SALVAGE MANUAL

SAN FRANCISCO FIRE DEPARTMENT

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Salvage Operations
January 2008

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FOREWORD

The goal of this manual is to establish standard operating practices as authorized by the Chief of Department and implemented by the Division of Training.

The purpose of this manual is to provide all members with the essential information necessary to fulfill the duties of their positions, and to provide a standard text whereby company officers can:

- Enforce standard drill guidelines authorized as a basis of operation for all companies.
- Align company drills to standards as adopted by the Division of Training.
- Maintain a high degree of proficiency, both personally and among their subordinates.

All manuals shall be kept up to date so that all officers may use the material contained in the various manuals to meet the requirements of their responsibility.

Conditions will develop in fire fighting situations where standard methods of operation will not be applicable. Therefore, nothing contained in these manuals shall be interpreted as an obstacle to the experience, initiative, and ingenuity of officers in overcoming the complexities that exist under actual fire ground conditions.

To maintain the intent of standard guidelines and practices, no correction, modification, expansion, or other revision of this manual shall be made unless authorized by the Chief of Department. Suggestions for correction, modification or expansion of this manual shall be submitted to the Division of Training. Suggestions will be given due consideration, and if adopted, notice of their adoption and copies of the changes made will be made available to all members by the Division of Training

Joanne Hayes White
Chief of Department

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INTRODUCTION

Salvage, as applied to the fire fighting service, is essentially the prevention and reduction of damage from indirect causes. It is the responsibility of each officer to be aware that salvage plays a vital role in the overall fire fighting operations. Every firefighter should be qualified to take all possible steps to assist in salvage work. "Salvage work in the fire service consists of those methods and operating procedures allied to firefighting which aid in reducing fire, water, and smoke damage during and after fires" (Essentials of Fire Fighting, 1990, p.301). Salvage begins the moment you arrive at the scene of any incident.

Damage caused by fire may be classified as either direct or indirect.

- **Direct damage** is caused by actual burning;
- **Indirect damage** is caused by the heat and smoke generated by the fire, water used to extinguish the fire, falling debris, and breakage.

Efficient salvage operations include not only the prevention and reduction of loses while the fire is in progress, but also the saving and protection of property after the fire has been extinguished. Some of the important salvage operations during a fire are:

- Placing waterproof covers to protect stock, furniture, business records, fixtures, and machinery from water and falling debris.

- Moving goods or property threatened by fire.

- Removing rugs from floors, pictures from walls, curtains from windows, etc.. to protect them from water, smoke and debris.

- Using waterproof covers to "bag" the floors.

- Diverting water from the fire building and the use of waterproof covers to cover floors and stairways or to provide chutes necessary to divert the water to the exterior of the building.

- Ventilation of the building to remove smoke and heat.

- Removing the contents of the building where they obstruct fire fighting operations and when it is not possible to provide protection within the building.

Some of the important salvage operations after the fire is controlled or extinguished are:

- Shutting down sprinkler systems
- Replacing fused sprinkler heads
- Placing sprinkler systems back in service
- Removing water from floors and basements
- Removing articles of value from debris
- Complete ventilation of the building to remove remaining smoke and heat
- Shutting off defective or damaged water systems to prevent leakage
- Providing necessary coverage for the roof, windows and other openings to protect the interior of the building and its contents from the elements
- The removal of covers spread during fires or other emergencies
- The securing of the building against intruders and vandalism

In order to accomplish these objectives successfully, engines and trucks in the Department are equipped with various salvage equipment. It is the responsibility of Battalion Chiefs to become acquainted with the various salvage equipment carried on the apparatus in their districts in order to utilize that equipment adequately when conditions warrant.

Effective salvage demands more than the spreading of covers over stock or the diversion of water from a building. Every firefighter must keep in mind the fact that efficient workmanship in connection with such jobs as forcible entry, ventilation, the handling of fire streams, overhauling, and in fact, every job in fire fighting, is definitely as much a part of salvage technique as is the spreading of covers or the diversion of water.

For example, frequently a fire is discernible from the street at the front or rear windows of a building. When a fire has originated in close proximity to the windows and a very small portion of the building or floor is involved, a stream directed at such a fire from a ladder, fire escape, or from the street will problaby extend throughout that particular floor or room. Should the attack on such a fire be from the inside, the stream will not only strike the fire, but the excess water will pass through the windows or strike the wall, with subsequent salvage of the contents not involved in the fire. In other words, inside fire fighting operations and common sense methods of forcible entry and ventilation are as important to effective salvage as they are to effective fire fighting.

Salvage also applies to the prevention of damage due to causes other than those sustained during a fire. For example, extensive water damage may result from a broken water pipe or main, a broken hydrant, a defective or broken sprinkler head, floods, leaking tanks on roofs, defective plumbing fixtures or clogged roof drains. Salvage also plays an important factor in the prevention of damage to property exposed to the weather due to windows or doors broken or damaged during storms or by accident.

Salvage needs no salesperson. Its principles are sound and every its practice pays a dividend in community goodwill which is a very important factor in the welfare of the fire service.

SECTION 1. CARE OF COVERS

Covers are a very important part of salvage operations, and the success of salvage operations depend as much upon proper cover maintenance as upon their application. When covers are used, care should be exercised to avoid pulling them over sharp edges and projections where they might become torn. Covers should never be spread on a floor or sidewalk with broken glass or other sharp pieces of debris. Unnecessary walking on covers should be avoided, and covers spread on floors or stairways should be removed as soon as possible. When it is necessary to fasten covers, the nails should be placed through the grommets only. Care should be taken when covering roofs to remove all nails, sharp or jagged points of tin, or anything that is likely to cut or tear a cover. Roof covers must always be fastened securely to prevent them from flapping.

When removing covers from stock or machinery, care should be taken to prevent tearing on sharp projections. The throwing of covers from roofs, windows, or other openings above the ground floor is strictly prohibited. Covers shall not be folded on sidewalks or floors amid broken glass or other debris.

Wet or dirty covers shall be washed on both sides with clear water and then hung on drying racks until thoroughly dry. If the removal of oil and dirt is difficult, or if oil or grease stains are encountered, a mild soap solution may be used and the cover scrubbed with a stiff broom followed by a thorough rinsing with clear water. Do not use warm water unless absolutely necessary. Solvents should be used for cleaning purposes as a last resort and only after scrubbing with soapy water has proved ineffective. Whenever solvents are used, all traces of such solvents must be removed by application of soapy water followed by a thorough rinsing with clear water.

The company officer shall inspect the covers for dryness, cleanliness and good repair before they are removed from the drying rack. Covers that have sustained small tears or small holes shall be mended with a waterproof adhesive tape. Covers that have sustained large tears or large holes shall be plainly marked and set aside for repair and reported to the Bureau of Equipment. Covers that are clean, dry and in good repair shall be folded in the standard manner and placed on storage racks.

Covers carried on the apparatus and not used within a period of three months shall be removed, refolded and replaced on the apparatus. Covers kept in storage and not used within a period of three months shall be removed, refolded and rotated into service on the apparatus.

Unless unavoidable, covers in a wet or damp condition shall not be allowed to remain on the apparatus more than twenty-four hours.

All covers shall be regularly inspected, maintained in good condition, and ready for immediate use.

Before leaving the scene of an alarm, and after the return to quarters, covers shall be properly checked and inspected, and any **damaged or lost covers** shall be reported in writing to the Bureau of Equipment.

When covers are issued to a company, such covers shall be marked with the appropriate designation and number, and such markings shall not be changed or obliterated without authorization from the Chief of Department, issued through the Bureau of Equipment.

Whenever covers bearing the markings of another company or unit are received or obtained in any manner by a company, this fact shall be promptly reported to the Bureau of Equipment and to the company to which the covers belong.

SALVAGE OPERATIONS

The Incident Commander shall exercise general supervision over all salvage operations at fires or other emergencies.

In compliance with the Fire Code, rental fees shall be charged for the use of salvage and roof covers spread by the Fire Department. The fee schedule for spreading or rental of salvage and /or roof covers is outlined on the cover rental agreement.

Whenever it appears that covers spread by the Fire Department at fires or other calamities will be required to be left on the premises over the allotted free period of two days for salvage covers, and ten days for roof covers, the officer assigned to these duties is hereby directed to present to the owners or authorized representative of owners of such premises, a form of agreement for their signature, whereby they agree to pay the required fees to the City and County of San Francisco, together with all transportation costs and damages, as provided in the Fire Code (see Sample Report Book for *Cover Agreement* instructions and *Reporting Procedures for Salvage and Roof Covers.*)

All signed agreements and written statements for covers left on premises over the allotted free period shall be promptly forwarded to the office of the Chief of Department.

All requests for the rental of covers, in cases where said covers are not spread by the Fire Department, shall be referred to the Chief of Department before such covers can be delivered.

SECTION 2. COVER WORK AT FIRES

The officer assigned to salvage operations at a fire must rely to a great extent on personal judgment, sincesalvage work is affected by many variables. A fire that calls for relatively little fire extinguishing on the part of the responding companies may provide considerable salvage work, such as a small fire that has activated the sprinkler system.

The first objective of salvage work is to locate the fire and then do cover work to protect the exposed property from as much water damage as possible.

If the fire is on an upper floor of a multiple story building, cover work usually starts immediately below the fire. If the fire involves a portion of a large storage, mercantile or manufacturing area, it may be possible to protect stock and machinery adjacent to the actual fire. It is vitally important that the officer be able to estimate the amount of water likely to be used and the probable extent of the fire, if he or she is to determine and develop an efficient plan of action. If the amount of water to be used will not permit holding it in "bags" on the floor below, the officer must be prepared to cover all stock and furnishings to the basement. Sufficient help and covers must be available to keep cover work well in advance of the water. Often the occupant of the premises involved may be able to indicate items of particular value to which salvage priority should be given.

If the officer decides that the water can be held on the floor below the fire, he or she should order the floor "bagged". In this procedure, the stock and furnishings in the exposed area are always covered first. The floor is then covered completely and the edges of the covers are rolled to hold water. Covers on stock and furnishings are then arranged to drain into the "bags." If the water threatens to run over the rolled edges, the cover edges are raised by means of chairs, boxes, or any other means of ready support to form *catch-alls*. Boards, poles or rods may be used to excellent advantage. Other means can be used also in bagging floors by nailing covers to baseboards or other materials. In this event, nails should be driven through cover grommets only. Officers must be efficient and ingenious enough to make use of the material at hand and show initiative in adapting themselves and their personnel to the diversified conditions that fires always present.

Upon entering the building, each firefighter assigned to salvage work should take as many covers as can be conveniently carried.

Firefighters should work in pairs when covering stock, furnishings, etc. An alternate method of folding a salvage cover is to roll it for spreading by one person. An advantage is that the cover need not be thrown when spread, but may be simply placed upon the articles to be protected, unrolled, and opened. This is a relatively easy operation for one person. If more covers than are immediately at hand are likely to be used, it is often preferable to detail the majority of the crew to spreading covers while the remainder of the crew carry and distribute the covers to the various floors or areas where they are required. The use of elevators, when available, is an important aid when distributing covers. In buildings of warehouse occupancy, including railroad, truck, and marine terminals, considerable merchandise or stored materials on pallets can be salvaged by removal from the premises by mechanical handling equipment, such as lift trucks.

The officer should quickly survey situations, cover where the water is liable to reach first, select the stock most valuable and easily covered, and then proceed to the more difficult work. If an officer devises effective groundwork in the basic operations, the crew will be able to achieve maximum results from salvaging. It is important to group stock and furnishings into compact stacks before covering, and extreme care must be used to prevent breakage. Stacks should be arranged where they are least exposed to water damage. Stacks should be placed so as to avoid ceiling openings wherever it is practical.

In residential property, household furniture presents a very similar condition in almost every class of dwelling, apartment or hotel building. If time permits, rugs should first be removed from the floor, rolled, and then placed over heavy articles of furniture. Pictures, lamps, bric-a-brac and other fragile articles should be bunched

as much as possible and covered for extra protection with clothes from closets, draperies, and curtains before being covered as a group. Valuables should be placed in drawers for safekeeping, dressers may be backed up against the ends of the beds, and where possible, the stack should be made in the center of the room with care taken to avoid sharp projections or edges that may cause damage to the covers. Bureaus, dressers, desks, etc., should be stacked with doors and drawers faced to the center of the stack as a safeguard against theft. The stack should be arranged so that sufficient room is left to manipulate the cover and so that the cover placed over it will be pitched to drain. A tacked-down or close-fitted carpet should be left down, as it will be found very difficult to remove it without tearing. Where practical a cover should be spread over it for protection.

Goods, stock, furniture, etc., should not be removed from the building while the fire is in progress unless absolutely necessary, as such action may seriously hinder fire fighting operations and obstruct vital passageways. If goods are removed, they should be covered outside the premises to protect them from the weather and from the hose streams used in fire fighting operations. If furniture is moved outside, cabinets, desks, etc., should be stacked with doors and drawers to the center of the stack as a safeguard against theft.

The arrangement of stock, machinery and furnishings in industrial and commercial buildings presents many difficult problems in salvage covering. The covering of stock and machinery is the first part of salvage work in commercial buildings, and it should be carried out as quickly as possible. Whenever possible, all material of damageable nature lying about on the floor of these buildings should be removed from the floor before cover work is started. This is extremely important since it is almost impossible to prevent a certain amount of water from reaching the floor, and if the materials are raised even a few inches off the floor, considerable water damage can be prevented.

When covering large or high piles of stock or machinery, the covers must be spread with care and not thrown over pointed objects, which may tear them. Covers should be spread in a manner that will allow the water to run off and should not be allowed to form a water receptacle. Chairs or similar objects placed on top of the pile will often assist in giving a tent-like effect which will drain off the water, or bales of goods may be placed on top of the pile to achieve the same effect. The first cover should be placed over the top of the pile as quickly as possible to prevent damage from dripping water. The remaining covers are then applied and secured under the first cover so that the first cover overlaps.

Shelving that is built to the ceiling, using the side wall of the room for backing, presents a difficult problem. Water from above naturally follows a wall in its downward travel and will damage the stock on such shelves. In some cases it is possible to remove the stock from the upper shelf and spread a cover lengthwise, securing the cover with nails through the grommets to the wall above or to the edge of the shelf. Sometimes it is possible to roll the edge of the cover and force it

between the shelving and back wall. In other cases, where the shelving is an inch or two removed from the wall, it is possible to pull the stock away from the back wall and then spread a cover over the top shelf to protect both the front and back of the shelving.

Firefighters performing salvage operations are frequently injured by falling from shelves that break under their weight or from positions where their foothold is insecure. For this reason, personnel should make use of ladders whenever possible and use extreme care, particularly when working above floor level.

In covering glass top showcases, counters and wherever else necessary, place chairs, cartons or other objects across the frames to warn firefighters against climbing or steping on them in the course of fire fighting, cover work or overhauling. When it becomes necessary to pull down ceilings over showcases, additional protection can be afforded by double covering. Reckless covering of delicate or fragile merchandise will often produce more damage than if the stock were allowed to remain uncovered. For this reason, covers should not be pulled across these materials, but should be carefully handled and dropped down over the material without drawing the cover across the stock unnecessarily.

In covering machinery, considerable care must be taken so that the cover is not torn or damaged. It is advisable, when covering oily machinery to place the side of the cover with the company identification against the machinery to lessen the possibility of oil or grease damage to the side of the cover which is usually placed on or against material. When covering belt-driven machinery, it is important to wrap the cover around the belt to prevent the water from following the belt and damaging machinery. If it is possible to remove the belt, this should be done. Machine belts should not be cut except in extreme emergencies. When it is necessary to cut belts, officers should note the manner in which the belt is laced. If rawhide is used, it is only necessary to cut the lacing. Where steel lacing is used, the belt is cut a distance of about three feet from the lacing.

Water damage is often caused by water following vertical pipes or columns downward, and in such cases, the edge of a cover should be tightly bound around the pipe with the twine and the cover bagged on the floor to catch the water. Water damage is often caused by leaking hose lines (house lines) connected to a wet standpipe or by water leaking from damaged Fire Department hose or loose couplings. In such cases, the floor or floor furnishings should be protected by spreading a cover under the hose and bagging the cover to trap the excess water or channel it to the exterior of the building.

When extinguishing fires in chimneys, salvage covers may be used to protect the room and furnishings from soot, sparks, and water coming out of an open fireplace. Place the fireplace screen or other spark arresting device in front of the opening to prevent live sparks from damaging the cover. A cover is hung over the opening of the fireplace and may be secured by placing heavy objects on top of the cover on

the mantel and on the cover at the floor where it abuts the opening. Nails through the grommets may also be used to secure the cover. Hang the cover with the side on which the company markings are stenciled against the opening.

Considerable salvage is often accomplished in the use of covers as hall runners to protect floors, stairs, carpets, rugs and other floor or stair coverings from water damage, debris, or from firefighters tracking debris in the course of their work.

Perhaps the most valuable possession of a business is the records, such as the orders, inventory, insurance policies, etc. Loss of records during a fire is often more disastrous than loss of stock. Experience has shown that many companies do not resume business after experiencing a fire in which their records were lost. When salvaging records, extreme care must be exercised when grouping and covering them; particular effort must be made to place the records above the floor level.

Computer systems will often be found in large and small businesses as well as in many private homes. Some of these computers are of the small desk top variety while others are larger minicomputers or mainframe computers. The firefighter must be aware of the different tolerance levels of the various computers that may be found at fires. Computers are environmentally sensitive machines. Larger computers are so sensitive that they must be constantly maintained in a cool, dry environment to ensure proper function. If there is a power failure in a heating and air conditioning unit that maintains this environment, the internal temperature of the computer can rise very quickly. At the relatively low temperature of 125 degrees F, magnetic tapes and disks may suffer irreparable damage. This makes it very impractical to cover these machines with salvage covers unless they can be shut down. The salvage cover will prevent air from circulating around the computer, thus causing heat to build up rapidly. A sudden temperature rise may also damage or destroy the delicate circuits of the computer.

In many instances, these computers are protected by fixed extinguishing systems. For example, these may be FM200 or carbon dioxide fire suppression systems. It is recommended that firefighters wear protective breathing apparatus in areas where fixed extinguishing systems have been activated since the oxygen content within a room can become significantly depleted when such systems are activated.

SECTION 3. REMOVING WATER FROM BUILDINGS

HANDLING WATER IN BUILDINGS

After the protection of building contents, the removal of excess water is normally the next most important salvage function. Not only is water a concern because of its weight and its natural tendency to travel downward in a building, but also because it accumulates or is absorbed in areas that may lack adequate drainage. This accumulation of water can damage machinery, utilities, and stored merchandise, as well as heating, ventilating, and elevator equipment. Accumulated water can also damage structural components. Here the ability, knowledge, and ingenuity of firefighters may be challenged because of the many different conditions found in this area of salvage work. A complete knowledge of all tools and salvage equipment, as well as proficiency in the techniques of using them, is essential to functioning quickly and efficiently.

A basic fact of fire fighting is that water places additional weight in a building and can significantly contribute to the collapse of structural members. Ideally all water applied on a fire will be converted to steam during extinguishment, but unfortunately this is not usually the case. Water will begin to accumulate in any area where insufficient heat exists to vaporize it into steam. If the application is from a 250 gpm nozzle, more than a ton of water per minute is added to a building. Continued application of a number of streams into the structure will rapidly increase internal loading on structural components.

The primary objective of salvage crews when removing water from a building should be to remove it quickly and safely without damage to unaffected portions of the building. Numerous avenues can be used to route water. Floor drains and soil pipe openings offer a built-in means of routing water through pipes that take the water far away from the area. Stairways may also serve as a route to the outside if conveniently located. Scuppers, where available, can aid in clearing floors in commercial buildings. As a last resort, walls may have to be breached or holes cut in floors when other methods fail. Elevator shafts and other shafts may be used in multistory buildings to take water to ground level. Pumps are invaluable for removing water that has pooled in basements, shafts, or inaccessible areas.

SMALL AMOUNTS OF WATER

Small amounts of water can be removed from the floor of a building with scoop shovels, buckets, brooms, squeegees, or the Water-Vac. Water can be swept or squeegeed toward a scoop shovel and then deposited into buckets. The buckets may be emptied at the exterior of the building or in a toilet, bath tub, showers, or other sewer connections. A salvage cover used to "bag" small amounts of water on the floor can be emptied with buckets.

LARGE AMOUNTS OF WATER

Three general means of removing large amounts of water from the upper floors of buildings are elevator shafts, stairways, and chutes to the outside.

ELEVATOR SHAFTS

Before water is directed into elevator shafts, the basement should be inspected to see if elevator machinery or any stock is exposed and requires prior covering. Personnel should ascertain whether or not the basement drains are open. Materials on the basement floor between the drain and the shaft should be moved or protected from water damage.

The standard procedure for using elevator shafts to drain large quantities of water is:

- If possible, raise elevator to point above drainage.
- Shut off electrical supply to elevator machinery.
- If exposed elevator machinery is in the basement, protect with salvage cover.
- Open basement drains.
- Make ready to remove the water from the elevator pit by means of a portable pump, if necessary.
- If the elevator shaft is open, protect the opening at intervening floors with salvage covers lapped into the shaft.
- If the elevator shaft is enclosed, block the door openings at intervening floors with salvage covers.

STAIRWAYS

When water is directed down stairways, cover the treads and risers in the standard manner. After proper placement of the covers, direct the water toward the stairway with brooms or squeegees. Covers must lead to the exterior or to a drainage point.

CHUTES TO THE OUTSIDE

A very practical method of draining large amounts of water from the upper floor or floors of type-3 or type-5 buildings is by use of chutes constructed on the floor below the water to drain through windows or doors to the exterior. Chutes are normally constructed with salvage covers; however, improvised chutes can often be made of available material at hand. A very effective short chute can be made by removing a door from its hinges and placing one end on the window sill with the other end pitched higher to drain. A rolled salvage cover is used to channel the water. Longer chutes require ingenuity on the part of the officer in using available materials.

Holes should be cut in floors only when large amounts of water are present and draining facilities are inadequate. When it becomes necessary to cut a hole for drainage into a chute, the ceiling below the floor containing the water must be punctured as soon as possible to prevent the water from spreading over the ceiling. It may also be found that water has accumulated between the floor and the ceiling below. Since it will only be a question of time before the ceiling will give way under the weight of the water, quick drainage can be effected by piercing the ceiling with a ceiling hook. Before any ceiling is opened, it is important to first cover the goods below.

DIKES

Good salvage practice often calls for the construction of dikes to prevent the spread, or to direct the flow, of water. Salvage covers rolled or folded and placed end to end may be used to good advantage to route water out of buildings. Folded or rolled salvage covers are also often placed in doorways on the floor to prevent the flow of water to rooms or areas not involved.

CATCH BASIN

Salvage operations sometimes require quick construction of devices to trap large amounts of water. The catch basin can be used for this purpose although a suitable method for draining the water must also be considered to eliminate the danger of runover.

WATER DAMAGE IN BUILDINGS

The use of exit stairways, elevator shafts, etc., generally are not satisfactory substitutes for adequate water damage control. In multi-storied buildings particularly, waterproofing and proper drainage facilities aid considerably in both reducing water damage and in increasing salvage. It has been shown conclusively by fire loss records that excessive losses can be attributed to water damage resulting from lack of waterproofing and drainage.

It is not always realized that, unless proper precautions are taken in advance, heavy water damage may be the direct result of firefighter's efforts to put out the fire by applying large quantities of water into a building. While the water may put out the fire, waterproofing and effective drainage can minimize considerably what otherwise could be ruinous damage resulting from water running or seeping down into a areas where there had been no fire at all.

In sprinklered buildings, a very large percentage of fires which cause sprinklers to operate either are extinguished or brought under control by the sprinklers. Water damage in such cases often is more than actual fire damage but the total damage almost always is much less than would have occurred if the building had not been sprinklered and the fire had been fought instead with hose streams. This is particularly true in hi-rise buildings where water from the upper floors may seep down to cause water damage on several floors below the fire floor.

Of great value in buildings is the use of skids on which baled goods, paper and other heavy bulky material could be placed. These should be made so as to keep the material six inches above the floor. Where material is kept under counters, in drawers, and in cabinets, these should be made and arranged so that the bottom six inches cannot be used for storage.

BASEMENT DRAINAGE

Basement drainage presents a most difficult problem, and many large losses have occurred in these areas because of lack of ample and unobstructed drainage facilities. A firefighter should immediately be sent to the basement of a burning building to see that all floor drains are unobstructed and that sump pumps, if provided, are functioning properly. If possible, all stock resting on the floor, subject to water damage, should be elevated or removed.

When normal drainage facilities prove inadequate or are obstructed, soil pipes leading from roof drains and upper floor plumbing can often be used to aid in draining basements. These usually have clean-out plugs which, when removed, allow water above their level to run through the pipe into the sewer. When the basement is drained, the plug must be replaced.

A suitable guard should be placed over the clean-out opening to prevent debris from entering and clogging the pipe. Breaking a soil pipe to provide drainage should never be done except in extreme cases, as breaking a sewer pipe sets up a new hazard, that of escaping sewer gas, which may be deadly. Should breaking be necessary, the soil pipe should be plugged immediately after the water is drained, and the Department of Health should be notified.

Toilet bowls removed from the floors leave openings that allow drainage of water. By disconnecting the flush pipe at the rear of the bowl and removing the nuts at the base of the bowl, the entire assembly can be lifted off. Toilet bowls are sealed at the base with putty or rubber, and lifting the bowl gently will break this seal without damage. The opening must be covered with a suitable guard, and closed when drainage is completed.

When heavy streams are being used, attention should be given not only to the stock and conditions of the basement involved, but also to the conditions in adjoining basements. Frequently, water from the involved basement will penetrate the walls on either side and cause damage to the stock in adjoining basements. It is often possible to salvage much of the stock from exposed adjoining basements by removing it to the upper floors. Salvage by this method will, however, depend upon the type of merchandise and furnishings present, together with the equipment and personnel available.

When a large stock of small articles are on shelves in the basement involved, the procedure of moving the stock is extremely difficult due to the time required to handle the merchandise. In such cases, it is often best to move the stock from the lower to the upper shelves and make every effort to maintain a low water level.

When basement drainage facilities are inadequate, the water may be removed with buckets and scoop shovels. If this method is impractical, a pump or eductor can be used. Every truck company is equipped with a "Prosser" submersible electric pump capable of discharging 120 GPM. The Utility Unit and the Bureau of Equipment have additional pumps and water removing equipment.

Normally, gasoline motor pumps should not be used inside of buildings because of their dangerous and noxious exhaust fumes. However, where the depth from which the water must be lifted exceeds the practical pumping lift, a portable pump may be carried down below street level and used to remove the water through lines of hose to outside street gutters. When using such pumps in a basement, the importance of providing a vent for the **exhaust fumes should not be forgotten!** Suction should always be taken from the lowest point of the basement using elevator pits, sumps, etc. Care should be taken to make certain that the outside street sewer drains and gutters are kept clear of obstructions and debris.

When water rises in basements to the point where it is about to come in contact with motors, refrigerating systems, etc., the motors should be shut off immediately. When it is threatening to rise to dangerous depths, the main electrical switches should be pulled to prevent possible electrical injury to firefighters working in the water, as well as additional damage to electrical equipment.

SECTION 4. SALVAGE & FIRE FIGHTING OPERATIONS

As previously stated, there is more to salvage than spreading of covers or removal of water from buildings. Salvage extends into every phase of fire fighting and is the application of common sense methods to fire fighting operations. Those operations conducted during a fire will be performed efficiently only if they are well planned and well supervised. Responsibility should be established by designating a salvage officer at every fire where salvage is necessary. When fires are small, a company officer can handle this task, but larger fires may require that a chief officer fulfill the responsibility as *SALVAGE OFFICER*. Regardless of the size of a fire, the responsibility for supervising and coordinating salvage operations must be established.

FORCIBLE ENTRY

When a first alarm assignment responds to an emergency at which a small fire exists, the Incident Commander should send only a few firefighters into the building. A few firefighters handling a small fire, quickly and efficiently, will prevent unnecessary damage and also eliminate the general confusion and interruption to business that usually accompanies a fire emergency.

It is the responsibility of all officers to prevent the reckless smashing of doors and windows when companies force entrance at fires. Tools have been provided on all apparatus with which to open doors and windows, and officers should see that all firefighters are trained in their use. It is inexcusable for firefighters to attempt to force a heavy glass paneled door and eventually damage the door frame and break the glass. In general, it is far better to break the glass and save the door frame.

Expensive tempered glass doors present problems that require special and careful treatment. If possible, entry should be made through adjoining windows. However, if there is no alternative, the glass panel should be struck sharply with the pick of an axe, or similar pointed tool, at an extreme corner of the door, which will cause the glass to disintegrate and fall away. The Department also provides various cutting torches that can be employed successfully, and with a minimum of damage, in opening locked metal shutters, barred windows and similar obstructions.

When performing salvage operations in buildings of multiple occupancy, it is often necessary to open a great many inside doors. In conditions of this kind, officers should prohibit reckless breaking into occupancies, as this procedure will neither save time nor accomplish the desired results. Inside doors can usually be opened easily by removing the stop and springing the lock with a bar or axe. The door can

then be reset into a closed position and the stop renailed without any further damage. Doors that open from the side opposite the stop can be opened easily by simply removing the hinge pins.

VENTILATION

Ventilation of buildings is of utmost importance in the control of building fires. The key to the prevention of unnecessary damage in the process of ventilating a building lies principally in good judgment and common sense on the part of officers.

When it is necessary to open a roof, the officer responsible should carefully select the proper location and have the firefighters make one large clean-cut (4'x4') hole. It is extremely poor practice to make several small holes in the roof, as this does not provide effective ventilation and adds to the difficulties in providing temporary protection against the weather, and also adds to the cost of future repairs. Officers should supervise all roof openings and guard against cutting too close to the flashings, roof drains, or chimneys.

Skylights can be pried loose and removed from the openings, or the glass lights can be removed from the frame to provide ventilation. However, if this is too time consuming, the glass should be broken in such a manner as to leave the frame intact. If it is necessary to break a skylight, use the proper method that will minimize injury to the firefighters below. With the pick of an axe or the Halligan tool, strike the corner of the skylight in order to break a small area. The small amount of glass falling to the floor below will serve as a warning to the firefighters the skylight is about to be taken. Wait about several seconds after the initial blow, then take the skylight, trying to pull as much glass as possible onto the roof. Indiscriminate breaking of glass in fire buildings shall not be permitted. The exercise of care during the process of ventilating will result in considerably less salvage, and will leave the building in better condition.

When plate glass show windows must be broken, an effort should be made to salvage the stock on display. If it cannot be reached from the inside, it should be removed immediately after the glass is broken, taken to a safe place and covered.

Smoke may often cause serious damage to the many classes of stock in fire buildings. The officer in charge of salvage should therefore maintain close contact with the Incident Commander and immediately inform the Incident Commander of the possibility of such damage and the need of particular ventilation. However, under no circumstances should officers make any attempt at ventilating the building except with the specific approval of the Incident Commander, and then only in the manner directed by the Incident Commander. Uncontrolled ventilation may have a serious effect on the fire and cause it to spread rapidly.

Smoke ejectors and portable electric exhaust fans, if used properly, are of considerable help in reducing excessive cutting and breaking otherwise necessary for natural ventilation. In addition, they help reduce smoke odor damage in buildings and to stock. The Rescue Squads, HazMat Unit, and trucks in the Division Stations carry fans for positive pressure ventilation. Forced air ventilation must only be used once the fire has been extinguished. The use of fans before the fire is extinguished has been shown to cause erratic fire behavior that can be extremely dangerous to firefighters. Charged hoselines must be kept at the ready to guard against a reignition of the fire caused by the forced air ventilation.

USE OF WATER

The most significant of all salvage principles may be the accurate application of water. Applying water at the wrong time, from the wrong place, with the wrong nozzle, and in unnecessary amounts causes a great deal of preventable damage.

Ideally, water should be applied from a position that will force fire gases and heat to the exterior through windows, doors, or other openings. Application of water from the correct location will not only reduce unnecessary damage, but will also control a fire more quickly and serve to ventilate the fire area.

Indiscriminate application of large quantities of water on stocks of paper goods, baled paper or fabric, grain, and other bulk or porous materials will cause excessive water damage and could cause overloading of floors with a subsequent collapse. This in turn could result in injury or death to personnel or unnecessary damage to the building and other contents.

Burst hose and leaking couplings that occur at fires in buildings cause considerable damage and are invariably the result of carelessness on the part of the company to which they are assigned. It is the responsibility of the officer to remedy this condition by carefully examining all hoses, washers, and couplings when hose is loaded on the apparatus.

Proper use of SCBA's allows firefighters to effectively control and extinguish fires quickly, thus ensuring less water damage.

SAFETY DURING SALVAGE

Salvage operations can be hazardous to firefighters. If possible, work areas should be well lighted. Firefighters engaged in salvage should use extreme care in climbing

on shelving, counters, showcases, or other fixtures, as falls are a leading cause of accidents in the fire service. Adequate equipment and protective clothing are necessary safety factors.

OVERHAUL

Salvage operations conducted after a fire is brought under control are generally associated with overhaul, an operation performed to prevent rekindling of a fire. Overhaul is also a function of extinguishment. The main difference between overhaul and salvage is that overhaul is performed to prevent the rekindling of a fire, and salvage work is performed to save property from damage by fire, water, smoke, heat, and fire-control activities. Salvage and overhaul are closely related.

Considerable salvage can always be produced by careful overhauling and by the careful opening up of ceilings and walls when searching for hidden fire. An officer who allows ceilings or walls to be pulled down over stock, rugs, furniture and fixtures without thought of salvage is guilty of ignorance, carelessness, or lack of experience. Firefighters should not avoid the work of overhauling by washing down piles of debris with heavy streams within a building. Such material should be carefully examined and smoldering articles extinguished with small streams or dipped in pails of water. Wet articles that are apt to drip water should be placed in "bagged" salvage covers.

Partially burned articles should not be removed from the building unless absolutely necessary, as considerable salvage maybe involved, and in many cases portions of burned articles serve a useful purpose when inventories of loses are made. However, when rags, cotton, old paper stock and similar materials are involved in fire, it is usually necessary to remove some of this stock from buildings to provide room in which to work. It is good practice to remove articles of little or no value like lath and plaster, burning mattresses, and similar material, as these are usually totally beyond salvage and are more effectively overhauled outside the building.

Wet articles that are liable to damage adjacent dry material should be placed in separate piles. Wet packing should be removed as quickly as possible so that it does not damage the contents. This is of particular importance when stocks of furniture or similar merchandise are wrapped with excelsior padding. Such stock should receive immediate attention, or its glued parts may loosen and warping may result.

Wet furniture should be dried with a chamois or other absorbent material to prevent water spots and stains. Mirrors and similar articles should be carefully wiped as soon as possible to minimize smoke damage. Drawers can be opened and the inside edges wiped dry to prevent swelling and jamming. Machinery is usually very susceptible to damage by water, and as soon as it is convenient to remove salvage

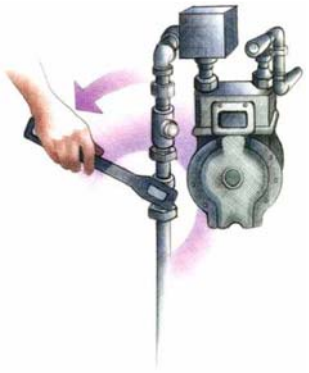
covers, the owner or person in charge should be advised to properly care for the machinery.

Air circulation should be started as soon as possible after a fire is extinguished, and in cold weather heating appliances should be used to assist in drying the building and stock. In rooms in which it is difficult to provide circulation of air, portable fans can often be used to circulate air to reduce smoke and moisture damage.

Packed fragile stock is difficult to overhaul. In such cases, it is often good practice to provide a watch detail and immediately instruct the owner to send employees inside to remove the packing material from the stock and remove the salvage to another floor or building.

Chiefs and officers shall utilize their knowledge and experience to make every effort to determine the origin and cause of fires. Salvage and/or overhaul operations may have to be suspended after fire is controlled to allow for an investigation of the evidence and a determination of fire cause and origin. In those instances when a person or persons have been severely burned, or where an explosion has occurred or arson is suspected, care should be taken not to destroy possible evidence during overhaul. Debris should not be disturbed or removed from the premises until the Bureau of Fire Investigation has completed that phase of their investigation. Officers and members shall assist the Bureau of Fire Investigation in the performance of their duties and refrain from overhaul and hose line operation in the area under investigation (refer to GO 95A-119 for fire investigation procedures).

CONTROLLING UTILITIES



Shutoffs and Tools Used

The control of fires in most buildings requires that utilities be handled sometime during the course of operations. This is done to prevent further damage to the premises as well as to provide safer conditions for firefighters to carry out fire fighting activities. It is important that those personnel assigned to handle utility equipment be familiar with not only the function of utility hardware, but also with the inherent hazards of each type of service.

Electrical Service

Firefighters must be able to control the flow of electricity into structures where emergency operations are being performed. In order to avoid injury and to protect electrical equipment, the firefighter should be familiar with electrical transmission and its hazards. While high voltage equipment is usually associated with fatal electrocution, conventional residential current is sufficiently powerful to deliver a fatal shock. In addition to reducing the risk of injury or death by electrocution, controlling electrical flow reduces the danger of wiring and electrical equipment igniting combustibles. Accidental equipment start-ups are also prevented by de-energizing the premises.

Factors most affecting the seriousness of electrical shock include the following:

- The path of electricity through the body (more serious when vital organs are affected)
- The degree of skin resistance (wet skin offers low resistance; dry skin offers higher resistance)
- Length of exposure (longer exposure causes more extensive damage)
- Amount of current (amperage flow)
- Amount of voltage (electromotive force)
- Type of current (alternating current (AC) or direct current (DC) affect the body differently)

Buildings are often serviced with pole-to-structure wires called service connectors. Wires come into a building through a “weatherhead” located at the top of a conduit that continues down to a service box. Before service is distributed throughout the structure, electricity is routed through a meter and an electrical panel that contains circuit breakers or fuses. The easiest method to de-energize a structure is through the main circuit switch at the electrical panel. The lever control for the main switch may be found padlocked or held in place with a lead wire seal. In either case the securing device will need to be removed before the switch can be thrown. When more than one service enters a building, as when a building is used for multiple occupancies, each service will have to be turned off at separate service boxes.

When a building becomes damaged in such a way that an electrical hazard exists, power should be shut off by a power company employee whenever possible. If damage involves only one area of a building, power should be maintained in the rest of the building. In this case, it is essential that personnel assigned to de-energizing the area, whether power company employees or firefighters, be familiar with the service to the building.

Firefighters should be alert for installations with emergency power capabilities, such as emergency generators. In such cases, pulling the master switch does not shut off the power entirely.

Downed wires at the fire scene present a special problem. Because a live downed wire is energized from high above the ground there is no easy way to de-energize it. It is recommended that a live wire not be cut except by experienced power company personnel with proper equipment. If a delayed response of utility personnel necessitates fire department action, only personnel with proper tools, tested gloves, and training should be assigned to de-energize a downed wire.

Water Service

Water damage, a major concern of fire departments, is usually associated with hoselines, sprinkler systems, and other fire control devices. Additional damage can also result from failure of domestic water system components at the fire scene. In this case, control of the water service is necessary to reduce water damage.

SECTION 5. SALVAGE PROCEDURE AFTER THE FIRE

There is probably no better way for the Department to establish good public relations than by returning victims to their homes or places of business as soon as possible after fires. Salvage work would not be complete if debris and water were left in the building to increase the damage caused by fire. After nonsalvagable material has been removed from the building, excess water should be removed immediately. This is particularly important in the case of hardwood floors, which will swell and rise if allowed to remain wet. Any excess water that might have splashed upon furniture should be removed.

Any material that is a source of danger to persons having to move about the premises should also be removed as soon as possible. For example, broken glass, defective ceilings, loose window frames and damaged plaster or loose lath on walls should all be removed.

REMOVING COVERS

As soon as water stops falling from above, covers should be removed in order to permit free circulation of air to the furniture or stock and thus prevent the general dampness of the building from affecting them. If practical, windows and doors should be opened to allow the air to circulate and assist in drying off the inside of the premises.

When removing covers, care should be exercised to dispose of any pockets of water that have accumulated in depressions or hollows in the covers. It would be careless to shower such water on stock that had previously been well protected; the water should be channeled into a bucket and disposed of. Covers should not be pulled over sharp projections but must be lifted to avert rips and tears. Small amounts of plaster or debris may be allowed to remain in the cover; however, the cover should be cleaned when removed from the building and refolded before being placed on the apparatus.

COVERING ROOF AND WINDOW OPENINGS

Covering holes in roofs or covering broken windows is a most important salvage operation. It is poor practice to salvage a stock of merchandise or household furnishings and leave them exposed to damage by the weather. Large broken

windows are usually covered with roof covers or plastic sheeting; holes in roofs are covered with either roof covers or roofing paper. When covering any such openings, care must be exercised to prevent tearing of covers by driving down all exposed nail heads before applying the cover. The cover must be securely fastened to prevent it being blown off by the wind. Nails securing the cover shall be driven through the grommet holes and bent over to hold the cover in place.

If the opening is too large for a single cover, laps should be made so that each succeeding cover is sufficiently lapped from bottom to top of the window or roof pitch. Where roof covers are spread over any sizeable opening, supports should be placed to prevent the cover from sagging. Smaller windows are covered with plastic sheeting.

On pitched roofs with composition or tin roofing, the composition or tin may be pried up sufficiently to provide space for slipping the edge of the cover underneath to prevent seepage at the top of the pitch. All covers shall be drawn tight and securely fastened.

Temporary roof coverings can also be made with roofing paper secured with lath or other lumber fastened with roofing nails. The advantage of using roofing paper for such protection is that it eliminates the danger of covers being stolen or damaged. It also provides the property owner with the advantage of not being forced to rush roof repairs in order to return covers. When covering roof openings with roofing paper, the paper is generally laid lengthwise to the pitch of the roof, sufficiently lapped at the edges, and fastened by driving roofing nails through plywood or lath to secure the paper in place. All exposed nail heads must first be driven down before applying the paper to prevent puncturing and tearing.

When pitched roofs are burned to such an extent as to make climbing the rafters dangerous, or when flat roofs are burned extensively, a top floor or attic space which is reasonably intact may be cleared and the floor or attic space "bagged" or provided with "catch-alls". In some cases, it may be possible to provide drainage by means of a "chute" through a wall opening.

FLAT ROOFS

When covering holes in flat roofs, first clear the opening of any debris, then carefully raise the composition roofing paper or tin from the roof boards to a height of four to six inches. Support this raised section with pieces of lumber or other material used as a wedge. This operation prevents roof water from flowing back into the hole.

Construct a temporary support for the cover by nailing an upright to the roof rafters at each end of the hole and a cross-piece to each upright. Pieces of lumber may also be nailed at intervals to the cross-piece, extending downward at right angles to

the roof, forming a frame resembling a skylight. The roof cover is then arranged over the frame and secured with boards placed over the cover edges and nailed through the grommets. The roof cover may also be secured by being weighted down with heavy stones, bricks or other heavy objects.

Small openings in flat roofs may be covered with roofing paper in the following manner:

- Sweep the area surrounding the hole clear of any excess tar and gravel
- Construct a support with lumber over the opening
- Cover the form with roofing paper
- Secure the roofing paper with roofing nails driven through the edges of the paper

PEAKED ROOFS

In covering small holes on peaked roofs, it is a comparatively simple matter to raise the roofing material above the hole, insert the end of a piece of roofing paper, bring it down over the hole, and fasten it in place with roofing nails.

Large holes are usually covered with roof covers placed from the lowest section of the roof to the peak. The upper covers must overlap the lower covers by at least one foot. In all cases, the covers must be securely fastened with nails or twine to withstand wind from without and draft from within. Whenever possible, laths or boards should be used on the cover edges and nails driven through the boards and cover grommets. Roof covers over openings near chimneys may be secured with twine around the chimney.

Openings near gutters or roof drains present unusual and difficult problems. It may be necessary to construct a temporary gutter or drain with a roof cover or with roofing paper or, when this is impossible, a "chute" constructed under the opening may be required.

SKYLIGHTS

Skylights and vertical shafts extending through the roof are probably the easiest of all roof openings to cover and make water tight due to the skylight framework and the firewall of the shaft being elevated above the roof level. Such openings are covered with roof covers with the edges weighted or nailed down or tied with twine to prevent the wind from blowing them off. Roofing paper may also be used in a like manner to cover small openings of this type.

WINDOWS

Where windows have been broken in the course of fighting the fire, it is advisable to cover the opening to prevent further damage by wind, rain, or cold weather and likewise to offer privacy and some protection from looters.

Large windows are usually covered with roof covers. The cover is suspended from the top of the window inside the building and secured with nails through the grommet holes.

The lower edge of the cover is projected out and over the sill of the window. The sides and lower edge of the cover are then fastened with nails through the grommet holes. Small windows may be covered with plastic sheeting, secured usually by stapling.

Other openings in exterior walls may be protected in the manner as described for broken windows. The covers may also be secured with lath or other lumber placed at the edges and nailed through the grommets or paper. When more than one cover is used to close an opening, the uppermost cover must overlap the lower cover by at least one foot to provide proper drainage.

SECURING THE BUILDING

The final aspect of salvage work before leaving the premises of a fire building is to secure the building against unlawful intrusion. Exterior doors must be securely locked, nailed in place or boarded up. This same precaution would also apply to interior doors in buildings of multiple occupancy. Broken windows or other openings in exterior walls at street level should be boarded up as well as covered. Openings into a burned out or otherwise dangerous stairwell or other vertical shaft should be blocked off to prevent usage. Furnishings and contents should be returned to as near normal placement as possible, and any valuables recovered during salvage operation shall be turned over to the Incident Commander. If necessary, station padlocks may be secured from the nearest police station to temporarily replace broken locks on business establishments.

SECTION 6. OPERATIONS IN SPRINKLERED BUILDINGS

For the Fire Department to fulfill its responsibility of reducing fire losses to an absolute minimum, firefighters must have a complete knowledge of sprinkler systems, how to use them to control fire, and how to prevent unnecessary water damage during fires in sprinklered buildings. This knowledge can only be developed through a sound prefire planning and through constant training. Prefire planning is necessary to determine the location of sprinklered buildings within the area; the types of sprinkler systems in use; and the location of valves, drains, scuppers, sump pumps, and other accessories for controlling water.

When a prefire planning survey is conducted in a sprinklered building, three questions should be answered: What is the type of the system? Where are the control and drain valves? What can be done to remove water from the building?

A prefire planning survey may also be used to teach occupants how to prevent excessive water damage. For example, where stocks are piled too close to sprinkler heads, the possibility exists that a number of heads may fuse during a fire that could easily be controlled by only one head. Stocks should be piled to provide a minimum of 18 inches of clear area below sprinkler heads. Control valves and drain valves should be tested periodically to ensure that they are in working order. Any stock stored directly on floors should be on pallets or skids.

SPRINKLER SYSTEMS IN USE

Many different sprinkler systems are in use, each with its advantages and disadvantages. The systems are classified as:

1. Wet-pipe systems
2. Dry-pipe systems
3. Pre-action systems
4. Deluge systems
5. Combined dry-pipe and pre-action systems
6. Limited water-supply systems
7. Substandard or junior systems

Wet-Pipe Systems

A wet-pipe system employs automatic sprinkler heads attached to a piping system and a water supply so that water discharges immediately from sprinklers opened by a fire. These systems are in extensive use in San Francisco and are generally

installed to provide protection for structures and occupancies where the fire problem is not considered unique.

Dry-Pipe Systems

A dry-pipe system employs automatic sprinkler heads attached to a piping system containing air under pressure. Heads open automatically under fire conditions, and air in the piping system is released, triggering a dry pipe valve that allows water to flow into the system and on to the fire through the fused heads. Dry-pipe systems are installed where extremely low temperatures may occur in structures exposed to freezing temperatures, in cold storage plants, etc.

Pre-Action Systems

A pre-action system employs automatic sprinkler heads attached to a piping system that may or may not contain air under pressure. Additionally, a heat-responsive device opens a valve to supply water to the piping system and to fused heads. Usually installed in areas that may be subject to freezing temperatures, pre-action systems protect buildings that exceed the capabilities of standard dry-pipe systems. Basically the pre-action system is more sensitive and can provide water for fire control more quickly than the dry-pipe system.

Deluge Systems

A deluge system employs open sprinkler heads attached to a piping system normally dry and supplied with water after the activation of a valve by a heat responsive system. Deluge systems, because of their open-head feature, are able to deliver water immediately in large amounts throughout areas where explosive or highly combustible materials are handled or stored. Deluge systems may be located in flammable liquid mixing and handling plants, paint manufacturing plants, nitrocellulose handling and storage plants, and similar extra hazard occupancies.

Combined Systems

A combined dry-pipe and pre-action system is usually installed in structures where wet-pipe systems are impractical and where a number of dry-pipe valves would be required because of the possibility of extremely low temperatures. The automatic sprinkler heads are attached to a piping system containing air pressure, and a heat-responsive device is employed to open both the water supply valve and air exhaust valves. Water is therefore supplied to heads more quickly than where air must be exhausted only through fused heads.

Limited Systems

A limited water-supply system is an automatic sprinkler system not connected to a standard water system, but supplied with water by a pressure tank of limited capacity.

Substandard or Junior Systems

A substandard or junior system is installed to protect moderately hazardous areas in non-sprinklered buildings. One or more automatic sprinkler heads connected to the domestic water system may be installed in waste-storage rooms, janitor's closets, small basements, heater rooms, and other similar areas. These systems are classified as substandard because they do not incorporate water-flow alarms, Fire Department connections, a separate water supply, and other standard requirements. The systems do, however, provide necessary fire protection in non-sprinklered buildings. From a salvage standpoint, excessive water damage may occur through the lack of an audible warning device; therefore, water may flow from a fused head or heads for quite some time before discovery and may cause extensive damage.

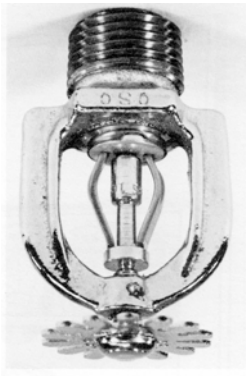
SPRINKLER HEADS

The two basic types of sprinkler heads are the upright and the pendant - so named for the way they are installed. Most sprinkler heads are stamped with either the letters SSU (standard sprinkler upright) of SSP (standard sprinkler pendant) on the deflector. Their differences are easily recognized: an upright sprinkler head usually has a large deflector curved at its circumference toward the sprinkler yoke, and a pendent sprinkler head has a small flat deflector. It is important to always use the correct type of sprinkler head during replacement.

Upright

Fusible Link

Pendant



Chemicle Pellet

Upright

Qucik Response

Sidewall (used)

Spent fuse

Heads of the correct temperature rating must also be used during replacement. The temperature rating of all automatic sprinklers is stamped on the soldered link or

some of the releasing parts. Fusing temperatures are also denoted by color. The color markings appear as dots on top of the deflectors, or more commonly the yokes or frame arms are painted.

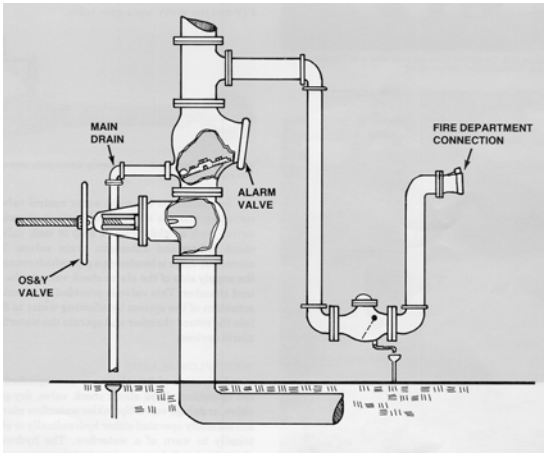
TEMPERATURE RATINGS OF AUTOMATIC SPRINKLERS

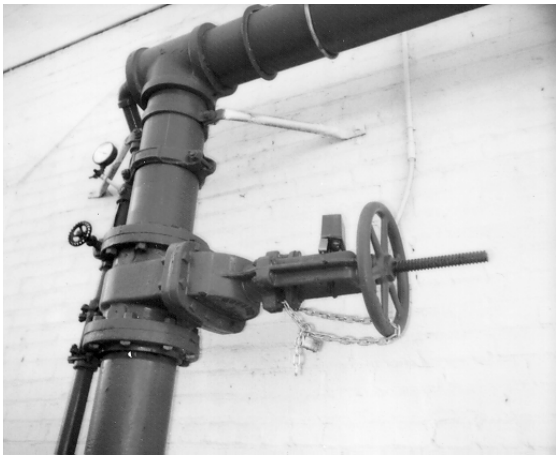
RATING	OPERATING TEMP.	COLOR	MAX CEILING
Ordinary		uncolored	
Intermediate	135°F - 165°F	White	100°F
High	175°F - 212°F	Blue	150°F
Extra High	250°F - 286°F	Red	225°F
Very Extra	325°F - 360°F	Green	300°F
High	400°F - 415°F	Orange	375°F
Very Extra	450°F	Orange	425°F
High	500°F		475°F
Very Extra			
High			

SPRINKLER VALVES

A knowledge of the location and operation of sprinkler control and drain valves is important to the firefighter, for these can be used to reduce excessive water damage. Two types of control valves are the outside screw and yoke and the post indicator. Both have a means of indicating whether they are open or closed.

OUTSIDE SCREW AND YOKE VALVE (O.S.& Y.)





The outside screw and yoke valve is installed in a valve pit, on a main riser, or on auxiliary lines. Pit and main riser valves control the entire system; valves on auxiliary lines may be used to control water flow to various floors or building sections. As its name implies, this valve has an outside screw indicating the position of the gate. When the screw is extended beyond the valve wheel, the gate is open.

POST INDICATOR VALVE (PIV)

The post indictor valve is located outside of the buildings, and has a sign that indicates whether the gate is open or closed. The valve also has a wrench usually sealed to a hasp on the post. In operating the valve, the seal must be broken and the wrench removed, turned over, and placed on the valve stem. An adjustable spanner wrench may be used if the post wrench is missing. Although the post wrench should not be padlocked to the hasp, sometimes this is the case. Firefighters should not hesitate to break such a lock, for the valve must be closed. A very few gallons of water can cause a great deal of damage - much more than the value of any padlock.

DRAIN AND TEST VALVES

The main drain, required on main risers, should be equipped with a sign reading **MAIN DRAIN** or **SPRINKLER DRAIN.** A drain adjacent to sectional control valve is also required and should be equipped with a sign reading **AUXILIARY DRAIN.** Inspector's test valves are installed in piping that taps into the sprinkler system and leads to an outlet equivalent to the flow of one sprinkler head. These valves are used to test alarm systems and are equipped with signs reading **INSPECTOR'S TEST.** These valves are also used to bleed the air out of sprinkler systems, as they are usually connected to the uppermost piping of the system. (Bleeding the air out of sprinkler systems prevents unnecessary false alarms from water surges.)

CONTROLLING SPRINKLER SYSTEMS

Stopping water flow from fused sprinkler heads immediately after determining that a fire is under control is a goal of modern fire departments. But this does not imply that sprinkler control valves should be indiscriminately closed. Steps to be taken by the Incident Commander on arrival at a fire in a sprinkler-equipped building are (1) to determine that all sprinkler valves are open by assigning a firefighter to check each valve and (2) to supply lines to Fire Department sprinkler connections. The fire should then be located and necessary steps taken to ensure that it is under control. Only then should sprinklers be shut off. Engine companies should lead dry lines into all buildings equipped with sprinkler systems. They should be charged only on the orders of the Incident Commander (100 psi).

Sprinkler heads can be shut off as necessary without interrupting water supplies to the balance of the system by using sprinkler shutoffs or wooden wedges. This procedure provides protection against the possibility of more serious situations developing, situations that could occur because a fire had traveled into concealed areas or because a fire apparently under control had regenerated suddenly and uncontrollably. Where individual heads are closed, the balance of the system remains in service.

Sometimes closing the valves is the only method of stopping water flow. Examples include:

- When individual heads are inaccessible because of their height, concealment, or obstruction

- When major parts of the sprinkler system have been ruptured or destroyed by explosion, roof or floor collapse, or other causes

- When a deluge system is involved

Under normal conditions, valves should never be closed unless the fire is definitely under control. Floor or sectional valves should be used to control flow if possible. Immediately after the correct valve has been closed, drains (main or auxiliary) must be opened. This allows water remaining in the system to flow harmlessly to the exterior of the building rather than into the building through open heads. The firefighter assigned to close a sprinkler must remain at the valve so that it may be quickly re-opened if necessary.

Sprinkler equipment should always be placed in service after a fire. This action will afford protection against the usual fires likely to occur and also against the added hazard of a rekindle. The person or company responsible for the protection of the building should be contacted, and they should reset the system immediately. If that person or company is not available, the following procedures are used to restore a wet sprinkler system to service:

Where water flow has been controlled by sprinkler shutoffs or wedges:

1. Close the floor or sectional, main riser, or post indicator control valve.
2. Open the main and/or auxiliary drain valve/s.
3. Allow the system to drain sufficiently so that water will not flow through the fused heads.
4. Remove sprinkler shutoffs or wedges from fused heads.
5. Replace fused heads with new heads of the correct type and temperature ratings. These should be obtained from the supply on the premises, if available, or from stock carried on the apparatus.
6. Close the drain valves.
7. Open the control valve.
8. Open the inspector's test valve to bleed the air from the system and to test the alarm device.

Where water flow has been controlled by closing the floor or sectional, main riser, or post indicator control valve:

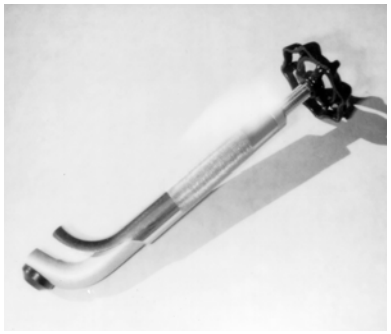
1. Open the main and/or auxiliary drain valve/s.
2. Remove fused heads.
3. Replace fused heads with new heads of the correct type and temperature rating.
4. Close drain valves.
5. Open the control valve.
6. Open the inspector's test valve to bleed the air from the system and to test the alarm device.

All truck companies are equipped with a sprinkler head assortment consisting of:

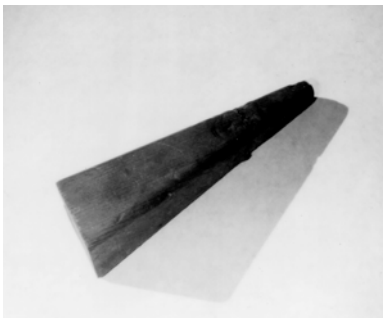
- 3 - 160 degree pendent heads
- 3 - 160 degree upright heads
- 1 - 212 degree pendent head
- 1 - 212 degree upright head
- 2 - sidewall heads
- 2 - flush heads
- Wrenches

When a sprinkler head is replaced from stock carried on the apparatus, the Sprinkler Replacement Agreement form is to be made out and forwarded to Headquarters. An additional supply of sprinkler heads is available at the Bureau of Equipment headquarters.

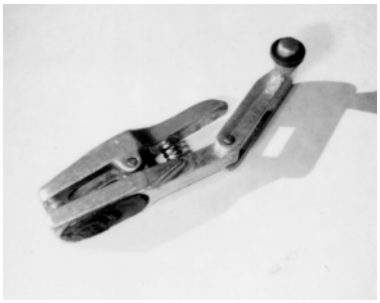
SPRINKLER SHUTOFF TOOLS



The **Sprinkler Stop Valve** is primarily used to shut down recessed sprinkler heads but it can also be used to shut down any type sprinkler head. It is opened and closed by turning the wheel handle at the bottom of the tool.



The **Redwood plug** is a quick and efficient manner of closing down water flowing from a sprinkler head. It is tapered and made of soft redwood which allows the tool to be inserted into the fused sprinkler head. Tap lightly with a axe to seat the tool and water flow will be stopped. Do not confuse the redwood sprinkler head with the redwood plug for broken pipes. The sprinkler tool is square at the large end and tapered; the redwood plug for broken pipes is round



The **Quick Fit Sprinkler Shutoff** is used to shut off water flow to all types of sprinkler heads. Results may not be as good when using on a recessed head. The jaws end is inserted into the sprinkler head and the fulcrum lever pulled down thereby opening the jaws and causing the tool to open and place pressure against the water flow from the sprinkler and therefore shutting down water flow.

RESTORING STANDPIPE SYSTEMS

Restoring wet standpipe systems is the responsibility of the management of the building. When firefighters use dry-pipe systems, it is their responsibility to drain the system, close all the valves, and restore all outlet and inlet caps.

FINAL WORD ABOUT SALVAGE AND OVERHAUL

The performance of effective salvage and overhaul during fire suppression activities in the community will demonstrate to citizens that there is concern for the protection of their lives and their property. During this time of crisis, small acts of extra effort by firefighters become important to victims and will be returned later in the form of goodwill and support.

Small household mementos carefully covered and saved for a youngster, parent, or senior citizen will assist in spreading a reputation of exceptional service for the Fire Department. Commercial or manufacturing occupancies of all sizes can profit considerably from efficient salvage operations that control water damage and protect valuable stock, records, and equipment. What is of value to others is difficult to determine during fire fighting activities. It is important, therefore, to follow the basic fire service objective of saving all property to the best of the fire department's capability. This requires salvage operations be performed with maximum speed and efficiency.

Effective overhaul work will result in much the same reaction from the community as that gained from effective salvage operations. Careful examination of the structure

for hidden fire ensures safety to all occupants through the elimination of rekindle ignition sources. Occupants become educated about the cause of fire in their building after investigation reveals the point of origin and hazard that started the fire. If the fire was incendiary, the public becomes aware that the Fire Department is pursuing the arsonist and is striving to eliminate a threat to the community. The building is placed in as safe a condition as possible before being turned over to the owner or occupant.

Salvage and overhaul serve a vital function in fire fighting operations and should be treated as such by all personnel. Training and equipment should reflect this importance, and every effort made to carry out these operations with enthusiasm and efficiency. The ultimate return for such effort will be manifested in not only better public relations, but also in the satisfaction felt by all personnel involved that it was a “job well done.”