presence of smoke and the force of it issuing from cornices, scuttles, skylights, windows, doors or other openings may give some indication of the fire location and its intensity.
  - H. Heat conditions due to hot spots on the roof, walls, doors or windows that are warm or hot to the touch may give indications of fire location and intensity.
  - I. If the conditions described exist when the units arrive the conditions are favorable for a backdraft unless the building is opened up properly.
  - J. If the front door is opened prior to roof venting there will be a momentary outrush of smoke followed almost immediately by an inrush of fresh air. This air sweeps in towards the fire area and when it reaches the edge of the glowing embers there will be an explosion and the entire store or structure will burst into flames and flash back or vent through this opening.
  - K. The proper procedure is to open the roof or area directly over the fire. This allows the hot gases to move upward through the opening away from the fire. These gases will ignite and vent to the outer atmosphere.
  - L. After roof venting has been accomplished, entry may then be forced at the lower level and lines advanced to extinguish the fire.

#### 4.5 LENGTH OF TIME THE FIRE HAS BEEN BURNING

- 4.5.1 A fire in its incipient stages can usually be extinguished with a direct attack and in most cases presents no problem to the fire forces.
- 4.5.2 An indication that a fire may have been "cooking" for some time prior to receipt of an alarm by this department, is an alarm received in the early morning hours, after the occupancy has been closed since the night before or longer. This calls for a more careful assessment of a plan of action before the commitment of forces since the factors of collapse or backdraft as discussed in sections 4.2 and 4.4 must be considered.

#### 4.6 ARSON

- 4.6.1 In recent years the number of arson related fires has increased significantly and must be considered a possible factor.
- 4.6.2 The means and methods of the arsonist are many. They range from the very simple to the highly sophisticated.
- 4.6.3 Members must be aware of the possibility of the presence of combustible and flammable liquids which may be used to start and accelerate fires.
- 4.6.4 Combustible or flammable liquids may be spilled over the floor or contents of a structure or occupancy, accelerating the fire. Flammable vapors, upon reaching a source of ignition, may flash back and fire may involve the entire occupancy or structure.
- 4.6.5 Members should also be prepared to encounter containers filled with flammable and combustible liquids in or near the area in which they are operating. It is advisable to have their hose line working well in front of them, cooling the area and extinguishing the fire as they advance. The reach of the stream must be utilized.

#### 4.7 ADVANCING LINES DEEP INTO LARGE AREA STORES OR CELLARS

- 4.7.1 Units should be aware that when advancing in these areas, heat and fire may be building up and passing over their heads.
- 4.7.2 It is advisable to post a lookout at the top of a cellar stair or outside cellar entrance to observe these conditions. Units advancing under the protection of a line may be unaware of this heat build up and fire may break out behind them.
- 4.7.3 In large areas or cellars it is advisable to have a backup or protection line in place for this contingency.
- 4.7.4 Advancing in a maze of aisles, stock may fall due to fire damage or water weakened containers, blocking exits and covering hose. This may cause injury to and disorientation of members.

- 4.7.5 Cellar entrances may have chutes or coasters used for delivery, turned on their sides. Care must be exercised that these are secure and don't fall onto the stairs after members have entered same. In the event of the need for a hasty exit they may impede egress.
- 4.7.6 Units advancing lines must check for floor and ceiling stability, particularly in areas of heavy fire, where floor or ceiling supports have been weakened by fire which has been extinguished.
- 4.7.7 Do not "bunch up." Spread out along a line to lessen floor loads in a central area and limit the injury potential in the event the structure fails.

#### 4.8 FIRE EXTENSION

##### 4.8.1 Horizontal Spread

- A. Via common cockloft.
- B. Through flimsy partitions.
- C. Between the beams in ceilings.
- D. Via hanging ceilings.
- E. Via ducts-air conditioning, heating, vent ducts.
- F. Butted joists.
- G. Common ceiling.
- H. "I" beams.
- I. Party walls.

##### 4.8.2 Vertical Spread.

- A. Via ducts.
- B. Via pipe recesses.
- C. Through ceilings.
- D. Via concealed spaces between furred plaster and brick walls.
- E. Via open stairs or trap-doors.
- F. Via voids.
- G. Convection -mushrooming at upper levels.
- H. Shafts- light and ventilation shafts from interior bathrooms and offices.
- I. Stock conveyor belts and chutes from cellars.

## 5. FIRE OPERATIONS

### 5.1 GENERAL

5.1.1 *All members shall comply with the provisions of AUC 329. When giving assignments, the Officer on duty shall ensure members are reminded of their designations as safety team members. These members must be aware that this designation is based on their unit's order of arrival at the box and will change as additional units arrive. While operating members shall pay particular attention to the following provisions of Sections 1.2 and 1.3 which state:*

*“When a fire progresses past the incipient stage, the fire area must be considered an IDLH atmosphere. Every member entering the IDLH must be equipped with personal protective equipment and a self-contained breathing apparatus. No member shall enter an IDLH atmosphere unless the member teams-up with at least one other member and remains within voice or visual contact with that member.”*

*“If a known life hazard is found and immediate action could prevent the loss of life, appropriate action (rescue activity) may be taken by the individual member. This applies only for a known life hazard, not for standard search and rescue activity. If such action is taken, the Incident Commander must be immediately notified and appropriate adjustments made.”*

5.1.2 It is well to remember that the value of the structure and its contents is rapidly deteriorating along with the structural stability at an uncontrolled fire.

5.1.3 Once fire has gained headway in a taxpayer, it is difficult to prevent it from involving the entire building. It will spread with amazing rapidity from store to store, through the many vertical and horizontal arteries to all parts of the structure.

5.1.4 If the fire is not brought under early control, a heavy loss to structure and contents may be expected, a partial or entire structural collapse may occur. The fire may extend to exposures, and both civilians and fire fighters may be injured.

5.1.5 Ventilation is of prime importance and urgent necessity in a building that is well sealed in which a fire has been smoldering or burning for sufficient time to allow a buildup of dense smoke and combustible gases. Ventilation at the roof and forcible entry at the street level must be coordinated to assure prevention of a back draft and quick extinguishment of the fire.

5.1.6 If the roof requires cutting, cut early while it is still strong and fire extension is still limited.

5.1.7 Store windows should be removed entirely when necessary for effective interior operations.

5.1.8 Have adequate forces on hand. The typical taxpayer weakens rapidly under heavy fire conditions and an early forceful attack permits effective interior and roof operations. If this attack is delayed the fire may force a perimeter defensive attack, virtually conceding loss of the building and contents.



## 5.2 COMMUNICATIONS

5.2.1 Verbal communications at fires must be prompt, clear, concise and complete.

5.2.2 In reporting information from a remote location to the chief in charge of the fire the following outline will serve as a guide as to what kind of information is of value.

A. Building:

1. Dimensions: width, height.
2. Features: windows, doors, extensions, courts.
3. Occupancy: life hazards, contents.

B. Fire:

1. Condition: light, medium, heavy.
2. Flame: location, height, push, travel.
3. Smoke: heavy, light, push, ready to light up.

C. Exposures: Where, what, how bad, floor above fire.

D. Number of units: on the scene, units working, location, number of lines.

E. Actions taken.

F. Actions in progress.

G. Conclusions: will hold, need help, can supply help.

H. Additional:

1. Dangerous conditions.
2. Things chief in charge cannot see.
3. Wrong actions by other units.

5.2.3 Deleted

5.2.4 Only that which is important and evident in a particular situation should be given to the officer in command. Any condition or change that would effect the outcome of operations or the structural stability of the building, however, *must* be reported to the officer in command.

5.2.5 The officer in command is receiving information from many sectors of the fire area and he evaluates it continually. He may change his orders or tactics based on this information.

5.2.6 When the officer in command requests information, answer as promptly as possible, informing him of conditions in your area. If you cannot supply the information or accomplish a task, say so. The officer may seek the information elsewhere or change his orders and tactics.

5.3 FIRE TRAVEL IN TAXPAYERS (See Fig. 11)

5.3.1 Deleted

5.3.2 Deleted

- 5.3.3 As a fire develops, the fire, heat, smoke and gases generated spread horizontally and vertically. They take the path of least resistance. They will fill every void and crevice in the structure if they are prevented an escape to the outer air.
- 5.3.4 In the cellar, the floor joists have the ceiling attached directly to the bottom of the joists, or furring strips are attached at right angles to the joists, and the ceiling attached to the furring. A fire originating in the cellar has a strong probability of entering the bays between the joists. If this occurs, the fire will travel the length of the joists. As the bay becomes occupied by the fire and the gases of combustion, and their horizontal travel is blocked, they will bank down and move into the adjoining bay. This process will recur until all bays are filled.
- The void created by the furring strips between the beams and the ceiling accelerates this fire spread. The same thing occurs when fire enters a ceiling on the first floor of a two story taxpayer or when it enters the ceiling of a taxpayer where the roof boards are nailed to the roof beams, such as in the standard (flat) roof. (See Fig. 9)
- 5.3.5 In the inverted roof the situation is different. The roof beams create the original ceiling level. Roof supports of 2 inch x 4 inch short studs are connected to the roof beams and extended upward, where they connect to a roof grid to which the roof boards are nailed. (See Fig. 11, Multiple Dwelling Fires). This presents a miniature lumber yard. It also provides much fuel for a fire to feed on and a large open area for quick fire spread.
- A. The inverted roof may be pitched from the front to the rear, front and rear to the center, or from the front, rear, and sides to the center. How the roof is pitched is usually determined by the configuration of the building and the position of the drainage facilities. In most cases the high portion of the cockloft is at the front of the building.
  - B. If fire enters the cockloft at the high point or front of the building, our fire problem is less severe than if it has entered into the cockloft at the rear. The reason is that fire does not burn quickly from a high point to a lower area.
  - C. Since most fires originate in the rear of the first floor where utilities, storage, and services are located, this is the area from which the fire usually extends to the cockloft. Generally, this is the lowest portion of the cockloft. The pitch of the roof (front to rear) allows the fire to spread rapidly to the higher cockloft area.
  - D. The standard (flat) roof may have little or no pitch. If it is pitched, it will be from the front to the rear.

## 5.4 VENTILATION

5.4.1 Ventilation may be defined as the removal of air from a building that has been contaminated with smoke, gases and heat, by providing a controlled means of escape, and the controlled replacement with fresh air for the purpose of making the building livable. It permits the engine companies to advance their lines rapidly and effectively extinguish the fire.

5.4.2 The ventilation requirements are:

- A. To make the building livable by reducing the heat and relieving the building of its hot combustible gases, which may be both poisonous and explosive.
- B. To prevent further spread of the fire: If ventilation is not first instituted at the roof prior to entry at the lower level, a backdraft could result and cause total involvement and loss of the structure. Also, if ventilation is started before charged hose lines are ready to advance, the fire could spread rapidly throughout the building.
- C. The proper application of venting procedures will result in a reduction in water used, less water damage, and a more efficient operation.

**Note:** It must be understood that ventilation probably will increase the intensity of the fire. Ventilation, therefore, must be carefully coordinated with engine hose line operations in order to avoid increasing the severity of the fire situation.

5.4.3 Two types of ventilation are at our disposal:

- A. Natural
- B. Mechanical

Each type can move smoke and gases vertically and horizontally.

5.4.4 Due to the configuration of the building, the limited openings on the sides or the rear, and the numerous subdivisions and enclosures, horizontal ventilation may be very difficult. At times, it may be attained by the use of a horizontal opening in conjunction with a remote vertical opening. In most of our operations, we employ a combination of both types of ventilation.

5.4.5 Generally, vertical openings are made at the roof level. Scuttles, skylights or covers of former skylights that are located over or near the main body of fire should be opened first. Openings that are made remote from the fire area may cause the fire to spread. These openings should not be made when such will jeopardize life or endanger any exposures, unless protective measures are taken.

5.4.6 The roof cut for vertical ventilation must be large enough to permit quick exit for the heat, smoke and gases. A hole eight feet by eight feet, where possible, is recommended. Methods for cutting and cuts are discussed under section 5.5.

- 5.4.7 Make sure, when cutting ventilation holes in the roof, scuttle covers or former skylight coverings, that ceilings or other sealed spaces below such openings are pushed down and opened to permit the exit of heat, smoke, gases and fire to the open air.
- 5.4.8 If difficulty is encountered in opening the returns of scuttles or skylight openings, it may be quicker and more practical to make examination holes for ventilation around the openings. If trenching is to be implemented, leave the returns in place where the skylights are to be used as an effective trenching boundary.
- 5.4.9 At times, as the roof cut is made and pulled, members may be driven back by the heat or fire and be unable to complete the opening. If this occurs additional openings must be started and completed. The choice of locations must be made by the roof commander based on his size-up or orders from the officer in overall command of the operations.
- 5.4.10 A review of roof construction features, along with an understanding of fire travel in taxpayers, is essential in assessing the situation and making decisions. (See Section 3.3)
- 5.4.11 The use of multiple saws, sufficient hooks and manpower are an absolute necessity, if roof ventilation is to be quickly and effectively accomplished.
- 5.4.12 The immediate ventilation and cutting of an effective size hole on the roof calls for two saws and four members on the roof. Additional manpower with proper equipment should be assigned to this position as soon as possible. An officer must supervise roof operations when more than one power saw is working on the roof.
- 5.4.13 Deleted
- 5.4.14 Additional ladder companies should be special called to the scene of the operation as needed. The first arriving officer should initiate this, if necessary. Consideration should be given to whether tower ladder apparatus is responding or should be called. The need for, and use of, four ladder companies at a serious taxpayer fire is not unusual.
- 5.4.15 An officer should be assigned as early as possible to supervise roof operations. The second arriving ladder company officer usually is ordered to supervise the roof. The forcible entry team of this unit can, if necessary, be supervised by an engine company officer awaiting entry for his hose line.
- 5.4.16 Roof conditions must be determined and monitored constantly. Joists and roof boards may be burned away or weakened to the extent that added weight may cause the roof or sections of it to collapse. In most cases, a roof fails section by section. The roof joists supported by "I" beams and girders within a section collapse when any portion within that section fails. How and when they fail depends upon the extent, duration, intensity and direction of fire travel.

- 5.4.17 Engine companies should be aware of the use of the fog patterns on the FT-2 tip to relieve an area of smoke and heat. Engine Companies must remember to adjust the fog pattern to the width of the opening and stand back four to five feet while operating.
- 5.4.18 Smoke ejectors (Super Vacs) are assigned to some ladder companies in all boroughs of the city. This tool should be utilized for ventilation, particularly at cellar fires in taxpayers. Judicious use of both the Fog nozzles and smoke ejectors can help clear large areas of smoke and heat when conditions for natural venting are difficult, or weather conditions are restricting natural ventilation.
- 5.4.19 Numerous buildings and occupancies make use of mechanical systems for ventilation, air conditioning and heat supply. These systems may serve one or more tenants or the entire structure. It may be necessary to shut down any or all of these systems to prevent fire, smoke and heat spread. Such systems may also be used to remove smoke from the fire area or other portions of the building and introduce a fresh air supply for the operating forces.

## 5.5 CUTTING ROOFS AND FLOORS

- 5.5.1 At taxpayer fires, nothing affects the outcome of an operation as much as ventilation. The key is the cutting and pulling procedures used to provide the necessary escape for the fire, heat, smoke and gases. Trenching is also an important factor but in most cases not to the degree of the ventilation cuts.
- 5.5.2 To be successful, the roof operating forces must fully understand what is to be cut, where to cut, when to cut, how much to cut, why they are cutting and the priority and sequence of cutting.
- 5.5.3 Cutting procedures must be well planned to be effective. Provisions must be made so that the initial cuts do not hinder or prevent the making of subsequent cuts, which might be critical.
- 5.5.4 It must be stressed that the ultimate purpose of the ventilation and cutting procedures is to allow the units to move their hose lines in and accomplish extinguishment of the fire. Their success depends on your success.
- 5.5.5 A word of caution: These procedures must be adjusted to meet the existing conditions. The principle of roof ventilation at a taxpayer fire, where an aggressive interior attack is employed, is a requisite. The technique is variable.

- 5.5.6 The direction and force of the wind is often a critical factor in determining the plan of action in cutting the roof. The most effective and quickest cutting will be accomplished if you work with the wind at your back. Plan so that the first and subsequent cuts are made with this in mind. If cuts are made on the leeward side of the initial cut, you may be unable to complete the necessary roof ventilation and be driven off the roof. Units operating below will be unable to advance and extinguish the fire. This may deter interior operations and cause the emphasis to be placed on exterior operations.
- 5.5.7 Deleted
- 5.5.8 Deleted
- 5.5.9 During cutting operations consideration must be given to the following:
- A. Location and extent of the fire.
  - B. Smoke, gases and heat in the cockloft or other portions of the building.
  - C. The location and seriousness of the exposure problem.
  - D. Condition of the roof and escape routes.
  - E. Wind direction and velocity.
- 5.5.10 The size and location of roof openings will depend on fire conditions, manpower, and equipment.
- 5.5.11 Roof cuts should be made in one operation. They should be lifted off in one piece if possible. If this is not possible, then the roof covering should be removed first, followed by removal of the roof boards. All obstructions below the cut should be removed or opened by pushing down from the roof through such openings.
- 5.5.12 Generally, wood joists run the short side of a building or occupancy, particularly in the older taxpayers where the occupancies within a taxpayer have frontages not exceeding twenty feet.
- 5.5.13 Wood joist beams are usually spaced 16 inches on center. Wood flooring and roof boards when nailed directly to roof beams are nailed at right angles to these joists.
- 5.5.14 In the larger, or more prevalent taxpayers, floor and roof joists may run side to side, or front to rear within the building. How they run is usually dictated by how the "I" beam, girder and column supports were laid out during construction. They usually run the short span within this configuration.
- 5.5.15 In most cases, you will not know for certain how the joists run until a ceiling is pulled, or the floor or roof boards are removed and you can visually observe them.

- 5.5.16 It cannot be assumed, once an initial determination is made on the run of joists, that all joists throughout the building run the same. In most cases joists will run in the same direction, but there are exceptions.
- 5.5.17 When rear extensions were added to taxpayers, it was not unusual to utilize a larger girder to tie the older section in with the newer section. This at times made the rear portion of the added roof higher than the older portion. Depending on the span to the rear lot line and the distance to the supporting beams and columns, the joists would be laid on their supports either as those in the older portion or at right angles to them. In addition to creating a higher portion or raised roof in this area, it also creates a larger void in the ceiling below. This factor should be recognized and appreciated when considering fire travel and venting the roof area of taxpayers. (See Fig. 12)
- 5.5.18 Cutting a hole eight feet by eight feet is recommended in providing ventilation at the roof. In a serious fire, instability, heat, or smoke conditions may make the cutting of this primary vent hole impossible, delaying overall effective ventilation.
- 5.5.19 If it is not possible to make an eight feet by eight feet cut in a serious cockloft fire or where a heavy heat and smoke condition exists in the cockloft, the largest opening possible shall be made.
- 5.5.20 On the standard roof where the roof boards are nailed to the roof joists, the rectangular cuts are preferable. If they are not made initially, they should be made subsequently when the run of the joists has been determined. The rectangular cuts will necessitate pulling sections of the roof that are nailed to either four or five roof joists. The rectangular cuts provide for maximum ventilation of bays between joists for the total area cut. Subsequent cuts should be made with consideration of venting additional bays and areas.
- 5.5.21 Care shall be exercised in cutting scuttle covers. Often, for security reasons, skylights have been removed and the scuttle coverings for such openings consist of plywood or other light materials with little or no substantial framing supports. Members should avoid walking or placing their weight on these coverings.
- 5.5.22 Where roof cutting is critical a chief officer should be assigned to this sector to coordinate and direct roof operations.
- 5.5.23 In addition to normal cutting operations, examination holes should be cut to:
- A. Determine if fire has extended to that area.
  - B. Use right angle tips, or if the cockloft is deep enough, cellar pipes.
  - C. Determine if and where additional ventilation cuts may be necessary.
  - D. Release pent up gases, smoke and heat in areas removed from the fire.

- 5.5.24 At cellar fires, it is often necessary to cut the first floor to provide the necessary means of ventilation, so that the engine companies may advance their lines for extinguishment. The cut also may be used for getting water on the fire with bent tips, distributors or cellar pipes. The cut should be made as near to the windows as possible and away from doorways and aisles. When the run of the floor joists has been established, the cut should be extended at right angles to the joists. This provides additional cellar ventilation, maximum ventilation of the bays between joists and access points for streams. The size, location and number of cuts depend on the obstructions encountered, location and extent of the fire and the area of the occupancy. Additional cuts in adjacent stores should be made as required. All such cuts should be covered by hose lines.
- 5.5.25 At times due to intense heat, smoke, or a lack of horizontal ventilation, the roof must be opened over the ventilation holes on the first floor. Cuts at roof level must be made to provide ventilation, so that units operating on that floor may operate and maintain control. This may also be necessary to provide ventilation if forces are operating in the cellar. Initiation of these cuts should not be delayed. Failure to maintain control of the first floor or cellar may result in the fire spreading throughout the building and into the cockloft.
- 5.5.26 Often, due to the street grade, taxpayers are built with stepped-up roofing. Therefore in a taxpayer we may encounter two or more roof levels. A fire starting in an occupancy at the lower grade level will have a natural tendency to travel to the higher portions or stepped-up portions with rapidity. The divisions between these roof levels, if there are any, offer little resistance to rapid involvement of the entire cockloft and roof area. Steps must be taken to insure ventilation, and trenching if necessary, to preclude fire spread.
- 5.5.27 A number of older taxpayers may have roofs of bow truss construction. These may be of wood, steel or a combination of both. Consideration must be given to the location of the fire, extent, duration and its intensity, in determining whether members should be committed to roof ventilation. If a serious fire involves the roof portions then members should not be committed to cut such roofs. Fire conditions must be closely monitored and the men on the roof must be removed when roof stability is in doubt.
- 5.5.28 In newer taxpayers the roof supports are of lightweight open web steel joists.
- A. They are spaced greater distances apart than the standard wood joists.
  - B. The spacing of the joists will vary depending on the strength of the joists and the type of roof decking used.
  - C. The most common decking is corrugated steel. With this type decking, the joists are spaced from four to six feet.
  - D. Steel rib straight trusses do not present the same problems for fire spread as does wood joist construction. The danger is their being weakened by heat and fire from the contents of the occupancy.



- E. The location and the run of the joists must be determined before cutting the roof.
- F. To avoid cutting the joists, a rectangular cut is recommended.
- G. Members shall avoid stepping on the portion of the roof being cut since it is unsupported and will fall into the building. Coordination with forces who may be operating below must be maintained.
- H. Gypsum concrete decking is of lightweight construction, spans wide spaces and is vulnerable to moisture. These characteristics are conducive to early collapse under fire conditions. Therefore, members shall not be committed to roof operations. Interior operations shall be conducted from areas of safety due to the weight of such decking materials (17.5 lbs. per sq. ft.). The presence of a gypsum roof deck will be indicated by a white powdery residue during saw operations. Upon this observation, members should immediately notify the IC and evacuate the roof.

5.5.29 In summary, at most taxpayer fires where the roof must be cut:

- A. Members must realize, the larger the vertical opening, the more effective ventilation will be.
- B. Never allow the smaller manageable four feet by four feet segment of an eight feet by eight feet ventilation hole segment to be pulled until the necessary additional leg cuts are placed in the cutting pattern. The early removal of the initial segment will often prevent the saw team from completing additional cuts.

## 5.6 TRENCHING

- 5.6.1 A trench cut is an opening made the full distance between two exterior walls or other firestops. The width of the trench should be at least three feet wide. A trench cut may be made in any direction regardless of the type roof.
- 5.6.2 Trenching does not take the place of ventilation holes. A trench may serve as an additional ventilation source. Its main purpose is to prevent the fire from passing that point at which the cut is made.
- 5.6.3 It is not practical to trench a large roof area of a taxpayer where fire has seriously involved a major portion of the cockloft. Emphasis must be placed on ventilation holes.
- 5.6.4 An officer in charge of roof operations can start a trench cut where he sees the necessity for it. Immediate notification of the officer in command of the operation is mandatory.
- 5.6.5 Trench cuts may be useful depending on fire conditions. In the event of a cellar fire or a serious first floor fire where successful operations are doubtful and it is feared that fire may eventually extend into the cockloft, a trench as a defensive measure may be advisable.

- 5.6.6 When making a trench take advantage of shafts, chimneys, bulkheads, scuttles, etc. Taking advantage of these will reduce the amount of cutting for the trench.
- 5.6.7 In summation, the success of roof operations depends on a proper size-up of conditions, possible developments, and taking an appropriate course of action. This will result in prompt, proper and effective roof operations, allow quick advancement of hose lines and final extinguishment of the fire with a minimum of damage.

## 5.7 BATTALION CHIEFS

- 5.7.1 Monitor the radio in quarters and while responding. Be aware of any changes in response patterns. This will forewarn you of any delays in responses, identify units responding and the apparatus they are equipped with. This is essential information on ladder company responses.
- 5.7.2 Announce your arrival on the scene to the dispatcher and units.
- 5.7.3 Assume command of the operation and:
  - A. Continue your size-up and determine from the first arriving officer:
    - 1. Existing conditions and actions taken.
    - 2. Units present and where they are operating.
  - B. If not already available, ascertain the following:
    - 1. The life hazard; immediate or potential.
    - 2. The exposure problems: are they immediate or a potential.
    - 3. The location and extent of the fire.
    - 4. The accessibility from the rear.
  - C. Determine if sufficient units are present to deal with conditions. If not, transmit the necessary alarms.
  - D. Implement your strategy and inform your units.
- 5.7.4 The need for additional ladder companies at these operations is great. The services of four ladder companies at a serious fire are required.
- 5.7.5 If a tower ladder is not assigned on the initial response, and its use is anticipated, special call one. When a taxpayer faces more than one street, consider the need for one on each street.
- 5.7.6 Tower ladder streams are the most effective, versatile and mobile large caliber streams that we have. A properly positioned tower ladder can cover a building with a frontage of 100 feet.
- 5.7.7 Assure that ladder companies have positioned sufficient portable ladders to the roof of one story taxpayers. All sides of the building should be covered.

- 5.7.8 A minimum of two portable ladders shall be placed on the front of the buildings. Their purpose is to provide alternate means of egress from the roof. They shall also be placed to indicate the boundaries of the fire building or the location of division walls within the boundaries of the fire.
- 5.7.9 Deleted
- 5.7.10 Coordinate the operations of units. Make sure that a sufficient number of lines have been stretched and that forcible entry, ventilation, and line operations are coordinated.
- 5.7.11 Provide a reserve force on hand to meet contingencies.
- 5.7.12 As a fire progresses in any area without diminution, consideration must be given to the fire extending via voids and recesses. A possible collapse of floors, ceilings or roof must be considered.
- 5.7.13 Where heavy caliber streams are to be used, units already committed should be withdrawn to safe positions, before commencing their operation. The withdrawal should be carefully controlled and monitored via Handie-Talkie. When large caliber streams are shut down, an assessment of conditions shall be made prior to recommitting lines to interior operations.
- 5.7.14 At major fires consideration must be given to the flying brand hazard. Patrols must be initiated to deal with this situation.
- 5.7.15 Additional chiefs should be called to supervise and coordinate sectors of the operation. They may be effectively used where operations are conducted on more than one street front, at extensive and critical roof operations with a heavy commitment of forces and where operations are on more than one level of a taxpayer.
- 5.7.16 Even with effective communications, there is nothing as good as a personal reconnaissance of the fire areas and sectors. This gives the commander first hand knowledge of conditions and problems. At these times the aide should be left at the command post.
- 5.7.17 Deleted
- 5.7.18 The need for the services of special units shall be considered:
- A. Hi Expansion Foam Unit: In difficult cellar fires the services of this unit may be the means of extinguishment or for sufficient cooling to permit the advancement of lines.
  - B. Mask Service Unit: At stubborn, smoky fires, there is a demand for many cylinders. Supply and resupply of units will be met by the Mask Service Unit.

- C. Rescue Companies: Each unit is equipped with two saws. The special equipment and technical knowledge of rescue personnel should be utilized for unusual occurrences at operations.
  - D. Satellite Units: They carry 5" inch hose used to supply the manifold, which in turn will reduce long stretches of many and varied lines.
- 5.7.19 The battalion chief must continually monitor conditions. He must adjust his strategy in anticipation of changing conditions. Units and lines shall be reinforced, redeployed or withdrawn as needed.
- 5.7.20 Notify the superior officer arriving on the scene of existing conditions, disposition of units, possible contingencies and your recommendations.

## **6. TACTICS, GENERAL**

- 6.1 Fire Tactics can be defined as any procedure or method that uses members and equipment skillfully and efficiently, to accomplish extinguishment of the fire-resulting in the saving of life and property.
- 6.2 A review of taxpayer fires in the management review program reveals that the fire that causes the most problems and losses, and requires the heaviest commitment of resources and time, occurs after these occupancies are closed.
- 6.2.1 At these times the fire may have reached an advanced stage and involved a good portion of the structure before the alarm has been transmitted.
  - 6.2.2 The possibility of a backdraft is great if the fire has not vented itself.
  - 6.2.3 If roof ventilation is effected and there is a delay in placing water on the fire it intensifies and invariably involves other stores, mainly via the cockloft.
- 6.3 In some cases the fire occupancy cannot be readily determined from the street because of a heavy smoke condition or store window covered by security devices. The roof examination may provide a quicker means of identifying the involved location.
- 6.4 Windows in taxpayers have been removed, bricked up or covered with sturdy materials.
- A. Gaining entrance to these structures usually requires a great deal of time, effort and manpower.
  - B. The application of water is delayed. This permits the fire to gain headway, especially if it has advanced into the cockloft area.

- 6.5 The art of firefighting is one in which we identify, evaluate and implement operational strategies and tactics for the control of the fire.
- A. The strategy used can be broadly classified as:
    - 1. Offensive-attack
    - 2. Defensive-hold
    - 3. Either of the above, in any order or combination.
- 6.6 The standard pattern of attack on a fire is:
- A. Force entry.
  - B. Ventilate.
  - C. Pull ceilings.
  - D. Operate hose line and extinguish fire.
- 6.7 Conditions such as the following may negate the standard approach to a fire:
- A. Life hazard must be given first priority.
  - B. Volume and extent of fire, requiring large caliber streams.
  - C. Location of the fire, inaccessible for hand-line operations.
  - D. Materials involved in the fire, explosion potential and water application compounding the problem.
  - E. Exposure problems where further fire spread would be a major concern.
  - F. Stability of the structure, which would be dependent on the condition of the structural components of the building, the intensity and duration of the fire.

6.8 SUMMARY

Sufficient forces, required hose lines, and heavy caliber streams where necessary, must be positioned and ready to deal with the situation prior to venting and forcing entry to the building. This calls for coordination, teamwork, skill and communications to carry it through to a successful conclusion.

## **7. TACTICS, ENGINE COMPANY**

### **7.1 GENERAL**

- 7.1.1 A fire in a taxpayer is usually a fast-spreading and difficult fire to control and extinguish. It calls for many handlines stretched quickly to the proper locations to prevent a large loss.
- 7.1.2 Deleted
- 7.1.3 If heavy or medium fire conditions are encountered the initial lines should be 2-1/2 inch. These lines can later be used to supply distributors, cellar pipes and heavy stream appliances. If the striking power and the water capability of 2-1/2 inch hose lines are not required, after the initial attack, they can be reduced to 1-3/4 inch lines for subsequent operations.
- 7.1.4 Supplying a sprinkler system is to be given a high priority after the establishment of the initial line.
- 7.1.5 When compatible with fire conditions, 1-3/4 inch lines may be used in exposures.
- 7.1.6 Use of the manifold carried by satellite units or the mini manifold supplied to some battalions may be of great advantage at fires where many lines will have to be stretched.
- 7.1.7 If difficulty is encountered in gaining entrance to a taxpayer fire, a small hole made in the security doors and removal of the window may provide an opening for hose stream operations. Consideration should also be given to using cellar pipes or distributors from the roof or floor above into the fire area. Protection lines must be provided for the members operating these devices.
- 7.1.8 For a fire that is traveling rapidly along a row of stores in a taxpayer it may be best to skip stores and stretch lines into alternate stores ahead of the fire. The by-passed stores will be covered by subsequent lines.
- 7.1.9 In many cases where entry is delayed or where the pulling of ceilings is impossible due to fire conditions or ceiling construction, a hose line or lines operated properly into a trench cut may confine the fire. Before these lines are operated all members in the stores must be withdrawn. As soon as interior operations can be resumed these lines must be shut down before entry into the area below. Small holes should be made in the ceiling to check for accumulations of water above the ceiling before interior operations are commenced.

## 7.2 CELLAR FIRES

### 7.2.1 Major Problems

- A. Occupants may be trapped in the cellar or in the rear of stores, if the fire extends from the cellar into the stores.
- B. Ventilation of the cellar is necessary to permit the advancing of hose lines for extinguishment. It is also necessary to maintain control of the first floor.
- C. The horizontal spread of fire between joints of the first floor and cellar ceiling.
- D. Security devices will delay access and operations at night. Entrance to the cellar may be one or more of the following: an interior trap door, an interior cellar stairway, an exterior flush sidewalk door, an exterior stairway or a horizontal entrance from an adjoining cellar.
- E. The vertical travel of fire, smoke and heat via partitions, pipe recesses, voids, ducts, interior stairs or burning through the floor.
- F. Fire weakening floor beams, iron girders and columns.
- G. Location of the fire in a cellar with high bulk storage, irregular partitioning, and a maze of aisles.

### 7.2.2 Tactics, Specific

- A. Supply a line to the cellar sprinkler siamese if the building has one.
- B. When stretching hand lines to the cellar enough hose should be flaked out, charged, and the kinks removed before advancing down the cellar stairs.
- C. Remember a charged line may be your only means of escape in case of rapid heat release, rollover, or flashover.
- D. If there is an interior stair to the cellar, especially if it is an open stair, and conditions permit, the first line must be stretched to this point to prevent the spread of fire and to permit operations on the first floor.
- E. The flooring should be checked for heat conditions in the cellar, as the line is advanced to the stairs. The door to the cellar must also be checked for heat before it is opened.
- F. If the line can advance down the cellar stairs it should do so. A second hose line must be stretched to the top of the stairs to protect the members in the cellar and prevent the upward extension of the fire.
- G. A position at the top or center of the stair will be very punishing, whereas in the cellar, close to the floor, conditions may be very favorable for operations. Members should keep stairways and door openings clear so that if members have to withdraw quickly, they will have an unobstructed path.

- H. Officers of advancing lines should monitor heat conditions by extending the bare hand above their heads.
- I. The last man on the hose line in the cellar must maintain surveillance of the area to the rear for endangering fire or other conditions. A member positioned at the interior entrance to the cellar similarly should monitor conditions for the first floor.
- J. When operating lines in the cellar, keep in mind that the main body of fire may be very difficult to hit due to wall partitions, high piled stock, irregular layouts, or not enough hose being stretched. Partitions can sometimes be removed or holes punched in them for stream operations. Stock can be removed by hand. Be careful not to knock over stock which may block retreat, bury hose lines or the fire.
- K. If stock cannot be removed, an attempt to hit the fire by deflecting the stream off the ceiling over the stock may be made.
- L. Use of fog nozzles in cellar fires requires discretion. If ventilation is inadequate the heat, smoke and flame may push back at, over, or around the members operating the hose line.
- M. If it is impossible to stretch a line into the cellar via the interior stairs, lines must be operated from front or rear exterior entrances. Use caution and do not have lines opposing one another. Advancing two lines into the cellar simultaneously may control the fire.
- N. Cellars of large area or heavy fire conditions may require two lines advancing in unison. If these lines do not control the fire, heavy outside streams will be required.
- O. When fire conditions or collapse potential make it necessary to keep personnel out of the cellar, considerations must be given to the use of high expansion foam, cellar pipes and distributors to control the fire.
- P. When conditions indicate, use cellar pipes and distributors through holes in the floor.
- Q. Flood first floor with use of Stang nozzle or tower ladder pipe as a last resort.
- R. Stretch lines into adjoining cellars and operate through holes made in partitions.
- S. Stretch lines for exposure protection.



### 7.2.3 Assignments

- A. First engine company: Stretch the first line into the occupancy above the fire to prevent vertical extension. In a building protected by a sprinkler system, if manpower and conditions permit, a second line shall be stretched to feed this system.
- B. Second engine company: Supply sprinkler system if first engine was unable to do so. ***Assist first engine with the initial line. If manpower and conditions permit, stretch a line that may be used for any of the following:***
  - 1. To control the first floor if the first engine company has advanced into the cellar via the interior cellar entrance.
  - 2. Serve as a backup or protection line for the first engine company.
  - 3. Stretch into the cellar via the interior stairs or the outside entrance if the first unit's line has to control the first floor.
  - 4. To employ the use of cellar pipes or distributors over the fire.
- C. Third engine company: ***If second engine is assisting with first line, stretch a second line which may be used as in sec. B above.***
- D. Additional engine companies will be used to stretch and operate lines to:
  - 1. Cover any additional stores where needed.
  - 2. Supply distributors or cellar pipes.
  - 3. Reinforce lines already in operation.
  - 4. Supply heavy caliber stream appliance.
  - 5. Stretch precautionary lines to the roof of the taxpayer and be prepared to operate as outlined in Section 7.4.1 A.6.

## 7.3 STORE AND COCKLOFT FIRES

### 7.3.1 Tactics (store fires)

- A. At taxpayer fires during business hours, there may be major life hazards. The first due engines must position their lines if possible, between the people and the fire. Break the store front windows for line advancement and leave the exit doors free for the people to use.
- B. The first two hand lines should be stretched to the store involved. Refer to Section 7.1.3 for hose sizes and operating procedures.
- C. Additional lines should be stretched to the adjoining stores. A line may also be required on the roof to protect personnel and exposures once the roof is opened.
- D. Depending on fire conditions extra lines can be stretched for cellar pipes and distributors, to be used in the store or stores involved.
- E. Hose lines must be available to operate Stang nozzles and tower ladder streams.
- F. Hose lines should be stretched to exposures in the rear or at the sides of the building as required.
- G. Be aware that some ladder company tools may be needed to aid the engines in their stretches, i.e., six foot hooks, forcible entry tools, etc.

### 7.3.2 Major Problems

- A. Life hazard, particularly at the rear of an occupied store.
- B. Fire entering the hanging ceiling and the cockloft.
- C. Spread of the fire through concealed spaces and ducts.
- D. Fire spreading to adjoining stores through weak partitions.
- E. Roof, ceiling or floor supports weakened by fire may collapse.
- F. Manpower for forcible entry if the fire occurs when the stores are closed.
- G. Stock and partitions impeding the progress of advancing lines.

### 7.3.3 *Tactics (cockloft fires)*

- A. Ventilate the roof to control fire spread and permit units to advance into occupancies.
- B. Ceilings shall be pulled in occupancies to expose fire and define extent of same.
- C. Hose lines shall be advanced into occupancies to extinguish and limit extension.
- D. Trenches should be cut to limit fire extension in the cockloft area, if necessary.
- E. Use bent tips in the sidewalls and partitions to limit fire spread.
- F. ***Operate from the roof with cellar pipes, distributors or New York bent tips. Protective lines should be stretched to protect members operating these appliances.***
- G. ***Operate hose lines directly into roof openings. This generally is not a good practice but in some cases may be the only way of hitting the fire and controlling it.***  
***Note: Before lines are operated into the roof all interior operations must cease or personnel withdrawn to a safe area. It must be remembered that the primary purpose of roof lines is to protect members operating on the roof and prevent fire extension to exposures.***
- H. ***As a last resort:***  
***If roof or interior operations are dangerous, personnel shall be withdrawn and the use of tower ladder, multiversal and deckpipe streams resorted to***
- I. ***On older type taxpayers there may be vents or store signs attached to the front of the building covering openings into the cockloft. Streams can be operated into these openings to affect extinguishment.***

#### **7.3.4 Major Problems (cockloft fires)**

- A. Rapid extension of the fire throughout the entire cockloft with fire dropping into the stores.
- B. Serious exposures to adjoining buildings, particularly to taller adjoining buildings on the lee side of the fire.
- C. Life hazard in the taxpayer and the adjoining buildings.
- D. Collapse of ceilings, the roof, parapet walls, roof signs, air conditioners or other heavy equipment on the roof.
- E. Duct systems spreading fire, smoke and gases throughout the building.
- F. The danger of pent up gases in the cockloft exploding when air and an ignition source are introduced.

#### **7.3.5 Assignments**

**A. First engine company:**

*Stretch the first line into the involved store protect life and extinguish the fire. In a building protected by a sprinkler system, if manpower and conditions permit, a second line shall be stretched to feed this system.*

*If fire has control of the cockloft and the need for exposure protection is critical, position the engine to utilize the deckpipe. In-line pumping will give good positioning and allow room for placement of a tower ladder.*

- 1. *Stretch a hand line into any seriously exposed building occupancy/building, depending on life hazard and the location and severity of the fire.*
- 2. *Refer to Section 7.1.3 and 7.1.5 for hose sizes and operating procedures.*
- 3. *If exposures are not an immediate problem, then the first line should be stretched into the store under the main body of fire and operated to extinguish the fire.*

**B. Second engine company:**

*Assist first engine with initial line. If fire has control of the cockloft, and the need for exposure is critical, assist first engine with initial line. If manpower and conditions permit, stretch a line into another seriously exposed building/occupancy and operate into the cockloft to confine and extinguish the fire. It may be advisable to skip stores in order to confine and extinguish the fire. It may be advisable to skip stores in order to confine a cockloft fire.*

**C. Third engine company:**

- 1. *Insure sprinkler system is supplied.*
- 2. *Stretch a line and operate as ordered by the Incident Commander.*

## **8. TACTICS, LADDER COMPANY**

### **8.1 GENERAL**

- 8.1.1 Life safety is the primary duty of ladder companies. Ladder members must be alert to life hazards in cellars, second floor occupancies, and in badly exposed buildings.
- 8.1.2 Ladder company officers must quickly observe the types of occupancies present to evaluate the life hazard potential of the building.
- 8.1.3 Egress from second stories is often limited and panic conditions are possible. These buildings must be well laddered to provide:
  - A. Roof access and egress.
  - B. Second floor rescues.
  - C. Escape routes for members searching the 2nd floor.
- 8.1.4 Many individual 2nd floor occupancies do not have a secondary means of egress. Heavy smoke in the second floor public hall may have trapped people in these occupancies. A thorough search must be made and all doors must be opened. Refuge may have been sought in such windowless areas as lavatories, store rooms, or closets.
- 8.1.5 Prompt ventilation at the roof is very important for the safety of the occupants and to enable search and rescue to be carried out.
- 8.1.6 Occupants may be trapped in the rear areas of stores, such as, stockrooms, walk in refrigerators (cold boxes), lavatories, offices, mezzanines and cellars. Windows from these rear areas may be barred, bricked over or covered with steel or wood for security reasons.

- 8.1.7 It is the responsibility of the first ladder company to arrive to locate and identify the fire. There may be times when attending to the life hazard may prevent the carrying out of these assignments. At such times the second ladder company will carry out the assignment.
- 8.1.8 The importance of communications between ladder companies and the officer in command cannot be overemphasized. Information, conditions found and actions taken or contemplated must be continually fed back.
- 8.1.9 Control must be maintained by company officers so that communications continue regardless of the operating demands placed upon the unit.
- 8.1.10 Prompt laddering of the roof for access must be carried out to perform reconnaissance of the top, sides and rear of the building, as well as for roof ventilation. Roof access should never be attempted via the interior. Place several ladders to the roof to provide remote escape routes.
- 8.1.11 The roof position should relay information on the following to the officer in command:
  - A. Size and shape of the building.
  - B. Location and volume of fire or smoke.
  - C. Exposures-sides and rear.
  - D. Roof loading-signs, machinery, etc.
  - E. Evidence of cockloft fire.
  - F. Roof construction.
    1. Presence (or absence) of extending parapets or evidence of fire walls.
    2. Differences in levels of the roof.
    3. Cornices - information on height, depth, opening into cockloft, etc.
    4. False fronts extending over the roof.
- 8.1.12 Where a backdraft potential exists roof ventilation **MUST** precede opening doors and other venting. Forcible entry must be coordinated with roof ventilation and line positioning.
- 8.1.13 Roof ventilation will be accomplished by removal of skylights and scuttle covers where they exist. The fascia or returns of these well-holes should be opened for examination of the cockloft.
- 8.1.14 Check for fire extension into the cockloft early and often.

- 8.1.15 When ladder company personnel are used to force security gates and street doors, it may be preferable to have them continue down the row of stores, opening all that may reasonably be expected to be necessary, rather than to suffer delay later in getting ladder members back from other duties.
- 8.1.16 When the forces at hand are limited, it may be necessary to skip a few doors initially to more quickly determine fire extension.
- 8.1.17 The demands for ladder company services at taxpayer fires are many. Engine companies can be pressed into service to perform truck work such as forcing a door, feeling partitions for heat and opening ceilings to get water into the cockloft ahead of a traveling fire.
- 8.1.18 At times access to the rear is limited. Portable ladders can easily be pulled over the roof for access to the rear for ventilation or forcible entry. A tower ladder can be used for carrying portable ladders to the roof.
- 8.1.19 Tower ladders should be positioned in front of the building in preference to conventional aerials. Heavy stream appliance is now in position if needed for the fire building or to protect exposures.
- 8.1.20 The basket of the tower ladder can be positioned a foot or two above the street level and the tower ladder stream can be directed into the store or stores. This allows a heavy stream to be moved into position quickly which can be readily moved from store to store.

## 8.2 CELLAR FIRES

### 8.2.1 Tactics

- A. Locating a cellar fire may be difficult, particularly when the building is closed.
- B. Suspect a cellar fire if smoke shows in many stores and there is a high heat condition on the first floor with no visible flame in either case.
- C. In taxpayers do not expect to find the cellar layout conforming to the first floor layout.
- D. First floor fires may be extensions of cellar fires. Conversely, first floor fires may drop down and start a cellar fire. Cellars must always be checked.
- E. Adjoining cellars must be examined promptly to check for extension via partitions or ceilings.
- F. Ventilation of the store must be rapid and complete to enable the lines to advance.

- G. Where openings into the cellar are limited, holes must be cut in the store floor.
- H. The practice of opening up directly over the main area of involvement may not always be practical for cellar fires. Conditions may require cutting holes in the floor near windows or under skylights.
- I. Floors should not be cut until a hose line is in position to protect personnel and prevent fire extension.
- J. Electric smoke ejectors can be of value in cellar ventilation, particularly where openings are limited.
- K. Smoke ejectors can be placed over holes cut in floors or hung in openings remote from the entrance through which the line is advancing.
- L. Extension of a cellar fire to the cockloft via partitions, pipe recesses, and ducts must be checked for early and often.
- M. Ladder company personnel must work into the cellar along with the engine companies to move stock, force doors and search as the fire is being extinguished.
- N. When sending members into cellars to shut down utilities, two mask equipped members shall be dispatched as a team.

#### 8.2.2 Assignments

- A. First ladder company to arrive
  - 1. **Forcible Entry Team**
    - a. To the store occupancy above the fire. Forcible entry as required at store entrance and cellar entrance.
    - b. Search the store for occupants and remove.
    - c. Ventilate the store as necessary. Take out the store windows if required. Ventilate rear from interior where possible.
    - d. Necessary opening of partitions, ceilings and ducts.
    - e. Cut the floor for required ventilation and operation of cellar pipes, distributors, bent tips or high expansion foam.
    - f. Shut down utilities.
    - g. Work in with engine companies to perform search and forcible entry and to remove obstructions that may be preventing the engine companies from advancing.

2. **Roof Firefighter**

- a. Place and raise portable ladder to the roof.
- b. Provide necessary roof ventilation of scuttles, skylights, etc.
- c. Monitor the roof, unless otherwise directed.

3. **Outside Vent Firefighter (OV)**

- a. Check the rear and sides of the building for access.
- b. Provide ventilation at the rear for the cellar and store above the fire.
- c. *If access in the rear is available, attempt entry when teamed with the 2<sup>nd</sup> due ladder OV (or another available member). Notify the company officer, and conduct searches with particular attention given to the first floor rear.*

4. **Chauffeur**

- a. *The primary position of the 1<sup>st</sup> arriving tower ladder is in front of the fire building /occupancy.*

*Note: Placement of additional tower ladders can be on the long side of the building as needed. If the taxpayer faces on two streets and the front of the building is covered by tower ladder(s), then place the additional tower ladder(s) to cover the other street front. Tower ladders should be positioned so that the fire can be cut off and driven back to the point of origin.*

- b. If apparatus is a rearmount aerial ladder, place it away from the immediate fire building /**occupancy** in order to leave the area accessible for a tower ladder.
- c. Join the forcible entry team, if not directed otherwise.

B. Second ladder company to arrive

1. **Forcible Entry Team**

- a. To adjacent stores and cellar entrances.
- b. Search stores.
- c. Ventilate.
- d. Check for fire extension. Open up floors, ceilings, and partitions.
- e. Cut floors where necessary for operation of cellar pipes, distributors and bent tips.



2. **Roof Firefighter**
    - a. Place a second portable ladder to the roof.
    - b. Bring saw to the roof if not required elsewhere and roof requires further opening.
    - c. If services are not required on roof, perform as directed.
  3. **Outside Vent Firefighter (OV)**
    - a. Team up with 1<sup>st</sup> ladder OV and operate as per Section 8.2.2 A3.
  4. **Chauffeur**
    - a. Position tower ladder if one is not already positioned.
    - b. If apparatus is a rearmount aerial ladder, place it away from the immediate fire building/ occupancy in order to leave the area accessible for a tower ladder.
    - c. Join the forcible entry team, if not directed otherwise.
- C. Additional ladder companies shall be special called and utilized to:
1. Perform necessary forcible entry.
  2. Provide additional ventilation.
  3. Pull ceilings and open partitions.
  4. Cut open floors and roof.
  5. Make secondary search.

### 8.3 *STORE AND COCKLOFT FIRES*

#### 8.3.1 *Tactics (store fires)*

- A. Most taxpayer fires originate in the store occupancy at street level. The occupancy usually consists of a sales area, a storage area and a utility area. Fires in these premises generally originate in the storage or utility area, which in most occupancies are in the rearmost portion of the building. In the same building, the storage or utility area of one store may butt the rear or side of another store which fronts on another street. Also this rear storage area may extend behind stores in the same building, forming an "L" shaped occupancy. Light partition walls will usually separate such stores.
- B. All areas must be searched for removal of the occupants with particular attention given to the rear and main selling areas. The cellar, rear or mezzanine areas may contain accommodations for the employees of the store to rest.
- C. Entry must be made into one or more occupancies as necessary, to locate the fire.
- D. The probing of the ceiling area with a hook upon entering will give some indication of conditions in the cockloft area.
- E. Ventilation of the store at the front by the removal of show window shall be done if ordered by the officer in command.
- F. Ventilation and access from the rear is often limited and time consuming due to boarded or sealed windows and doors.
- G. Restaurant occupancies where the ducts are run along the ceiling, are usually boxed or framed out with combustible material. It may be advisable to remove the entire framing if the fire originated in, or has extended into the ducts. Often ducts are covered with non-flammable insulation with paper covering that may cause fire extension.
- H. Shut down fan motors to prevent a forced draft that may spread the fire.
- I. Caution must be exercised in working in the area of stoves with the presence of containers of hot grease and oils.
- J. Verify that the fire origin was actually in the store in which operations are in progress. This can only be assured by checking adjacent stores, which may be to the side or rear.

### 8.3.2 Tactics (cockloft fires)

- A. *Although the fire may have started in the cockloft from defective wiring, or a defective chimney, most fires extend to the cockloft through ceilings, vertical arteries or ducts from fires in stores or cellars.*
- B. Ladder companies must attempt immediate and complete roof ventilation using saws to cut a large hole over the main body of fire. Examination holes shall be made to ascertain whether fire has reached other portions of the roof. They also serve to relieve that portion of the roof area of heat and gases and mitigate possible backdrafts.
- C. Where the size of the roof and the forces on hand make it practical, a trench cut may be made to head off fire extension in the cockloft.
- D. The practicality of trenching will depend on many factors:
  - 1. The size of the roof - a long trench may take too much time.
  - 2. The volume of fire - it may be no longer possible to get ahead of the fire.
  - 3. Ceilings - height and type. Due to inaccessibility and extensive lighting systems, it may be necessary to attack the fire from above.
- E. Ceilings, in stores or on the second floor of two story taxpayers, must be opened rapidly. Sufficient personnel, with proper size hooks, must be assigned if quick control of the fire is to be accomplished.
- F. Holes may be needed for cellar pipe, distributor or bent tip use.

### 8.3.3 Assignments

- A. First ladder company to arrive
  - 1. **Forcible Entry Team**
    - a. Force entry.
    - b. Locate the fire.
    - c. Control the life hazard.
    - d. Search the store.
    - e. Ventilate the store at the front. Remove the show windows when authorized by the officer in command, and only when a charged line is in position.
    - f. Open ceilings and partitions in the fire store for examination and extinguishment.
    - g. Check the cellar for fire.
    - h. Shut down gas and electric supply.
    - i. Work in with the engine company.

2. **Roof Firefighter**
  - a. Place a portable ladder to the roof.
  - b. Take the portable saw to the roof and provide ventilation. Depending on conditions and the time of fire, the saw may initially be required by the forcible entry team.
  - c. Monitor the roof and report changing conditions to the officer in command of the fire.
3. **Outside Vent Firefighter (OV)**
  - a. Check the rear for access.
  - b. *Provide ventilation at the rear.*
  - c. *If access in the rear is available, attempt entry when teamed with the 2<sup>nd</sup> ladder OV (or another available member). Notify the company officer, and conduct searches.*
4. **Chauffeur**
  - a. *The primary position of the 1<sup>st</sup> arriving tower ladder is in the front of the fire building occupancy.*

*Note: Placement of additional tower ladders should be on the long side of the building as needed. If the taxpayer faces on two streets and the front of the building is covered by tower ladder(s), then place the additional tower ladder(s) to cover the other street front. Tower ladders should be positioned so that the fire can be cut off and driven back to the point of origin.*
  - b. If apparatus is a rearmount aerial ladder, place it away from the immediate fire building/*occupancy* in order to leave the area accessible for a tower ladder.
  - c. Join the forcible entry team. *If fire extends to the cockloft, proceed to the roof to assist roof firefighter.*

B. Second ladder company to arrive

1. **Forcible Entry Team**

- a. Force entry into the adjacent stores.
- b. Check for fire extension.
- c. Perform necessary search.
- d. Provide necessary ventilation.
- e. Open up partitions and ceilings for engine companies to extinguish the fire.

2. **Roof Firefighter**

Raise 2nd portable ladder to the roof. Take saw to roof and assist in ventilation.

3. **Outside Vent Firefighter (OV)**

- a. *Team up with the 1<sup>st</sup> ladder OV and operate as per section 8.3.3 A 3.*
- b. Deleted
- c. Proceed to the roof or other position as directed.

4. **Chauffeur**

- a. If the apparatus is a tower ladder, and the first ladder apparatus to arrive was not a tower ladder, take a position in front of the building. If the taxpayer faces on two street fronts and the one street front of the building is covered by a tower ladder, then place it to cover the other street front.
- b. If apparatus is a rearmount aerial ladder, place it away from the immediate fire building/*occupancy* in order to leave the area accessible for a tower ladder.
- c. Join the forcible entry team, if not directed otherwise.

C. Third and additional ladder companies shall be used to:

1. Provide additional forcible entry.
2. Provide additional ventilation.
3. Pull ceilings and open partitions for engine companies to extinguish fire.
4. Provide additional tower ladder use.
5. Perform other duties as directed.

## 8.4.1 TOOL ASSIGNMENTS

8.4.1 Tool assignments at taxpayer operations may vary from the normal at times.

8.4.2 The conditions vary depending on whether the stores are occupied or unoccupied.

8.4.3 Ladder company units shall consider the following for their standard operating procedures.

### A. **Forcible Entry Team**

The can man brings the can and hook to the fire door. The other man carries an ax and a halligan tool. He can be used to go for additional tools as needed.

1. The maul and *duckbill lockbreaker* may be required for some padlocks.
2. The Bam-Bam tool and screwdriver are used to pull padlock cylinders. Brass padlock cylinders are being replaced by "case hardened" materials. The Bam-Bam tool is ineffective on these locks.
3. The use of the saw must be considered to cut security doors with recessed locks. The proper blade, i.e., aluminum oxide, shall be used for this purpose.
4. The metal slats of the security doors can be removed by using the power saw. Two cuts are made across the slats to form a triangle with the apex at the top. This makes it possible to remove the cut slats and push the remainder of the door up, or it provides an opening for hoseline operations after the windows are removed.
5. For additional information on the forcing of security doors, refer to WNYF, 4th Issue 1969, and to Section 311 of Taxpayer fires.

### B. **Man to the rear (OV)**

1. Remember what the objective is: access, force entry, search and ventilation.
2. Obstructions which may be encountered in the rear are doors sealed with wood or metal and bricked up windows. The tools taken must be commensurate with goals. The maul and halligan are required. A hook, pike head or flat head ax will be inadequate in this situation.

### C. **Roof Firefighter**

When the member going to the roof is carrying the saw, a hook must also be taken. Members going to the roof subsequently should bring an ax or iron with the saw if available. Tarred over scuttles and skylights can be removed, and a full complement of tools will be available for use. These may be used by engine company personnel if truck company members are at a premium.

- 8.4.4 Taxpayer operations necessitate the use of hooks (10, 12 and 15 foot sizes). Their use must be anticipated. Truck companies, other than first or second due on the initial alarm, should report in with their 10 and 12 foot hooks besides their normal tool complement. The hooks will be used by them or other personnel on the scene.
- 8.4.5 Units equipped with smoke ejectors shall consider their use where conditions warrant. Ejectors can be of particular value in venting below grade areas where heavier than air gases can accumulate.
- 8.4.6 Portable lights shall be used where operations will be facilitated. They should not be thought of as just an overhauling tool.
- 8.4.7 Portable pumps may be used for dewatering flooded areas in fire buildings and exposures.

## **9. TACTICS, TWO-STORY TAXPAYER**

- 9.1 If the fire is on the first floor, operations will be similar to those for one-story taxpayers, but with added emphasis on the following:
  - 9.1.1 Life hazard may be great on the second floor with possible panic conditions.
  - 9.1.2 Completely ladder the second floor. Utilize portable ladders.
  - 9.1.3 Life hazard on the second floor may require extensive search procedures.
  - 9.1.4 Deleted.
  - 9.1.5 Use hose streams to protect occupants where necessary.
  - 9.1.6 Preventing the spread of fire to the upper floor and cockloft will require the proper placement of many hose lines.
  - 9.1.7 Retain command of the first floor to save the second floor.
  - 9.1.8 A large hall on the second floor may mean roof girders and a deep cockloft.
  - 9.1.9 Vigorous action is required to prevent fire from extending to the second floor and the cockloft.
  - 9.1.10 Ventilation holes cut on upper floors can provide venting for areas below and facilitate other operations.
  - 9.1.11 Fire extension in ducts and shafts may present serious problems.

- 9.1.12 Examine for fire extension in walls, shafts, ducts, etc. The possibility of a large open stairway must not be overlooked if the occupancy on the second floor is a dance hall, meeting hall, etc.
- 9.1.13 If the fire originated in the cellar it may require flooding of the first floor as a last resort.
- 9.2 A fire originating on the second floor of a two-story taxpayer may be treated as a fire originating on the first floor of a one-story taxpayer. Added emphasis must be given to the following:
  - 9.2.1 The need for an aerial ladder to the roof for ventilation.
  - 9.2.2 The forcible entry team should use the stairway to the second floor.
  - 9.2.3 In a second floor occupancy with large unobstructed areas, such as a dance hall or meeting hall, the ceiling beams span greater distances, the cocklofts may be deeper and the ceilings may be higher. This will require using proper size hooks, ten foot or longer, more time and work and additional manpower to open these ceilings.
  - 9.2.4 If the second floor is divided into multi-occupancy use, the penetration of heavy caliber streams will be limited due to partitions subdividing the floor area.
  - 9.2.5 The probability of a fire extending into the cockloft is greater.
  - 9.2.6 Deleted
  - 9.2.7 Remote stairs and rear fire escapes must be looked for.
  - 9.2.8 The advancement of ladder company personnel should be coordinated with engine company personnel to expedite the locating, confining and extinguishment of the fire.
  - 9.2.9 Areas below the fire must be examined for any fire dropping down.



## **10. SAFETY**

It is the intent of this section to reinforce the points of safety awareness essential to fires in taxpayer type occupancies. In firefighting, as in any dangerous occupation, safety should be everyone's goal.

### **10.1 INTERIOR OPERATIONS**

10.1.1 All members shall wear masks. Their use is obvious in the fire occupancy. They should be readily available and used when necessary in exposures. Smoke conditions change rapidly in taxpayer fires; members should be prepared for it.

10.1.2 Be aware of falling and hanging objects, i.e., flimsy mounted fluorescent fixtures, hanging "BX" electrical cables, sheets of tin from ceilings, etc. Advancing and operating in an upright position while using masks may expose firefighters to serious injury from these objects.

10.1.3 Advance carefully with hose lines. Large open areas allow the fire to move around the sides of, over, and behind the fire forces. Officers and members are to be constantly aware of conditions at the sides and rear until the fire is under control.

10.1.4 Flooring in these occupancies is thin and cellar fires may burn through the first floor. Provide adequate lighting and cautiously define the safe floor areas. Openings found that may cause injury should be covered and their presence communicated to all members operating.

10.1.5 Advance in cellar fires cautiously. A life line may be needed by engine and ladder company personnel. Large areas under many occupancies are subdivided. This creates a maze of storage rooms and corridors.

10.1.6 Chief and company officers should be cognizant of the need to provide illumination as soon as conditions and manpower allow. This aspect should be considered in daylight as well as in night operations.

10.1.7 Communication of conditions found should be a watchword of safety. Holes or defects located from above or below (in the flooring or roof), worsening heat conditions, extending fire in cocklofts, ceilings or flooring areas are of concern not only to those observing them but also to those above and around.

## 10.2 EXTERIOR OPERATIONS

- 10.2.1 When operating on thin, flimsy roofs, members should be aware of sudden failure possibilities. Operations over a fire near heavy equipment, roof signs, etc. should be accomplished with extreme caution. Communicating the types of equipment found and condition of supports in relation to the fire, is a must, both to command personnel, and to forces operating below.
  - 10.2.2 Roof areas at taxpayer fires often have very poor visibility. Slow maneuvering by member operating there, as well as the safety practice of probing ahead with tools, should be common practice.
  - 10.2.3 Keep in mind your escape route from roof areas. As conditions and the area of operation change members should adjust their escape route.
  - 10.2.4 All members at the scene should be aware of backdraft, flashover and collapse indications that are visible or indicated from any area. Communication here is also the key. A single point of information communicated to the officer in charge, may give the indication of imminent collapse when it is combined with previous feedback.
  - 10.2.5 Visibility on the sidewalk and store front areas at these fires varies throughout the progress of the fire. Move cautiously when visibility is poor; take note of surroundings when visibility increases momentarily.
  - 10.2.6 Plate glass in store windows and doors must be broken carefully and thoroughly trimmed to prevent serious injury. Eye shields must be down when breaking or trimming glass.
  - 10.2.7 Cornices, signs, marquees and other projections must be constantly monitored for possible weakening and collapse.
- 10.3 Safety at taxpayer fires should be an ongoing practice. The occupancy is a potential "injury factory" from the time of the Fire Department's arrival until the last member boards the apparatus to "take up." Caution and communication are the watchwords to a safe operation.

## **11. CONCLUSION**

- 11.1 A taxpayer fire presents a complex and difficult operation. The points brought out in this document have made use of the vast experience of the members in the field. It has stressed construction and firefighting features that are common to most taxpayers.
- 11.2 Knowledge of construction features is probably the single most important factor in dealing successfully with these fires. Fire personnel should be involved in a continual learning process in their areas of response to gain this knowledge.
- 11.3 Because of the variety of buildings and contents encountered, it is almost impossible to devise an operating procedure for every situation. Judgments based on knowledge and sound firefighting principles, must be made to solve individual fire problems.

**APPENDIX A - BUILDING LAWS RELATING TO TAXPAYERS**

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**1. BUILDING LAWS, 1938 CODE-GENERAL**

**Note:** Only structures erected after the enactment of these sections of the law would be affected. Check the sections of law for full details.

- 1.1 Maximum permitted area of structure is 10,000, 14,500 or 17,500 square feet depending whether the building faces upon one, two or three street fronts. The area of the structure is the area between exterior walls or between fire walls. This area may be doubled if the area is sprinklered. (C26-254)
- 1.2 Concealed roof space areas to be cut into areas of 3,000 square feet or less by fire stops. (C26-685)
- 1.3 When wood purlins and cross braces are used for suspended ceilings, the space between the ceiling and the floor or roof above is to be cut into areas of 2,000 square feet or less by firestops. (C26-461)
- 1.4 In business structures with concealed roof spaces the partitions that separate different premises shall extend to the underside of flooring or roofing. (C26-685)
- 1.5 Cellar ceilings are to be fire retarded. (C26-669)
- 1.6 Cork or fiber board may be used as roof insulation if covered by approved roofing. (C26-680)
- 1.7 Two adjoining stories may be connected by an open well, unenclosed stairway or an escalator. (C26-292)
- 1.8 Openings on a lot line to have at least 3/4 hour protective assemblies. (C26-659)
- 1.9 Plastic light diffusers (luminous suspended ceilings) to have a fire rating classification of self extinguishing. (C26-461)

## 2. BUILDING LAWS, 1968 CODE-GENERAL

**Note:** Only structures erected after enactment of these sections of the law would be affected. Check the sections of the law for full details.

- 2.1 Maximum permitted area of structure is 7,500 square feet if unsprinklered. There is no limit to area if the building is sprinklered. (C26-Tables 4.1 and 4.2)
- 2.2 Construction class is generally IIB or IIC combustible.
  - 2.2.1 IIB-exterior walls are non-combustible with a rating. Protected wood joists. Floors, roof and interior finish are protected.
  - 2.2.2 IIC-exterior walls are non-combustible with a rating. Unprotected wood joists. Floors, roof and interior finish are protected. (C26-Table 3.4)
- 2.3 Occupancy classification is mercantile, occupancy group "C", retail stores, sales, markets, etc. (C26-Table 3.2)
- 2.4 Sprinkler systems required in spaces exceeding 7,500 square feet also require a siamese. (C26- 1703.1 (f))
- 2.5 Concealed spaces in ceilings unless sprinklered should be firestopped into areas not exceeding 3,000 square feet. (C26- 502.5)
- 2.6 In construction group II, an existing suspended ceiling shall be completely removed before a new ceiling may be suspended. (C26- 504.1 2)
- 2.7 Fire escapes are prohibited in new buildings and are only allowed with special permission in altered buildings. (C28-401.1)
- 2.8 Roof parapets are required, on exterior walls, in buildings over 22 feet in height and if the roof consists of combustible materials. Parapets shall be at least two feet high. (C26-503.3)
- 2.9 Taxpayer type occupancy buildings have a Fire Index rating of 2. (C26-301 .1,-Table 3.1)

**Note:** It is not intended to describe and date each of the laws that apply to taxpayer type buildings. Such detailed study is not necessary for the purposes of this book. The construction of taxpayers will differ depending on the architect, the builder, alterations made and the date erected.