A COMPARATIVE STUDY OF THE EFFECTIVENESS AND EFFICIENCY OF INTEGRATED AND NON-INTEGRATED INDUSTRIAL SECURITY ORGANIZATIONS

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ABSTRACT

A COMPARATIVE STUDY OF THE EFFECTIVENESS AND EFFICIENCY OF INTEGRATED AND NON-INTEGRATED INDUSTRIAL SECURITY ORGANIZATIONS

by Gordon Wayne Kettler

The objectives of this study were to evaluate the types of organizational structures employed by industrial security organizations and to arrive at an indication as to which method of organization was the most effective and efficient.

The study of the functionally integrated and non-integrated types of industrial security organization is a new area of study. Some studies have recently been done regarding the integration of police and fire activities in the municipal setting, but nothing has been done concerning this type of organization in industrial security; at least nothing has been found by the investigator. This study is the first step into this area, and it is felt that the ultimate answering of this basic question is of paramount importance to the industrial security profession.

Two industrial security organizations, similar in all aspects except for the organizational structure, were selected for study.

The effectiveness and efficiency of the two industrial security organizations was measured by taking various facts and figures from a common industrial security activities reporting form over a period of three and one-half years.

The results were quite clearly in favor of the integrated method of organization. While this study was conducted on only two industrial security organizations, there can be little doubt that the organizational structure influences the effectiveness and efficiency of an industrial security organization, at least to some degree. There are probably other factors not herein considered which affect the efficiency and the effectiveness, but the importance of the organizational structure must be conceded.

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CHAPTER I

INTRODUCTION

Industrial security is a very intangible function to a casual observer. He generally envisions it in a stereotyped manner whereby a "watchman", usually a semi-retired person, is tipped back in a comfortable chair slowly puffing on a well-charred pipe, probably in a semi-conscious condition. This image exists in the minds of many people today. Prior to World War II, this picture was probably more fact than fiction. Management expected that their "watchmen" would perform the job of keeping employees in and outsiders out; very little more was expected of them.

Since 1939, this concept of industrial security has changed radically. The government became concerned about the laxity of the industrial security organizations which were protecting the nation's industrial might. The problem of organizing a capable industrial security force in the United States was given to the Federal Bureau of Investigation. "The agents found American industry virtually had no security."[1] After the war the type of industrial security organizations that emerged was far different from the inefficient organizations that had existed prior to World War II.

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[1]"Tightening up Industrial Security," Business Week, (October 15, 1960), p. 183.

Many companies realized that there was a great economic value in keeping their security organizations at a high level. The war years provided management with examples of just how good industrial security organizations could be and many executives were reluctant to return to the pre-war type of industrial security, and indeed refused to. As a result, many high quality industrial security organizations exist at the present time.

Industry is now concerned not only in maintaining the efficiency of industrial security organizations, but also with the ever-rising costs of this and other functions not directly related to production, which reduce profits. This thesis studies the effects of organizational structure on the effectiveness and efficiency of an industrial security organization. The correct organizational structure provides a more effective and efficient industrial security force, many times at lower costs to management.

It is generally understood that no organization can occupy levels of effectiveness higher than those determined by the ability of its executives. "But it is not generally understood that the influence of superior organization upon the accomplishments of mediocre executives can raise the enterprise to heights not otherwise attainable."[2] In this

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[2]Dalton E. McFarland, Management Principles and Practices (New York: The Macmillan Company, 1958), p. 160.

day, a dollar's worth of security service is expected for each dollar spent. Therefore, it is felt that a study of the effectiveness and efficiency of an industrial security organizational structure is both appropriate and timely.

I. THE PROBLEM

Statement of the problem. Today, in the industrial security profession there are two basic methods of organizing an industrial security force. One is the integrated method, whereby all security functions are performed by one type of officer usually referred to as a patrolman. The other type of organizational structure is the non-integrated pattern. This is very similar to the majority of municipal fire and police departments in which the duties are divided among firemen and policemen. This thesis attempts to provide information which will indicate whether one method of organization is more effective than the other and if so, which one and to what degree.

Hypothesis. Due to the lack of research in the area in which this thesis dwells, the hypothesis must be based on other than theoretical grounds. It was necessary to use information from literature which was available and from actual experience in industrial security.

There are advantages and disadvantages to each type of organization; perhaps the actual determining factor is the setting in which they were found. The author has attempted to provide a situation in which this factor was nearly constant, as will be seen in subsequent chapters.

All scientific undertakings need a sense of direction and a basis for the analysis of results. The following is offered as the hypothesis of this thesis: The integrated type of organizational structure found in industrial security organizations is more effective and efficient than the non-integrated pattern of organization.

II. METHODOLOGY

Methodology. The first step in the method of this thesis is a detailed description of that variable which was tested, or the organizational structure of the two industrial security organizations selected for testing. This includes a detailed discussion of each organizational structure and a description of the duties of the personnel of each industrial security department. It is the purpose of this step to contrast the two methods of organization, in order to depict how the placement of duties and responsibilities vary from one organization to the other.

The second step is the examination of factors which were seen as important determinants of the type of demands

placed on each of the industrial security organizations. It is clearly shown that the demands placed on both of these industrial security organizations were quite similar. The variables which are examined are as follows:

1. Facilities being protected - a general description of the physical facilities being protected by each security organization.
2. Fire hazards and protection provided - a listing and description of high fire hazards present in each facility and the protective measures taken.
3. Theft hazards and protection provided - a listing and description of the high theft areas present in each facility and the protective measures taken.
4. Departmental personnel and equipment - this portion will consider hiring requirements, salary, fringe benefits, training provided by the company, and equipment made available to department personnel.
5. Centralized control - a description of the controls placed upon both organiza-

tions by their parent corporation,

and their common fire underwriter.

The facility was selected as the variable to be proven constant, because it was deemed necessary that in order to provide a valid comparison the facility in each case should be quite similar to the other in size, construction, processes, products and services rendered.

A discussion of the fire hazards which were present in each of the facilities is necessary if the frequency and severity of fires is used as a measurement of organizational effectiveness. The information for the discussion of fire hazards was acquired through an inspection of each facility in which all fire hazards and protection provided were noted. By showing that approximately the same amount of fire hazards existed in both organizations, it can be postulated that the frequency and severity of fires which occurred in each facility reflects the effectiveness and efficiency of the respective organizational structures.

A similar method of exploration and rationale lies behind the study of security hazards which were present in each facility. It is necessary to show that the same levels of security hazards existed in each facility in order to contend that the frequency and severity of the thefts which occurred in each facility indicates the effectiveness and efficiency of the respective organizational structures.

The same quality of personnel and equipment should have existed in both organizations for this to be a valid comparison. Thus, those things which helped determine the quality of personnel of a department is examined. These things include: hiring requirements, salary rates, fringe benefits, training provided, and equipment made available.

Lastly, the centralized control that was exerted by the corporation and the fire underwriter is also examined in order to determine the effect it had upon the policies and practices of each security organization. It is shown that these policies and practices were influenced in such a way that they are similar.

The third step is the collection of data concerning the effectiveness and efficiency of the two industrial security forces under study. This, of course, is a very difficult thing to measure, because many of the services and functions performed by industrial security organizations are incapable of being measured. Nevertheless, it is felt that the two primary functions of an industrial security organization are the prevention of fire and the prevention of theft. Because of this, the following factors serve as indicators of the effectiveness and the efficiency of the two industrial security organizations:

1. Number of no-loss fires reported.

2. Number of loss fires reported.
3. Total losses caused by fires.
4. Number of times municipal fire department was called upon to furnish assistance.
5. Number of volunteer plant fire brigade members trained.
6. Number of company property losses reported.
7. Number of employee property losses reported.
8. Value of company property losses reported.
9. Value of employee property losses reported.
10. Value of company property recovered.
11. Value of employee property recovered.

This data was collected from records covering a three and one-half year period. This is considered an adequate period of time to provide an overall indication of the respective departments in these areas. Any period of time extending much beyond this would not have enabled the investigator to check the type and extent of hazards which were in existence.

The last step in the methodology is an analysis and a set of conclusions based upon the data secured by the preceding ways. The analysis is made in a logical manner comparing data of the two sources. All of the areas were taken into consideration before any final conclusions on the relative effectiveness and efficiency of the two organizational structures were made.

Sources of information. A great deal of library research work was, of course, used in order that the investigation of the variables could be done in an intelligent manner. This included the consulting of sources dealing with the question of organizational structure, and much technical research dealing with fire and theft hazards and their correct protection.

Personnel who provided centralized control over the two respective organizations were consulted and interviewed in order that an intelligent level of understanding could be reached regarding the type and degree of centralized control that was provided by them.

The two industrial security organizations that were studied supplied the bulk of the information gathered. This has been acquired by interview and consultation with their personnel and by inspection of the facilities which they protected. These two organizations were chosen because of

their great similarity in all respects, except for their different organizational structure.

In due respect for the privacy of the organizations studied, their parent corporation and the fire underwriters association, an effort has been made to keep them anonymous. All the names in this thesis are fictitious; however, the facts represent real situations.

III. IMPORTANCE OF THE STUDY

Today, industrial security is faced with demands which would seem at first glance to lead it in opposite directions. The first demand is to reduce, or at least hold the line on, departmental expenditures. The second demand, placed upon it by management, is to maintain a high level of effectiveness and efficiency.

By holding down costs, the company can more easily meet or better their competitors' sales prices. Thus, there is a desire on the part of management to reduce all of its costs, especially those that are not directly related to the production effort. Management has a very just reason for wanting security costs held at a minimum.

However, it is also justified in demanding a high level of security. This is readily borne out by reviewing two sobering facts. First, "according to FBI reports,

thieves concentrate on plants at the rate of one a minute, 24 hours a day."[3] The second fact is that a single fire on August 12, 1953, caused the destruction of the Hydra-matic automatic transmission plant of the General Motors Corporation causing a direct loss of approximately $55,000,000 and probably a similar amount in indirect losses, which can never be measured accurately.[4] These two facts demonstrate the reason why the level of industrial security cannot be allowed to diminish; indeed it must continuously rise.

One way in which both of these needs might be met would be to organize the industrial security organization in the most streamlined, effective, efficient, and appropriate way possible. The author believes that this study is of great importance to the industrial security profession because it provides a chance to take a close look at the degree of importance that the organizational structure of the industrial security department has in regard to the department's effectiveness and efficiency.

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[3]David Skowronek, "How to Slam the Door on Plant Thieves," Business Management, XXI (March, 1962), p. 47.

[4]National Fire Protection Association, "General Motors Fire," Quarterly of the National Fire Protection Association, XLVIII, (October, 1953).

IV. DEFINITIONS OF TERMS USED AND ORGANIZATION OF THE REMAINDER OF THE THESIS

Integrated. The integrated type of industrial security organization is that which is organized in such a manner that there are no policemen and firemen per se. Their duties and responsibilities are combined and carried out by patrolmen. It should be noted that there may be several specialists even in the integrated type of organization who carry out such functions as criminal investigations, fire brigade training and fire inspections. This demand for specialization calls for two or three men out of a total force of one hundred men.

Non-integrated. In the non-integrated type of organizational structure there are strictly "specialists" as compared to the "generalists" found in the integrated type of organization. In the non-integrated type of organization, the duties and responsibilities are separated and the personnel are of two types. One group is referred to as firemen, and they perform duties in the area of fire prevention and protection. The remaining members are usually referred to as patrolmen, but differ from the patrolmen of the integrated type of organization in that they perform exclusively police-type functions. Conceivably, in an extreme emergency these specialists of the non-integrated type

of organization might be called upon to perform the other's duties, but ordinarily this would not take place. The fire and police personnel in a non-integrated type of organization may or may not be responsible to the same department head, depending upon the particular situation.

In order that the reader may grasp the direction of this thesis, an understanding of what the investigator wished to study and how it was accomplished is necessary. Therefore, a short descriptive model of the thesis follows.

Chapter II provides the reader with a review of the literature that pertains to the study at hand. This review of the literature is divided into three sections, going from general organizational information to literature that is specifically related to the question in this study; namely, which method of organization is the most effective and efficient. The three areas are: (1) literature dealing with the advantages and disadvantages of specialization, (2) a discussion of findings from studies pertaining to integrated fire and police services at the municipal level, and (3) a review of literature regarding the values of integrated and non-integrated industrial security organizations. The purpose of Chapter II is to provide the reader with a background regarding trends that were reviewed in reviewing the literature dealing with this subject.

Chapter III contains a description of the two organizational structures which have been selected for study. These two formal organizational structures are compared and contrasted with each other. They are also related to the literature which is reviewed in Chapter II.

Chapters IV, V, VI, VII, and VIII describe variables which are very similar. These variables include: the physical plants being protected, the fire and security hazards present and measures taken to cope with them, personnel policies and working conditions in each organization, and lastly centralized control provided by the parent organization and insurance regulations placed on both of them. The purpose of these chapters is to demonstrate to the reader that, except for the difference in organizational structure, the two industrial security organizations were very similar in all other respects. Because of this, it is assumed that any differences in the effectiveness and efficiency of the performance of the two organizations is a reflection of the ways in which they were organized.

Chapter IX deals with measuring the effectiveness and efficiency of the two organizations over a period of three and one-half years. These figures are then compared and analyzed, the results, conclusions and implications are made as to which method of organization is the most effective and efficient and to what degree this advantage exists. This

information is provided in Chapters X, XI, and XII respectively.

CHAPTER II

REVIEW OF THE LITERATURE

In reviewing related literature, no studies were found which were directly related to this thesis; however, there was literature available which provided a greater understanding of the problem being studied.

The literature which dealt with organizational principles in general provided a basic background from which to work into the more specific questions dealing with the values of integrated fire and police services. The information gathered from the general field of organization pertaining to the advantages and disadvantages of specialization were particularly useful.

A significant amount of research work has been carried out on the value of integrated departments of public safety in small cities throughout the United States. This group of studies has provided the author with information on the values of integrated fire and police services.

The field of industrial security, however, has not provided research work compared to that conducted in the area of public safety. Nevertheless, a wealth of information has been drawn from experienced sources and related to industrial security.

I. LITERATURE DEALING WITH THE ADVANTAGES AND DISADVANTAGES OF SPECIALIZATION

William Foote Whyte has pointed out that prior to 1933, specialization of function was taken for granted as always being the most effective means of organizing any work function. In 1933, when Elton Mayor's book, Human Problems of an Industrial Civilization, was published, the absolute value of specialization came under fire and has been continuously questioned since that time. According to Whyte, "extreme functional specialization does not necessarily create the most efficient organization."[5]

Gardner and Moore have contended that specialization is certainly necessary in our modern world, but that over-specialization must be guarded against. They indicated that over-specialization takes place when the degree of specialization brings about low employee morale. This state of over-specialization may be no more widespread than the involvement of a few individuals. "Over-specialization can also involve whole departments in an organization, as well as individual employees."[6]

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[5]W. Lloyd Warner and Norman H. Martin (ed.) Industrial Man (New York: Harper and Brothers, 1959), p. 309.

[6]Burleigh B. Garner and David G. Moore, Human Relations in Industry (Homewood, Illinois: Richard D. Irwin, Inc., 1955), p. 373.

Strauss and Sayles also have touched upon the importance of specialization in our way of life, but they warned that specialization may have a negative effect upon employee morale. "The use of specialization as a means of increasing output and efficiency has many repercussions for human relations within the organization, some of which pose complex problems."[7]

McFarland has shown specialization as creating serious problems of coordination of functions within an organization. According to him, it is one of the key reasons for the breaking down of coordination in an organization. In his view, individuals, especially in executive positions, become highly specialized and then they lose touch with the rest of the organization; thus, they can not perform their functions in the most beneficial way for the organization as a whole. "Concentration in their specialities tends to blind staff executives to the realities of the business as a whole, making their coordination with line activities difficult."[8]

O.W. Wilson has expressed the belief that the question of specialization plays an important part in the degree of

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[7]George Strauss and Leonard R. Sayles, Personnel (Englewood Cliffs, New Jersey: Prentice Hall Inc., 1960), p. 353.

[8]McFarland, op. cit., p. 273.

effectiveness a police department can achieve. "Decisions relating to specialization are extremely important in police administration and greatly affect the operation of the department."[9]

Wilson felt that the decision is not whether a police department should have specialization or not, but rather to what degree should it specialize. To decide this, the administrator has to make a subjective judgment. He must take into consideration the advantages of specialization which Wilson has listed as the following: responsibility placed, experts developed, training improved, esprit de corps promoted, special police interest stimulated and public interest aroused.[10]

Against these advantages, the administrator must weigh the following disadvantages: usefulness limited, general police interest restricted, tasks of command made difficult, other administrative problems created, development of a well-rounded police program hampered, territorial coverage diminished.[11]

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[9]O.W. Wilson, Police Administration (New York: McGraw-Hill Book Company, Inc., 1950), p. 27.

[10]Ibid., pp. 30-31.

[11]Ibid., pp. 31-32.

In summary, Wilson has stated that the advantages and disadvantages must be weighed and a decision made as to the degree of specialization needed. He has further stated that upon reaching this point of decision, the following determining factors, which help in making this decision, are present:

> The quality of personnel, the need for special skill and ability, the importance of the job, the amount of work to be done, the need for readily available services, intermittent emergency needs, need of maintaining skill, need for planning and control, the dissimilarity of the task to other duties, attitude of personnel towards the task, interference with usual duties and the size of the force and area of jurisdiction.[12]

The International City Managers' Association has dictated that some specialization is necessary for an effective police operation, especially in the larger urban forces. However, they are quick to point out its disadvantages. "Specialization creates difficult problems of integration and coordination; it divides the department into separate forces that sometimes operate independently of each other."[13] Because of these and other serious disadvantages they stated that, "specialization should be held to the minimum consistent with effective operations."[14]

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[12] Ibid., pp. 32-35.

[13] International City Managers' Association, Municipal Police Administration, (fourth edition; Chicago: The International City Managers' Association, 1954), p. 68.

[14] Ibid.

In this first section, it is clearly demonstrated by the various authors that specialization is a necessity in our modern world. It is necessary to have some division of labor, but they point out that the advantages of specialization must be weighed against its disadvantages. Various viewpoints expressed on specialization in the municipal setting will now be presented.

II. LITERATURE ON THE VALUE OF INTEGRATED FIRE AND POLICE SERVICES ON THE MUNICIPAL LEVEL

Charles S. James has conducted a large group of detailed studies on numerous integrated fire and police services located in small cities throughout the United States and has arrived at the conclusion that this method of organization has many advantages which merit close examination.[15] He has pointed out that integrated fire and police services are not only feasible, but offer a real opportunity for cities of almost any size to provide police and fire services on a more efficient and economical basis than is possible under separate departments.[16]

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[15]Charles S. James, A Frontier of Municipal Safety (Chicago: Public Administration Service, 1955), Also see James, Police and Fire Integration in the Small City (Chicago: Public Administration Service, 1955).

[16]Charles S. James, "Concepts of Fire-Police Integration," Public Management, (September, 1955) pp. 194-198.

The National Board of Fire Underwriters has also studied this question of integration of fire and police services and has arrived at a completely opposite conclusion from Mr. James. Their assertion has been that the real test of an integrated organization should be whether or not the fire and police functions have enough similarity so that the use of the same men is practical. They have concluded that the amount of similarity needed to make this type of organizational structure feasible does not exist.[17]

The International City Managers' Association has also given the question of integration of fire and police services on the municipal level careful consideration. They have concluded that there is a multitude of factors which could eventually bring about wide-scale adoption of the integrated type of organization. Their list of the factors which may bring this about follows:

> The steadily rising cost of government, the inadequacy of volunteer fire forces, the insistent demands on the part of policemen and full-time paid firemen for a reduction in the work week, the recent technological developments in communications, transportation and other equipment, and the increased attention to the importance of organizing to prevent fire and crimes--all have tended to give municipal administrators reason to contemplate the feasibility of employing "public safety officers"

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[17] "Combining of Fire and Police Departments," Special Bulletin No. 300, November, 1953 (New York: National Board of Fire Underwriters, 1953).

who would be trained to perform both police and fire functions.[18]

They also have been quite deliberate in pointing out that although integration does have certain economic advantages over the separate fire and police services, it must also provide a higher level of protection. "Unless the organization can meet the test of better service it is not likely to survive as an economy measure alone."[19]

The International City Managers' Association have concluded that with adequate advice and preparation a capable city manager could provide his community with adequate service under this type of organization. "He may find a possibility of better service offered by integrated public safety organizations as exemplified by the experiences of the cities which have tried them."[20]

In this section, various expressions of agreement and disagreement regarding the question of integration and non-integration of fire and police functions at the municipal level have been presented. It is quite evident that there are advantages and disadvantages in both integrated and non-integrated organizations. On the industrial level, viewpoints

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[18]International City Managers' Association, Municipal Fire Administration, (sixth edition; Chicago: The International City Managers' Association, 1956), p. 58.

[19]Ibid., p. 67.

[20]Ibid.

have also been expressed by various authors, some of which are presented in the following section.

III. LITERATURE ON THE VALUE OF INTEGRATED FIRE AND POLICE SERVICES ON THE INDUSTRIAL SECURITY LEVEL

John L. Buckley has done considerable writing on the question of integration within industrial security. He has expressed a strong belief that the answer to the question of how to provide a higher quality industrial security organization is the integration of fire, police and other closely related functions under the direction of one man, a security director. "Only an integrated organization with a defined area of responsibility can do the total job with any degree of efficiency."[21]

Buckley has strongly advocated total integration, a scheme whereby all phases of loss-prevention would come under the security director's control. This, he has stated, would promote the highest possible degree of loss protection.

> What is urgently needed is an integrated approach to loss prevention by encouraging management to consolidate the various functions under a professional industrial security manager.[22]

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[21]John L. Buckley, "The High Cost of Pilferage," Law and Order, XI (October, 1963), p. 35.

[22]John L. Buckley, "Industrial Security," Best Insurance News Fire and Casualty Edition, LXX (January, 1962), p. 106.

In addition to the normally integrated functions, Buckley would have added the following to the direction of the director of security: safety, control of proprietory information, insurance, industrial salvage, emergency planning and mutual aid. Buckley may be termed a very strong advocate of the concept of total integration of all loss prevention functions. He feels that these functions which are related in purpose should be integrated into one operation.

> From an organizational point of view it is very difficult to separate the duties of the plant protection officer from the duties of the fire prevention specialist, security or safety specialist. All of these people strive towards the same objective--the prevention of loss in all forms.[23]

John Norton has expressed the thought that perhaps the question of integrated security functions is being overlooked. According to him, although conditions may dictate the desirability and necessity of having a separate fire department, in other cases it is no longer necessary. Though a company may have had a fire department for years, perhaps it would do well to look at the overall problem and ask, "Do we need a company fire department?". Because a company has always had a fire department is no basis for saying it currently needs one.[24]

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[23] Ibid.

[24] John Joseph Norton, "The Security Executive Must be a Businessman, too!," Industrial Security V (April, 1961), p. 20.

Mr. Norton expressed the belief that in many cases a company fire department could be replaced with one well-trained fire inspector.

> A careful review of our individual situations could well reveal that one well-trained fire inspector or marshal would suffice to stay abreast of all hazardous situations in our plant.[25]

This, he inferred, would free personnel (previously exclusively firemen) to perform the functions of a patrolman in an integrated fire and police organization.

However, this is not always possible. Special fire hazards, absence of a close, well-trained and well-equipped municipal fire department, and other factors may make it necessary to maintain non-integrated fire and police services. While he expressed a belief that under certain conditions a non-integrated type of industrial security organization may be called for, he maintained that there is a definite possibility that in certain non-integrated industrial security organizations it would be beneficial for them to be integrated.

Karl W. Heinlein also has studied the value of integration of industrial security organizations. He has concluded that the integration of firemen, policemen and safety specialists provides an actual economic gain for the company being protected. He stated that an evaluation will

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[25] Ibid.

show a relationship between fire, accident, and other losses and the constantly rising costs of insurance, downtime, and other financial drains the company must meet. It is simply good business to take a fresh look at the plant security.[26]

Francis X. Jahn offered the Westinghouse Defense Center, of which he is security manager, as an example of integrated security. In this structure, all phases of security rested with the security manager; this included: visitor control, classified documents control, security education, security policies, practices and procedures, police and fire protection. This security organization had no fire department as such. There were only two fire specialists while the remaining force was made up of general patrolmen and their supervisors.[27]

The National Industrial Conference Board viewed the question of integration as a question which is best decided by the particular security organization. To them, the fact that one security organization is integrated while another is not does not provide an example of either a bad or a good situation. However, they did indicate that in those industrial

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[26]Karl W. Heinlein, "Why we Think Professional Guards Cut Security Costs," Pulp and Paper, XXXV (April 3, 1961), p. 35.

[27]Francis X. Jahn, "Industrial Security Planning a Total Protection Concept," Industrial Security, VII (October, 1963), p. 28.

security organizations which are not integrated, it is necessary for the guards to share in some of the responsibility of fire protection and prevention.

> While many companies do not incorporate fire protection and prevention under the plant protection chief, practically all companies emphasize these functions of plant protection and provide special training and instruction in fire prevention.[28]

There are examples of non-integrated industrial security organizations in the literature, one of which is the General Electric Everdale plant. The operation in this plant was so specialized that they had two completely separate patrol forces; one was for police type functions and the other was for fire protection and prevention duties.[29]

The National Fire Protection Association presented as a key determinant in selecting the degree of specialization needed in industrial security, especially with regard to fire protection and prevention, the size of the industrial establishment being protected.

> The larger a plant or multi-plant organization is, naturally the more elaborate will be its organizational

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[28]National Industrial Conference Board, Industrial Security, II. Plant Guard Handbook (Studies in Business Policy No. 64. New York: National Industrial Conference Board, 1953), p. 27. Also see National Industrial Conference Board, Industrial Security, I. Combating Subversion and Sabotage (Studies in Business Policy No. 60. New York: National Industrial Conference Board, 1952).

[29]James A. Davis, "Plant Security," Industrial Security, V (July, 1961), p. 10.

> structure, and probably the more need there will be for particular expertness in such specialists as the Manager of Fire Safety.[30]

The National Fire Protection Association when speaking of the functions of the plant guard expressed the principle that the guard's most important job is the detection of fire. But they did not feel that the guard's duties should be combined with that of the fireman, in the actual fighting of fires as seen in the following two paragraphs:

> In the average industrial plant, the greatest importance of the guard's (or watchman's) rounds is his service to fire protection rather than plant "security" as such.
>
> Job requirements must be developed for plant guards who must be fully trained in all the required techniques. It should be noted that these job requirements, while necessarily including prompt notification, in many cases should not include fire fighting.[31]

Yet while displaying a viewpoint which favors non-integrated fire and police functions in industry, they nevertheless recognized that their purposes are the same; namely, the prevention of all forms of loss to the company which they serve.

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[30]National Fire Protection Association, Portable, and Manual Fire Control Equipment (Vol. VIII of National Fire Codes. 10 Vols.; Boston: National Fire Protection Association, 1963), p. 6M-2.

[31]Ibid., p. 6M-13.

> The fire-safety phase of loss-prevention, therefore, must be integrated or coordinated with the overall management phase of loss-prevention in any plant or in any multi-plant organization.[32]

A review of the literature has shown that there is by far a larger amount of literature dealing with generalization in integrated organizations and its advantages. However, there is a definite lack of literature dealing with the values of non-integrated security departments as compared to integrated security departments. This thesis, as stated before, was undertaken to establish the merits of the two types of security organizations.

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[32] Ibid., pp. 6M-2 - 6m-3.

CHAPTER III

DESCRIPTION OF ORGANIZATIONAL STRUCTURES

The purpose of this chapter is to provide an accurate description of the organizational structures of the two industrial security organizations which were examined. After reading this chapter, the reader will be able to clearly conceptualize the basic differences between integrated and non-integrated industrial security organizations. Although these differences do exist, the reader will find there are common functions to be performed.

This chapter of the thesis is formulated by following the flow of authority down the formal organizational charts which are illustrated on the following pages. Both organizations are dealt with at the same time, since it is felt that the discussion will be logical and will provide the needed comparison and contrast between these two organizational structures. It is imperative that the basic differences in the two methods of organization be understood at this time, since this is the variable upon which the remaining chapters are based.

I. IDENTIFICATION OF ORGANIZATIONS

At this point, it is necessary to identify the two companies for which the respective security staffs provided

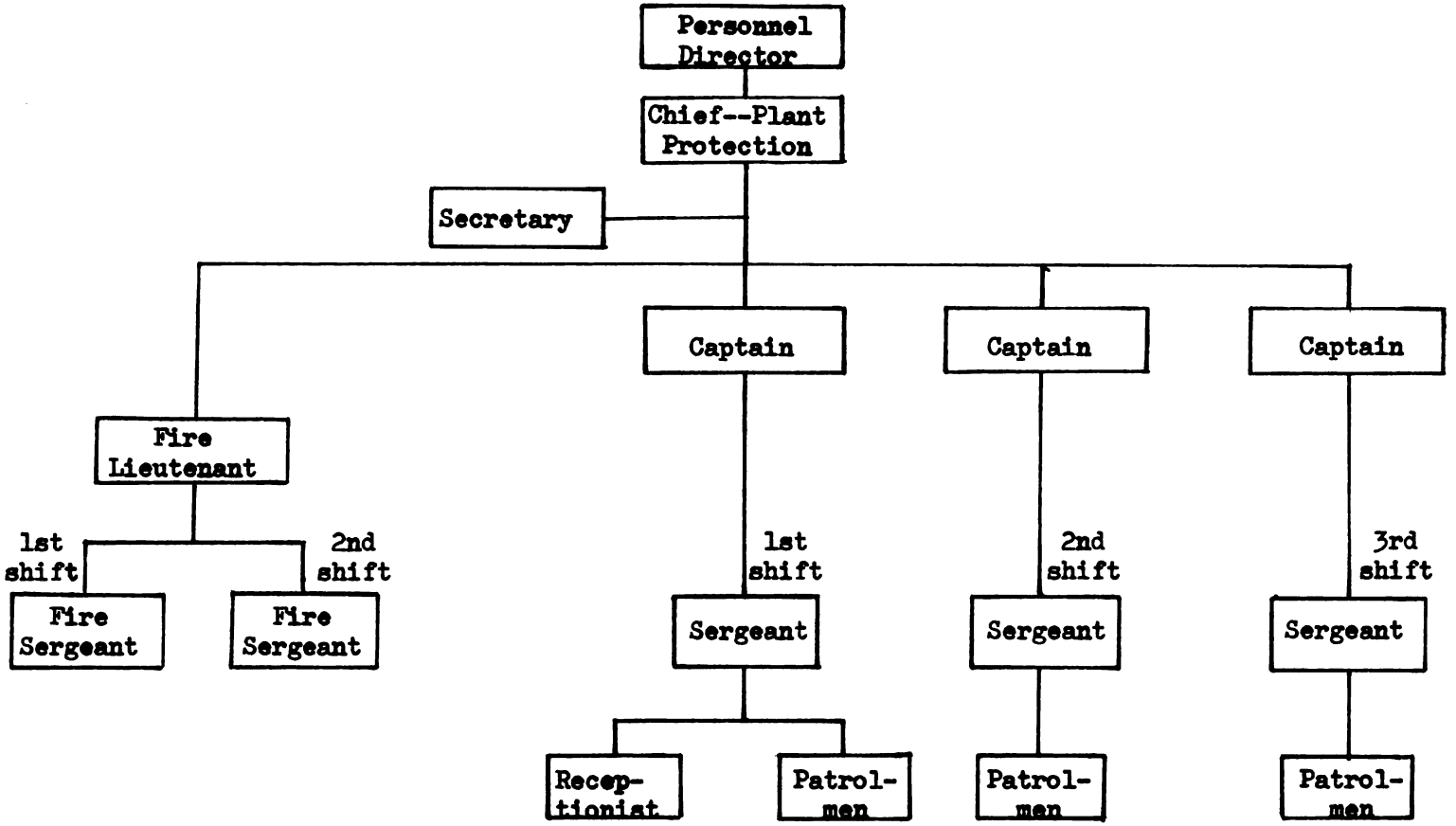

FIGURE 1

ORGANIZATIONAL CHART OF THE ATLAS MANUFACTURING DIVISION

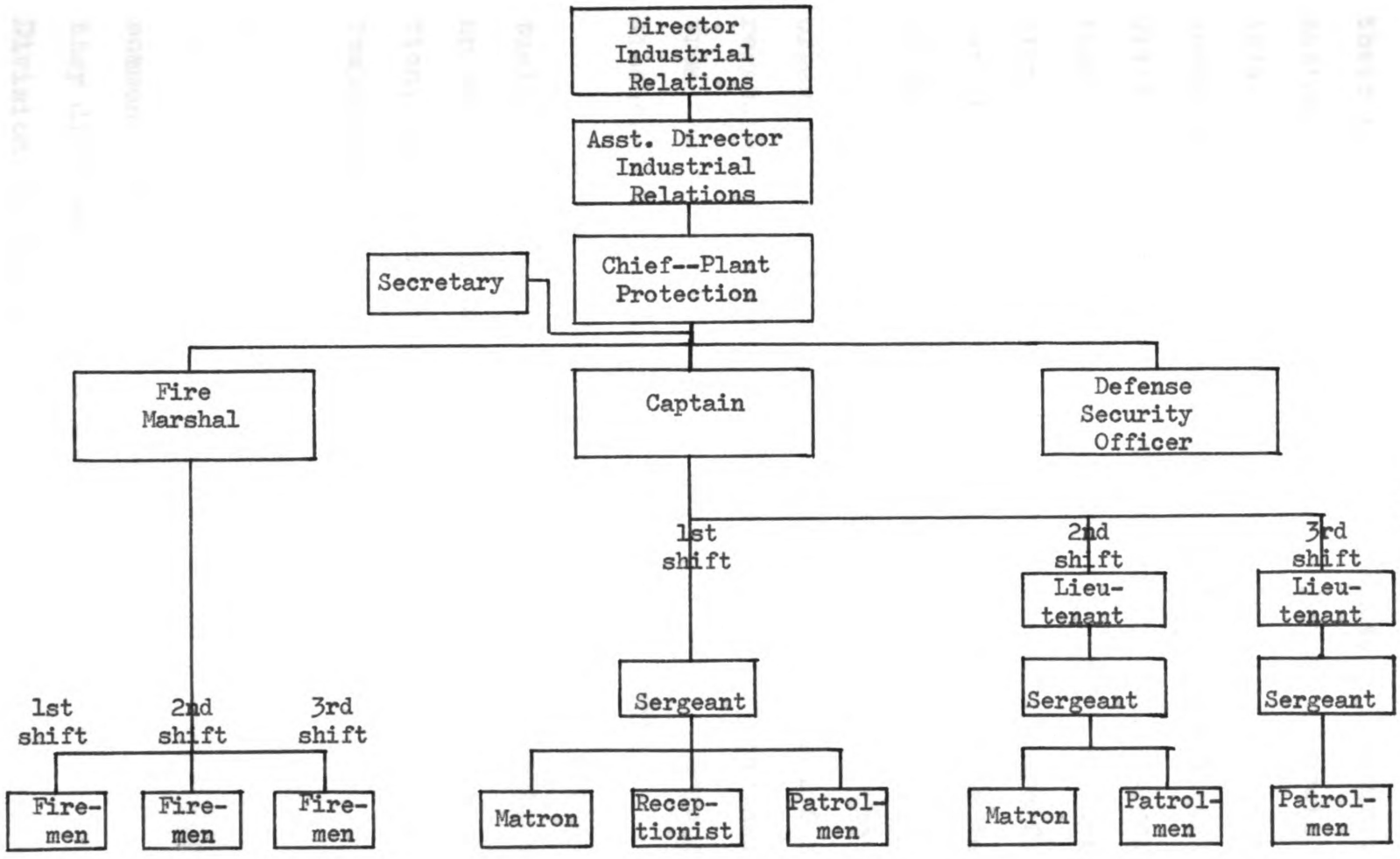

FIGURE 2

ORGANIZATIONAL CHART OF THE BARTELL EQUIPMENT DIVISION

their services. The integrated industrial security organization is referred to from this point on as protecting the Atlas Manufacturing Division and the non-integrated industrial security organization is referred to as the Bartell Equipment Division. These divisions are members of a larger corporation which is referred to as the Universal Products Corporation. As previously mentioned, these names are fictitious, but the facts submitted regarding them are true descriptions of the actual situation under study.

Before delving into the description of the two organizations it is necessary to provide a brief statement regarding the amount of control and direction they received from the corporation level security staff. This subject is discussed in greater detail in Chapter VIII.

The centralized corporation security staff was virtually in a consulting position. Plant security was left up to the local or division management. Within the corporation, the actual security management was a decentralized responsibility.

II. DEPARTMENTAL DESCRIPTION

Both security organizations were located within a common departmental structure. While having common functions, they differed as to the name assigned to each. In the Atlas Division, it was referred to as the Personnel Department.

In the Bartell Division, it was known as the Industrial Relations Department. While these two departments had different labels, functionally they were nearly identical. Both of these departments provided the following services for their respective divisions: hiring and control of all hourly and salaried personnel, labor relations, control of medical services provided to employees, administration of all insurance and similar services provided by the division for the employees, the suggestion program, control of the safety efforts put forth by the respective divisions, control of all education and training endeavors, and the administration of the industrial security organization. Thus, while referred to under different names, for the sake of this study it is sufficient to say that each industrial security organization was located within a larger department which was functionally the same in both instances.

III. ADMINISTRATIVE HEADS

The administrative heads of both industrial security organizations were the heads of the personnel and industrial relations departments, respectively. Again, as the title of these two departments differed, so did the title of the administrator; one was called the Director of the Personnel Department and the other was denoted as the Director of the Industrial Relations Department.

The first real difference in the flow of authority is seen in the flow from the respective directors to the chiefs of plant protection. In the Atlas security organization, it flowed directly from the Personnel Director to the Chief of Plant Protection. In the Bartell security organization, it flowed to the Assistant Director of Industrial Relations, and then on to the Chief of Plant Protection. This difference is not of great importance to this study as the Chief of Plant Protection in either setting had nearly equal access to top management.

IV. DESCRIPTION OF SECURITY ORGANIZATIONS

The Chiefs of Plant Protection in both security organizations were the executive heads of their organizations. They both performed a multitude of similar functions of which some of the most important are listed at this time. They were responsible for: the control of the flow of company property from the premises, the control of entrance and exit of company personnel, corporation personnel, vendors, suppliers and visitors to and from the division's property. They were also responsible for maintaining harmonious relations with municipal, country, state and federal law enforcement agencies with which they were, or might be brought into, contact. They were also responsible for the selection and training of all security personnel and the providing of

adequate fire protection.

At this point, the discussion shall be directed to the flow of responsibility and authority to that area in each security organization which dealt with the provision of fire protection and prevention. Within the Bartell security organization, the bulk of this function lay directly with the Fire Marshal. He was responsible for maintaining harmonious relations with all local fire departments with which he might conceivably be in contact. He was also charged with the organizing, maintaining, and training of the plant volunteer fire brigade. He directed all of the actions of the personnel which made up the division's fire department, which had ten members. He had the responsibility of keeping all records pertaining to fire protection and prevention. When inspections were conducted by fire underwriting company representatives, he accompanied them and handled their recommendations. He was directly responsible to the Chief of Plant Protection for his actions, but received little in the way of actual technical advice from this source. He had a great deal of freedom. He was a person who had highly specialized skills regarding fire protection and prevention, and did not perform police-type functions and activities.

The firemen were directly responsible to the Fire Marshal. They were not responsible to the other supervisors of the industrial security organization in a direct manner.

Each fireman was responsible for the inspection of certain sections of the premises for fire hazards and the condition of fire fighting equipment. They also issued cutting and welding permits when the need arose, and acted as fire watches in extra hazardous situations. They also maintained the fire fighting equipment, which involved recharging fire extinguishers, installing sprinkler systems, and testing fire hoses. They also responded to all fire alarms, (similar to a municipal fire department) with the appropriate fire fighting equipment and extinguished the fire. The firemen at the Bartell Equipment Division, like their immediate supervisor, the Fire Marshal, were specialists. They performed strictly fire-type functions.

The Atlas security organization provided fire protection and prevention in a very different manner. The duties performed by the Fire Marshal at the Bartell Division were performed by the Chief of Plant Protection, a Fire Lieutenant and two Fire Sergeants. The Chief of Plant Protection was responsible for maintaining harmonious relations with all local fire departments with which he was, or might be brought, in contact. He was also responsible for the purchase of all new fire fighting equipment for the division. The Fire Lieutenant and the two Fire Sergeants were the only specialists with regard to fire protection and prevention activities. Even this statement must be qualified because the two

sergeants were frequently called upon to take on the duties of the regular shift sergeants. The Fire Lieutenant was the only true specialist as compared to the eleven fire specialists in the Bartell security organization.

The Fire Lieutenant and the two Fire Sergeants were directly responsible to the Chief of Plant Protection for the following activities: (1) organization, maintenance, and training of volunteer plant fire brigade members, (2) inspection of fire fighting equipment and fire hazards, and (3) writing of cutting and welding permits. The task of inspection and issuance of cutting and welding permits was supplemented by the entire personnel of the Atlas security organization. The Fire Lieutenant and Fire Sergeants were responsible for performing police-type functions along with their fire prevention and protection duties.

There were no firemen as such within the Atlas security organization. In case of a fire, the responsibility for extinguishing it lay with those members of the plant volunteer fire brigade nearest at hand and with all members of the security organization. Each man in the Atlas security organization was both fireman and policeman and it was each man's equal responsibility to respond to a fire alarm and extinguish the fire.

The repair and installation of fire equipment was accomplished by employees who were referred to as fire

maintenance employees. These persons were not members of the Atlas security staff, although like many in the plant they were members of the volunteer fire brigade and were charged with responding to fires in the areas in which they worked. Unlike the firemen of the Bartell security staff, they did not respond to an alarm in an area which was out of their general work area. They could have, however, supplemented industrial security personnel with the inspection of fire fighting equipment, but not with the inspection of hazardous areas.

The fire maintenance employees were not under the direct supervision of any member of the Atlas security staff as were the firemen at the Bartell Equipment Division. They were members of the factory maintenance department. To receive their assistance, the industrial security department had to make a request to the factory maintenance department which in turn issued the appropriate work order to the fire maintenance employees.

The methods used to accomplish the fire protection and prevention activities at these two security organizations were quite different. At the Atlas security organization, the emphasis was placed upon the development of generalists. There was only one man who had true specialized fire-type duties out of a total force of ninety-eight. At the Bartell security organization, the emphasis was placed on the

development of specialists. There were eleven men who had specialized fire-type duties out of a total force of ninety-nine.

Because classified government work was carried out by the Bartell Equipment Division, it was necessary for their security organization to have a person who was referred to as the Defense Security Officer. He took care of all matters in this area, making sure that the Bartell Equipment Division fulfilled all of its obligations regarding governmental regulations.

The last group of supervisory capacity personnel who reported directly to the Chief of Plant Protection was that of the Captains. In the Atlas security organization, there were three Captains, each responsible for a shift. These three Captains had command of their respective shifts and its personnel, including the Fire Sergeants in the absence of the Fire Lieutenant and the Chief of Plant Protection from the plant. The captains were responsible for the enforcement of the rules and the regulations and laws as they were related to their commands. In the absence of the Chief of Plant Protection from the plant, they took on his duties and responsibilities.

At the Bartell security organization, there was a different situation with regard to the duties of the Captain. He acted as an administrative assistant to the Chief of Plant

Protection and assumed the Chief's responsibilities during his absence from the plant. He also had control of first shift plant protection activities similar to that of the Lieutenants on the second and third shifts who reported directly to him.

The next level of command was that of Lieutenant. There was only one Lieutenant in the Atlas security organization and he was a specialist in fire protection and prevention; he will not be discussed here as he was discussed in great detail previously. Within the Bartell security organization there were two Lieutenants who were responsible for the plant protection organization on their particular shift. They coordinated the activities of the Sergeants assigned to each shift and also coordinated plant protection activities with plant management. They performed the same type of duties and had the same responsibilities as those performed by the Captains of the Atlas security organization.

The remaining level of personnel in a supervisory capacity was that of Sergeant. Except for the two semi-specialized Fire Sergeants, and an occasional investigation assignment given to the Sergeants of the Atlas security organization, the Sergeants of the two organizations had similar duties. The performance of investigations for such things as larcenies, assaults, and malicious destruction of property were carried out by either the Captain or the

Defense Security Officer at the Bartell security organization. The Sergeants in both organizations were responsible either to a Lieutenant or a Captain and were charged with the direct supervision of all members of the security organization under them in order to promote efficiency and discipline.

The Patrolmen of both organizations were the backbone of the organizations and except for the emphasis placed upon fire protection and prevention at the Atlas security organization, they shared most of the same duties and responsibilities, which consisted of:

1. Prevention and performance of initial investigations of larcenies, malicious destruction of property, assaults, and other crimes that might have occurred involving company property and personnel.
2. Enforcement of plant rules and regulations.
3. Assistance to public police in the removal of employees wanted for crimes.
4. Control of the movement of pedestrian and vehicle traffic.
5. Enforcement of health, sanitation, and safety rules.
6. Patrol of buildings.
7. Inspection of special hazards and fences

around plant perimeter.

8. Prevention, detection and extinquishing of fires.

In addition, a multitude of other special tasks and assignments were also the responsibilities of Patrolmen at each organization.

The Matrons, like the Patrolmen and Receptionist, were responsible to the Sergeants. The Atlas security organization did not have any Matrons. The reason for the lack of Matrons at the Atlas security organization was due primarily to the comparatively low number of females in their hourly rated work force. The Bartell security force had two Matrons, one on the first shift and one on the second shift. The duties of the Matrons were as follows: (1) reporting violations of shop rules (especially loitering in ladies' restrooms), (2) servicing garment machines in ladies' restrooms, and (3) accounting for the money taken from the machines.

Another position on the organizational charts of each organization was that of Receptionist. Their duties in both security organizations were quite similar. Atlas Division had one Receptionist who worked in the main office lobby. The Bartell security organization had two Receptionists; one worked in the main office lobby and the other worked in the personnel building lobby. Their duties were

varied, but their primary duty was to allow only authorized persons to enter the premises through their respective lobbies. This included keeping an accurate record of all persons admitted and directing them to the various offices.

The last position discussed here is that of Secretary. In both security organizations, the Secretary's primary function was to keep all records pertaining to plant security activities (such as correspondence, personal records of all plant security employees), and to provide assistance and general information to those individuals who requested, and were entitled to, it.

In summary, the salient point which emerged in this examination of the two organizational structures was the existence of specialists in the Bartell security force and the existence of generalists in the Atlas security organization. It is this difference in organizational structure which this thesis purports to examine and evaluate in terms of the effectiveness of each structure.

CHAPTER IV

DESCRIPTION OF PERSONNEL

The purpose of this chapter is to describe the personnel of the two industrial security organizations. This will be accomplished in the following manner: (1) by exploring the hiring requirements of both organizations, (2) by describing the monetary and fringe benefits each organization provides, and (3) by discussing the training programs each organization provides for its members.

I. HIRING REQUIREMENTS

The hiring requirements placed upon the members of both security organizations were almost identical. Both organizations preferred that an individual be at least five feet, ten inches tall, with weight in proportion to his height and build. They also required that the individual have normal vision which could be corrected by glasses, and that he have normal hearing. The applicant must be in a generally healthy condition, with no history of chronic illness which might in any way impair his contribution to the security organization. All applicants must pass a physical examination given by the respective division's medical department before being hired.

Both security organizations levied a minimum educa-

tional requirement of at least a high school education, with additional credit given to individuals who had acquired education beyond this level.

Both organizations tended to hire younger men, rather than hiring semi-retired or pensioned persons. All applicants had to be at least twenty-one years old. Conceivably, an individual from an older age group might have acquired employment with the security organization if he possessed some special skill or talent in such areas as criminal investigation or experience in fire protection.

Both organizations required that all their members be eligible for surety bonding. To be eligible, they must not have had a prior police arrest record, and also they must have provided proof of being a reliable and generally trustworthy person. In addition to this, the Bartell Division also required that all of its members be able to acquire a clearance of "secret", since classified government projects were conducted on the premises.

II. MONETARY AND FRINGE BENEFITS

The base pay, shift differentials, pay for rollcall time, holiday pay, the stock and bond program, and cost of living adjustments to the base pay were identical in all respects in both organizations. Uniforms were provided and cleaned at each organization. Vacation policy and numerous

other fringe benefits were again identical. These things were standard because they were determined by the parent corporation and they were followed by all of the divisions in the corporation.

The members of the Atlas industrial security organization were all salaried. They rotated shifts and worked a seven-day operation which averaged six days of work per man out of every seven.

The patrolmen of the Bartell industrial security organization were also salaried, but the firemen were hourly-rate employees and thus did not share in many of the fringe benefits. Both the patrolmen and the firemen of the Bartell security organization worked a seven-day operation with the patrolmen averaging eleven working days out of every fourteen days, and the firemen averaging five working days out of every seven days. Both the firemen and the patrolmen at the Bartell security organization had shift preference. The members with the most seniority had their choice of the shifts.

Both the hiring and remuneration provided to both industrial security memberships were quite similar. The remainder of this chapter will deal with the training which members of each organization received.

III. TRAINING PROGRAMS

The induction training provided by both security organizations was essentially on-the-job type training. This was usually done by a senior member of the organization.

There was quite a difference in the type and amount of in-service training provided by the two industrial security organizations for their memberships. The Atlas security organization provided fifteen hours of training for all of its members. This fifteen hours of training was conducted at times other than when the men usually worked and they were paid an overtime rate for the time they spent receiving this training. The instruction was provided by members of the security organization and various specialists in the personnel department. The fifteen hours of training consisted of the following: industrial fire protection, first aid, investigative techniques, report writing, criminal law, public and labor relations, and safety.

Approximately twelve of the members of the Atlas security force had or were attending college-level police administration classes. The Atlas security organization also acted as a training area for college graduates in police administration for industrial security forces protecting Atlas facilities at other locations.

The training program provided for the members of the

Bartell Division consisted of an hour of industrial fire protection training and an hour of first aid training. None of the members had attended any of the college-level police administration classes, though they were available to them.

In summary, it readily can be seen that the hiring standards and the monetary and fringe benefits of these two industrial security organizations were almost identical. This can be attributed to the fact that these policies were dictated by the parent corporation. However, the training provided for the members of both security organizations differed considerably. The Atlas Division provided much more in-service training than the Bartell Division.

CHAPTER V

DESCRIPTION OF FACILITIES

The facilities which were protected by each of the industrial security organizations under study were quite extensive. Those facilities protected by the Atlas industrial security organization totaled 2,914,917 square feet and were located on approximately 100 acres which were rambling and divided by a river which ran through the middle of the property.

The facilities which were protected by the Bartell industrial security organization were somewhat larger, both in square feet and acreage. The total area of the Bartell industrial complex equaled 3,494,000 square feet of floor space; approximately 200,000 square feet were located in a multi-storied building located 2 miles from the main complex.

Both of the facilities were located within the same city. Thus, the quantity and quality of fire and police services which was available to these two industrial security organizations was the same.

The total work forces in these two facilities were quite similar in size, though they differed to some degree in composition. The Atlas Division employed approximately 13,000 (this included both hourly-rated and salaried employees). The total work force of the Bartell Division was

approximately 12,500 employees (including both hourly-rated and salaried employees). The proportion of women in the work force at the Bartell Division was approximately 55 per cent, compared to approximately 20 per cent at the Atlas Division. Also, there was more research work carried on at the Bartell Division, which necessitated a higher number of technically trained personnel than at the Atlas Division.

The products of the two facilities were too numerous to be itemized, but included the following major groupings. The Atlas Manufacturing Division produced automobile engines, automobile valves and numerous pressed metal products for both trucks and cars. The products produced by the Bartell Equipment Division included the following: automotive electrical products, automotive instruments and panels, gas filters, oil filters, and air filters. Both of these facilities also provided storage space for their products. The Atlas Division also provided space for storage of automotive products produced by other divisions of the corporation, of which both organizations were members.

The main difference in production methods employed by these two organizations was that the Atlas Division was geared to produce on a high volume production line basis. This entailed the use of long continuous assembly lines and yearly modifications for model changes. The Bartell Division, while a high quantity producer, manufactured a greater

range of products which were smaller in size and similar in design. This meant fewer large scale assembly lines and an almost continuous state of change in production facilities. The Bartell Equipment Division supplied all of the automotive divisions of the Universal Products Corporation, while the Atlas Manufacturing Division supplied only other members of its division.

Both facilities were founded in the 1920's and some of the original buildings were still in service at the time of the study. Since the time of their founding, there has been literally a continuous building and modification program in the physical plants of both organizations. The resulting structures were a combination of various materials such as brick, fabricated metal walls, steel sash, glass, exposed steel columns, and trusses. The design of the roofs at both locations were a combination of monitor, sawtooth, and flat types. The plant roofs at both organizations were constructed of many materials -- reinforced concrete, cement tile, gypsum tile, metal deck, and wood plank construction with either tar and gravel or smooth roofing applied.

In summary, the facilities at both organizations were quite similar, both in age, size, type of construction, and materials used. They both were heavy manufacturing facilities, using many of the same production techniques.

CHAPTER VI

FIRE HAZARDS AND PROTECTION PROVIDED

Industrial fire protection is the subject under consideration in this chapter. An attempt has been made to present the basic steps taken by both industrial security organizations to protect their respective facilities from the ravages of fire and explosion. Appendix A was devised as a guide used by the investigator in his inspection of the fire hazards and protection at each plant. The primary purpose of doing this is to provide a basis for an intelligent interpretation and understanding of the data presented in Chapters IX and X, which measure the effectiveness and efficiency of the two industrial security organizations.

Quite naturally the fire hazards were not exactly the same at each facility. But as previously mentioned, it is contended in this thesis that many factors do exist in industrial fire protection which are similar enough and which exist in almost all industrial settings, so that the facilities can be compared and contrasted in order to arrive at a general understanding of the fire protection problem faced at each organization.

Three primary areas were explored. The first area consisted of the equipment employed by both industrial security organizations to prevent and combat industrial fires. This included such things as: the fire protection system,

the fire alarm system, special fixed systems, and heat ventilation. The second area of interest explored in this chapter incorporates the procedures and general philosophy of both industrial security organizations towards industrial fire protection. This includes the procedures used in controlling the use of oxy-acetylene torches and emphasis placed on the part of the volunteer fire brigades in industrial fire protection. The last area of discussion in this chapter is a generalized examination of the high fire hazards present at each facility and the steps taken to provide protection against them. This examination involves hazards which were present at both facilities and also those high fire hazards which were unique to each industrial operation. This discussion deals primarily with those hazards which the author and the personnel at each security organization considered to be of real consequence. It would not be possible to describe each and every fire hazard in detail. Instead, they are described in general terms which includes their relative number and the steps taken to guard against the hazard.

It is hoped the reader will acquire a general idea of the types and amounts of fire hazards present at each facility. The reader should also be aware of the methods used to prevent them from damaging the facilities or from crippling the production capabilities of these industrial operations.

I. FIRE PROTECTION EQUIPMENT

Water is the universal extinguishing agent of fire. Its immediate and abundant supply is of great importance to any industrial fire protection system. The Atlas fire protection system had as its primary source a 150,000 gallon elevated water tank which was filled by an electric pump taking suction from a six-inch city water connection.[33] The remainder of the primary source for the Atlas Division was a 115,000 gallon underground storage reservoir at the plant's power house. The fire protection facilities were also fed at two locations by connections to twelve-inch city water mains. These connections acted as a source of water only if the static pressure dropped in the plant's mains to a lower level than that which was in the city's twelve-inch mains. This allowed a check valve arrangement at either or both of these connections to open and thus pressurize the plant's fire protection system to a pressure equal to that which stood on the city's twelve-inch mains.

The Bartell security organization used the city water mains directly as their primary water source. They

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[33]Factory Mutual Engineering Division, Handbook of Industrial Loss Prevention (New York: McGraw-Hill Book Company, Inc., 1959, pp. 14-1 - 14-40.

took suction at several locations from city water mains which were 24, 12, and 8 inches in diameter. Water pressure in the city mains was approximately 60 psi, which was increased by the pumps to approximately 100 psi.

It should be noted that this description of the Bartell Division's fire protection facilities does not include the building which was located two miles from the main Bartell complex. This divorced area, consisting of 200,000 square feet of floor space, was a multi-storied structure and was protected 100 per cent by a sprinkler system. It received its water for fire protection purposes through piping which originated from another division of Universal Products Corporation located nearby.

The secondary water sources for the Atlas fire protection facilities were a 1,500 gallons per minute automatic electrical fire pump located at the plant's power house, a 1,500 gallons per minute automatic diesel-powered fire pump located at the river pump house, and a 1,500 manually controlled elevated centrifugal fire pump located at the plant's hospital building.[34] All fire pumps could take suction from the river, which had a capacity of over 1,000,000 gallons. Water supply from the river had been a problem during periods when the level was low. However, the

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[34] Ibid., pp. 12-3 - 12-4.

river had been dredged in those areas around the pump intakes and a broken concrete coffer dam had been erected to provide an adequate water supply.

The secondary water sources for the Bartell fire protection facilities were three gravity tanks with capacities of 150,000, 200,000, and 500,000 gallons. Two automatically controlled 1,500 gallon per minute electric fire pumps were used to take suction from the city mains and to pressurize the plant's mains.[35] The electrical power for the fire pumps at both organizations were on their own circuits.

The ages of the underground fire mains at each facility were about the same. Construction began in the 1920's and since that time numerous additions and replacements had been made, as was indicated by the increasing size of each division. Thus, it is probably safe to say that their overall age was nearly the same, as was their reliability.[36]

The Atlas Division had 52 hydrants on its premises, compared to 44 hydrants located on the Bartell premises.[37]

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[35] Ibid., pp. 15-1 - 15-25.

[36] Ibid., pp. 10-1 - 10-5.

[37] Gilbert E. Strecher, Fire Prevention and Protection Fundamentals (Philadelphia: The Spectator, 1953), pp. 590-491.

Both organizations provided hose houses at most of these hydrants. The Atlas hose houses contained 500 feet of 2½-inch hose compared to the 250 or 500 feet of 2½-inch hose located in the Bartell hose houses.[38]

There were 217 inside hose drops located at the Atlas facilities and each had 50 or 100 feet on the hose reel. The Bartell Division had 190 inside hose drops, each having 100 feet of hose on the reels. Both organizations used 1½-inch hose for their inside hose drops.[39]

The Atlas facilities had 52 roof hose outlets and each was provided with a hose cabinet and 100 feet of hose. This compares to 60 roof hose outlets which were at the Bartell facilities, each with a hose cabinet containing 150 feet of hose.

The entire manufacturing areas of both facilities were sprinklered, with the exception of a magnesium die casting operation located at the Bartell Division. The sprinkler heads had been removed and plugs provided in this area.[40]

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[38]Factory Mutual Engineering Division, op. cit., p. 11-12.

[39]Ibid., p. 11-11.

[40]National Fire Protection Association, Combustible Solids, Dusts and Explosions (Vol. III of National Fire Codes. 10 Vols.; Boston: National Fire Protection Association, 1963), p. 48-21.

Approximately 35 per cent of the Atlas office areas were sprinklered compared to approximately 50 per cent of the Bartell office areas. Both organizations used both wet-pipe and dry-pipe sprinkler systems. Adequate sprinkler heads were held in reserve at both organizations in case of an emergency. Valves were provided for control and inspection of the sprinkler systems. These valves were all sealed and inspected frequently.[41]

The fact that 100 per cent of the manufacturing area was protected by automatic sprinklers is a point which made the fire threat very similar at both of these facilities as gauged by the degree of damage which might be caused by a fire.

Automatic sprinkler protection is extremely important to industrial fire protection for various reasons. Sprinklers prevent many fires from reaching devastating proportions and sometimes mean the difference between short interruptions and extensive and prolonged shutdowns of manufacturing operations.

Automatic sprinklers operate within the area of a fire under severe conditions of heat and smoke which prevent fire fighters from entering. They operate as needed, eliminating

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[41]Factory Mutual Engineering Division. Organizing Your Plant for Fire Safety (Norwood, Massachusetts: Factory Mutual Engineering Division, 1950), p. 22.

costly human delay and mistakes in attacking a fire. Sprinklers operate in the immediate vicinity of the fire and deliver a finely divided water spray in quantity where it is most effective. Since the minimum amount of water is used, water damage is thus reduced. They are much more effective than hose streams that must be directed to a fire from windows or through heavy smoke.

Automatic sprinkler systems allow modern industry to utilize more extensive open areas, hazardous equipment and processes, and to store valuable materials in a single building, due to the protection they afford.

These figures illustrate the effectiveness of automatic sprinkler systems in 60,000 fires within a period of forty years:

> 81 per cent of fires extinguished or controlled by eight sprinklers or less.
>
> 86 per cent of fires extinguished or controlled by twelve sprinklers or less.
>
> 90 percent of fires extinguished or controlled by twenty sprinklers or less.
>
> 95 per cent of fires extinguished or controlled by fifty sprinklers or less.[42]

These figures illustrate the point that sprinklers indeed do play a very important role in protection of facilities from severe fire damage. The fact that both

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[42]Stecher, op. cit., p. 610.

facilities had 100 per cent of their manufacturing areas protected by automatic sprinkler systems made them very similar in the degree of fire protection provided.

An automatic sprinkler system, such as was present at both facilities under study, is not an effective deterrent to fire unless it is equipped with the necessary alarms which will automatically detect fires, locate them and supervise the operating conditions of the sprinkler systems.

By providing the appropriate alarm system, water damage can be held to a minimum since there is thus an immediate awareness that sprinklers are operating in a certain area. Personnel can be dispatched immediately to the scene and be there to turn off the sprinklers as soon as the fire is extinguished.

Since all fires can not be extinguished by sprinklers, additional fire fighting equipment may have to be dispatched as soon as the alarm is received.

The Atlas facilities were protected by a central-station type of alarm system. The only alarm protection provided was that of manually operated fire alarm boxes, and local alarms on the sprinkler risers. In the central-station system used by the Atlas Manufacturing Division, a private organization installed, maintained, and supervised the protective signal system.[43] The industrial security

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[43]"Lets Look at Some Protective Signaling Systems," Firemen, (January, 1957), p. 1.

staff did not directly monitor the alarm system, but they were connected by a direct wire telephone to the alarm company's central office.[44] The alarm used on the sprinkler risers was a mechanical one and only sounded an alarm which was audible in the general area of the riser and sprinkler which was in operation.[45]

The Bartell facilities were protected by a proprietory alarm system. A proprietory alarm system is like a central-station alarm system except that it is located on the protected premises and the system is installed, operated and maintained by the management of the protected property.[46]

The proprietory alarm system used by the Bartell security organization recorded fire alarm box reports, water flows in sprinkler risers, and the flow of carbon dioxide in the low pressure refrigerated carbon dioxide special fixed systems.[47] This alarm system also provided a local fire

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[44]Roy E. Capshaw, "Electrical Devices Used in Plant Protection," Industrial Security, VIII (April, 1964) pp. 50-53.

[45]Robert S. Moulton, (ed.), National Fire Protection Association, Handbook of Fire Protection (Boston: National Fire Protection Association, 1954), p. 1089.

[46]Factory Mutual Engineering Division, Handbook of Industrial Loss Prevention, op. cit., p. 24-2.

[47]American District Telegraph Company, Proprietory Systems and Their Role in Plant Security (September, 1960), pp. 1-4.

alarm system for fire brigades. A local alarm was provided at the various sprinkler risers to detect water flows, as was the case at the Atlas facilities. However, this alarm was electrically actuated, instead of mechanically as were the Atlas local water flow alarms.

In summary, the fire alarm systems used by both security organizations differed in several ways. It is quite evident that the Bartell security organization's alarm system was superior to that of the Atlas security organization for several reasons. First, there was no central console provided at the Atlas Division. They relied on the direct wire telephone which could cause slight but costly delays in dealing with fire. Secondly, Atlas Division had no means of monitoring any of its carbon dioxide fixed systems. It should also be noted that Atlas used all high pressure carbon dioxide fixed systems and that Bartell used both low pressure and high pressure carbon dioxide systems. Bartell did not use alarms on its high pressure carbon dioxide, but the fact remains that a larger portion of Bartell's carbon dioxide system was under alarm supervision than was the system at the Atlas Division. Thirdly, the Atlas Division did not provide any water flow alarms on its sprinkler risers other than the mechanically operated local alarm. This was a basic defect in their alarm system, one which did not exist at the Bartell Division. Lastly, the lack of a local

fire alarm system for the plant volunteer fire brigade at the Atlas organization was also a decided disadvantage. This was a definite defect since Atlas relied so heavily on its fire brigade; more so than did the Bartell Division. They had to depend on a "word-of-mouth" spread of the alarm.

Another key part of a fire protection organization are fire trucks. The amount and type of fire trucks used by both industrial security organizations reflected their differences in organization. The Atlas security organization had one fire truck which was strictly an emergency first aid fire fighting vehicle. It carried hand fire extinguishers, breathing masks, ladders, and first aid equipment. It did not carry large quantities of either carbon dioxide, dry chemical, or foam. Neither did it carry water pumping equipment.

The Bartell security organization had four fire trucks. These trucks were multi-purpose and were equipped with water, carbon dioxide, dry chemical extinguishing equipment, and first aid fire fighting equipment. They also carried breathing masks and ladders. These trucks had built-in two-way radios.

As has been pointed out, this difference in the number and type of fire trucks reflected the organization of each security department. Atlas Manufacturing Division relied heavily on its fire brigade and its patrolmen to extinguish

fires. This was also reflected in the higher number of fire hydrants, inside hose drops, and their much larger fire brigade membership.

Bartell Division expected that its fire department would extinguish the greater share of the fires encountered. The volunteer fire brigade and the patrolmen were intended to be initial, and then later supplemental, man power for the firemen.

Besides being available on the fire trucks, fire extinguishers were placed throughout the plants. Both industrial security organizations used the following portable fire extinguishers in their facilities: water, dry chemical, carbon dioxide, foam, G-1 powder, and ABC dry chemical.[48] Carbon tetrachloride was not used by either of them.

The physical distribution of the various fire extinguishers was in accord and in many cases actually exceeded the requirements laid down by the National Board of Fire Underwriters for manufacturing buildings.[49]

As previously mentioned, the manufacturing areas of

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[48]National Fire Protection Association, National Fire Codes, VIII, op. cit., pp. 10-1 - 10-143.

[49]National Board of Fire Underwriters, Standards of the National Board of Fire Underwriters for the Installation, Maintenance and the Use of Portable Fire Extinguishers. (New York: National Board of Fire Underwriters, July, 1959), No. 10, pp. 5-6.

both organizations were completely protected by automatic sprinklers. Both wet-pipe and dry-pipe systems were utilized. The dry-pipe systems were located on shipping and receiving docks, but were also used in other locations which were not heated since a wet-pipe system would have been of no value during winter months.[50]

The Bartell Division also employed the use of a special type of automatic sprinkler protection system called the deluge system. This type of sprinkler protection was provided in a paint mixing area where it was felt that large amounts of water were needed immediately upon ignition of a fire. Sprinkler heads opened separately in the other types of systems and a fire in the paint mixing area could have reached dangerous proportions before all the heads were opened.

The Atlas Division also had a paint mixing area which was approximately the same size, but a high pressure carbon dioxide system had been provided which was backed by a wet-pipe sprinkler system.

The fire control plan and the equipment used in its implementation were almost identical at both industrial security organizations. It was devised and imposed by the

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[50]National Fire Protection Association, Sprinklers, Fire Pumps, and Water Tanks (Vol. VI of National Fire Codes. 10 Vols.; Boston: National Fire Protection Association. 1963), pp. 13-116 - 13-117.

corporation's central security staff shortly after a serious fire at another division. This plan contained three basic parts, which were of equal importance and interdependence.

The first part of the plan required complete sprinkler protection in all manufacturing areas. This has already been discussed and it has been pointed out that both facilities, with the exception of the magnesium die casting production area at the Bartell Division were completely sprinklered. This one area was not sprinklered because it would have increased the possibility of fire damage. However, sprinkler protection was provided for the perimeter areas.

Total protection in the manufacturing areas was deemed fundamental since it served to keep fires small by arresting them in the incipient stage. "The deadly fallacy of relying upon spot sprinkler protection has been illustrated in numerous catastrophes throughout the country."[51]

The second part of the fire control plan followed by the two organizations was that of separation of areas. Both the Atlas and Bartell facilities used extensively curtain boards (draft curtains) in place of complete reliance upon fire walls, which did not fit well into the design of modern

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[51]Clyde W. Truxell, "Fire Protection at General Motors," Quarterly of the National Fire Protection Association, LVI, (October, 1961), p. 149.

industry.[52] Curtain boards were essential for proper venting as they banked up heat and smoke within the curtained area which resulted in a pressure differential that directed the heat and smoke towards the vents for relief. "It has been established that vents are ineffective without curtain boards, since only the heat and smoke near the vents will be vented."[53]

In sprinklered buildings, curtain boards served as a key phase in the fire control plan. Banked heat within curtained areas hastened the operation of automatic sprinklers. In the case of flash fires, curtain boards prevented the spread of heat throughout the building and the unnecessary opening of sprinkler heads.[54]

The third phase in the fire control plan was the provision of adequate emergency roof ventilation.

> Tests and experience in actual fires has shown that when emergency roof ventilation is coupled with well-designed draft curtains and 100 per cent sprinkler protection, basic fire control can be maintained and brigades can operate effectively.[55]

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[52] Ibid.

[53] National Fire Protection Association, Building Construction and Facilities Vol. IV of National Fire Codes. 10 Vols.; Boston: National Fire Protection Association, 1963), p. 204-10.

[54] Ibid.

[55] William W. Truxell, op. cit., pp. 149-150.

Both facilities under study had adequate emergency roof venting. This venting was accomplished in various ways at both organizations. Monitors were used at both facilities. This type of ventilation depended upon the breakage of ordinary glass, (not over 1/8 inch thick), in the side walls to provide the required venting. Sawtooth roof skylights were also used at both facilities to provide venting. Wire glass in fixed sash was not utilized in these installations thus allowing these vents to provide the utmost utility in case of fire requiring their use. Automatic heat ventilators were used by both organizations.[56]

Since the fire control plan was imposed by the corporation, it may be assumed that their ability to minimize and extinguish fires were similar and comparable.

In this section of the chapter, the equipment and the manner in which it was used by the two industrial security organizations has been discussed. It has been demonstrated that the water needed to provide fire protection at each facility was both available and reliable.

The Atlas Manufacturing Division's fire alarm system was not equal to the system used by the Bartell Division. There was no direct monitoring of the alarm system, and no provisions were made for the supervision of either its

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[56]National Fire Protection Association, National Fire Codes, IV, 1963, op. cit., pp. 204-7.

special fixed carbon dioxide systems or its sprinkler system risers. Neither was there a local fire alarm system for the plant volunteer fire brigade, which was a poor situation since an integrated industrial security organization places great emphasis upon the use of patrolmen and fire brigade members in the general area of the fire.

Both Atlas and Bartell Divisions could probably have benefited by increasing the capabilities of their respective alarm systems. There was a need at both divisions for supervisory alarms on such things as gravity tank water levels, gravity tank temperatures, all carbon dioxide fixed systems, supervision of fire pumps, sectional control valves, various sprinkler control valves and other hazards on which notification is important.[57]

Atlas Division also lacked multi-purpose fire trucks, but this was because they relied on the volunteer plant fire brigade and patrolmen for fire fighting.

In summary, both organizations were quite similar in the quality and quantity of measures taken to provide adequate fire protection. The major differences in equipment provided for this purpose were seen in the lack of alarms and multi-purpose fire trucks at the Atlas security organization.

Even with the differences already discussed the basic plans were similar and comparable due to corporate policy.

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[57]American District Telegraph Company, loc. cit.

II. INDUSTRIAL FIRE PROTECTION PROCEDURES

The steps taken by both industrial security organizations to provide an adequate fire brigade were similar, as were their methods in other areas. Production and maintenance employees in all sections of both facilities were selected from those who volunteered for brigade duty. These employees were extensively trained on company time by members of the security staff at the Atlas Division. The trainers were either the Fire Lieutenant or the Fire Sergeants. At the Bartell Division, the training was conducted by the Fire Marshal and he was assisted by members of the plant fire department.

Each shift had its own fire brigade and all members were under the direction of the Fire Marshal at the Bartell organization. In his absence, the ranking security officer assumed responsibility for the fire brigade.

At the Atlas Division, there was also a fire brigade on each shift. The Chief of Plant Protection was in command of the fire brigade; however, in his absence the ranking plant protection officer assumed this responsibility. Preferably, either the Fire Lieutenant or one of the Fire Sergeants would have been there to take over the responsibility.

Another way of protecting the facilities from fire is controlling cutting and welding processes. The largest

industrial fire loss on record can be attributed to the use of an oxyacetylene torch under unsafe conditions.[58] Approximately 6 per cent of all fires on industrial properties have been caused by cutting and welding, primarily with portable equipment in areas not specifically designed or approved for such work.[59] Because of this threat, the methods used by each security organization in controlling cutting and welding processes were very important.

Requests for an inspection of the area had to be submitted and the area inspected before a permit was granted at either facility. This procedure was followed whether division personnel or contractors were to be involved in the welding activities.

At the Atlas Manufacturing Division, requests for welding permits were submitted to the foreman of the area in which the work was to be done. This foreman had permits for distribution and would inspect the area in question. Following this, he completed the permit form and signed his name. The permit was then attached to the welding equipment and copies were sent to the various departments as indicated

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[58]National Fire Protection Association, "General Motors Fire," op. cit., p. 3.

[59]National Fire Protection Association, Gases (Vol. II of National Fire Codes. 10 Vols.; Boston: National Fire Protection Association, 1963), p. 51B-4.

on the permit.

An authorized member of plant protection also conducted an inspection of the area in which the work was to be performed. Upon determining that the area was free of fire hazards, he would approve the permit, indicating what fire fighting equipment was to be provided and what precautions were to be taken in the area. He would order a fire watch if he considered it necessary.

When the cutting and welding job as specified on the permit was completed, the permit was removed from the welding equipment by the area foreman, signed and sent to the Plant Protection Office.

Cutting and welding permits at the Bartell Division were issued in a different manner. Permits for Bartell employees were issued by the maintenance foreman. The operator was made directly responsible for his actions, and he could refuse to sign the permit for cutting and welding if he thought the conditions were too hazardous. The maintenance foreman or the operator could request that the fire department provide assistance in reducing the fire hazards to a safe level.

The Bartell Fire Department usually did not become involved in the issuance of cutting and welding permits to a Bartell employee unless some high fire hazard existed as determined by the operator or the maintenance foreman. The

reader will recall that at the Atlas Division the patrolman made a second inspection in which he specified the precautions to be taken and what fire fighting equipment should be made available before he would grant permission for the work to be done. At the Bartell Division, the maintenance foreman provided the only inspection and he signed the permit. At both facilities, the operator was required to sign the permit, but at the Bartell Division the operator had more responsibility since a second inspection was not conducted.

Cutting and welding permits for outside contractors at the Bartell Division were issued only by fire department personnel. All areas had to be inspected by fire department personnel and had to meet with their approval before a permit was issued.

Although the procedures for granting permits for cutting and welding differed, their basic purpose in establishing the requirements were the same. Both divisions wanted assurance that adequate supervision was maintained by responsible persons who would take the necessary precautions. The difference in procedure was merely a difference in the placement of responsibility. The Atlas security organization took more of the responsibility upon itself than did the Bartell organization. The Atlas security organization had more direct control of the operation of these processes than did the Bartell security organization which placed more

responsibility upon the operator of the cutting or the welding machine. Some degree of direct supervision was lost by the Bartell organization. However, the operator was made more responsible and more aware of the importance of his actions. Both methods of control had proven adequate and at the time of the investigation had been successful in controlling the cutting and welding processes at each division.

III. FIRE HAZARDS AND PROTECTION PROVIDED

It would be physically impossible in the limited space of this thesis to adequately describe every fire hazard which existed at each facility or to properly compare them. The author will present a description of the more serious fire hazards which were present at these facilities and the protection provided for each. The hazards will also be compared in relative numbers at each facility.

Both the Atlas and the Bartell facilities maintained numerous spray painting booths. The Atlas Division had six paint spraying areas while the Bartell Division had twenty-one. These spray painting booths were involved in production spray painting operations, and not merely maintenance or sign painting activities.

The following precautions were taken by both security organizations: (1) Ready accessibility had been provided to the booths in case of a fire. (2) Positive mechanical

ventilation was provided to control fire, to control overspray, and to safely dispose of flammable vapors outside of the building. (3) All equipment used was kept in good condition, and booths and ducts were cleaned regularly. (4) Automatic sprinkler protection was provided in spray rooms, booths, and exhaust ducts. (5) Special fixed systems using carbon dioxide or foam were used in some, but not all, of the paint spraying operations at both facilities. (6) "No Smoking" signs were provided and conspicuously displayed in these areas.

The paint spraying operations were adequately protected at both facilities. However, Bartell Division had a much greater number of booths and thus more chances for a fire to take place.

The Atlas Division had four paint-mixing and storage rooms as compared to ten of these rooms which were located on the premises of the Bartell Division.

The protection provided for these paint-mixing and storage rooms was very similar at both facilities and included the following: (1) All electrical equipment used in the rooms was approved (Class 1 - Group D). (2) All rotating and mixing tanks were grounded with copper grounds. (3) Concrete floors had conducting surfaces and non-sparking tools were used in these rooms. (4) Doorways were curbed and scuppered. (5) All rooms had adequate drainage for

sprinkler discharge. (6) All exits and entrances were equipped with fire doors. (7) Explosion vents were provided in the ceiling and window panes were scored on the outside. (8) Mixing tanks were vented to the outside. (9) All dispersion valves were of the safety type. (10) Mixing rooms were either located along outside walls of the plant, in separate buildings, or were provided with extra protection. (11) First aid fire equipment was available outside each room. (12) Special carbon dioxide fixed systems were provided in all rooms except one. This room was at the Bartell facility and it was protected with a deluge rather than a wet-pipe automatic sprinkler system.

The paint-mixing and storage rooms located at both facilities were adequately protected from fire. However, again Bartell Division was faced with a greater threat of fire since they had ten of these rooms compared to four at the Atlas Division.

There were seven heat-treating areas where oil quench tanks with capacities of from 450 to 700 gallons were used at the Atlas Division. The Bartell Division had three heat-treating areas using oil quench tanks which had capacities of from 600 to 2,000 gallons.[60]

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[60]Factory Mutual Engineering Division, Handbook on Industrial Loss Prevention, op. cit., p. 47-1.

At each facility, the oil quench tanks were protected with automatic carbon dioxide systems and were backed up by an automatic sprinkler system. Some of the oil quench tanks had automatic dump tanks provided, but not all. The Atlas Division had sprinklers provided in the exhaust stacks of its heat-treating tanks. The Bartell Division used steam to extinguish any fire that might have taken place in the exhaust stacks of their heat-treating processes.

Again, as was the case in the paint spray booths and the paint-mixing and storage rooms, the precautions taken by the two divisions to guard against the threat of fire were quite similar. About the only difference in the fire threat was the difference in the number of these operations. There were slightly over twice as many heat-treating operations using oil quench tanks at the Atlas Division than there were at the Bartell Division.

Both facilities had dynamometer test cells. The Atlas Division had five of these cells which were located in two areas. The Bartell Division had fourteen of these dynamometer cells plus four more gasoline testing cells, all of which were in one area.

All of the dynamometer and gasoline test cells at both organizations were protected by automatic sprinkler systems. The dynamometer test cells at the Atlas Division were protected by an automatic carbon dioxide system. The dynamometer

test cells located at the Bartell Division were not all protected by carbon dioxide, although all four gasoline test cells were. The reason for the lack of automatic carbon dioxide protection on some of the dynamometer cells was the fact that the fuel used was brought only to floor level and a vacumn pump was used on the engine to lift the gasoline to the carburetor. At the Atlas Division, the fuel was supplied by a positive pump which supplied gasoline under pressure to the carburetor. The gasoline test cells were also protected by an instrument which continuously measured the level of gasoline in the atmosphere in the cell and at a predetermined level it automatically turned off all apparatus in the room. Other precautions taken by both divisions in the protection of their dynamometer test cells were the provision of: adequate ventilation and exhaust; a fuel supply regulated against excessive pressure; engines interconnected with fire protection systems, which shut off automatically when a system was actuated; prohibitions against smoking and flames in the areas; automatic fuel cut-off in event of fire; approval of all electrical equipment used in the cells (Class 1 - Group D); and adequate drainage for the sprinkler systems.

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[61]National Fire Protection Association, Flammable Liquids (Vol. I of National Fire Codes. 10 Vols.; Boston: National Fire Protection Association, 1963). p. 30-62.

The dynamometer test cells and the gasoline test cells were protected in a similar manner and adequately. Again, the threat of fire was in the number of cells they used and the Bartell Division had nearly four times as many as the Atlas Division.

The Atlas Division had a number of engine test stands at the final assembly end of the engine assembly line. The Bartell Division had no such fire hazard at its facilities. The precautions taken by the Atlas Division included sprinkler protection, the surrounding of the area by draft curtains, fuel supply regulated for excess pressure, automatic cut-off of fuel supply in event of fire, adequate ventilation in the area, electrical maintenance according to the hazardous area, "No Smoking" signs posted and conspicuously displayed, and emergency showers in the area. This was a high fire hazard which existed only at the Atlas Division, and it was adequately protected from the threat of fire.

The Bartell Division had the world's second largest magnesium die casting operation. This was an extremely high fire hazard and was a constant threat to the Bartell Division. The precautions taken in this area included the ability to dump molton magnesium, should it become ignited, into a dump tank; large quantities of G-1 powder stored in this room which could be used to extinguish the burning magnesium once it had been dumped; and numerous first aid fire extinguishers

filled with ABC dry-powder for smaller magnesium fires. Because of the reaction of water with magnesium, all of the sprinkler heads had been removed above this magnesium die casting operation and plugs inserted in their place.[62] Sprinkler heads had been left only around the perimeter of this magnesium production area, so that in case of a fire they might act as a means of protecting the surrounding area from the heat of the burning magnesium.

Upon reviewing the major fire hazards in both facilities, it can be seen that most of the high fire hazards existed in both facilities. Except for the heat-treating operation with its oil quench process, the Bartell Division had a larger quantity of high fire hazards. The Atlas Division had the engine test stand area which was, without a doubt, a high fire hazard. However, the Bartell Division had an extremely high fire hazard in its magnesium die casting operation. It would be very difficult to rate one or the other division as having a specific numerically rated fire hazard which was higher than the other. It is safe to say that the facts in this section of the thesis, which describe the major fire hazards in both facilities, reveal that the Bartell Division had a greater number of fire hazards than the Atlas Division. Upon reading the data to be presented

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[62]National Fire Protection Association, National Fire Codes, III, op. cit., p. 652-10.

later which deals with the fire statistics of both facilities, it will be possible to make an honest appraisal as to which method of organization actually provides the best fire protection for the facilities it protected.

CHAPTER VII

SECURITY HAZARDS AND PROTECTION PROVIDED

This chapter deals primarily with the security provided by the industrial security organizations under study. The purpose of doing this is to provide a comparison and contrast between the security needs of both facilities and the way in which each security organization strove to meet these demands. Appendix B is an example of the guide used in collecting data for this chapter.

This examination will be structured as follows: First, a general discussion of the physical security both organizations had to provide will be presented. Secondly, a discussion of the various security measures each organization used to reduce theft from the premises will follow. Lastly, the high theft areas in existence at both organizations will be discussed. There will be no discussion regarding the demands placed upon the Bartell Division by its government security obligations; suffice it to say that the demands were minimal and that they did not greatly affect the testing of the hypothesis under study.

I. PHYSICAL SECURITY

"The most valuable instrument for the prevention of burglary is good lighting of the areas surrounding the

buildings and grounds."[63] Both facilities under study were provided with continuous lighting around all their perimeter areas. No emergency lighting existed in these areas although both organizations were provided with battery trickle charge units for the lighting within the plants, but this was a safety precaution rather than a security measure. The lighting units used for perimeter areas at both facilities were located above the fence so that the lighting pattern on the ground included an area on both the inside and the outside of the fence.[64] All other areas inside the plant area itself were lighted, including the employee parking lot.

Both facilities were protected with more than adequate perimeter lighting.[65] These two organizations used this cheapest of all physical security measures to the fullest advantage.

Both facilities were protected by adequate perimeter barriers. Wire fencing was used around both of the organizations, with the exception of those areas where the buildings were constructed and so arranged as to provide uniform

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[63]John Richelieu Davis, Industrial Plant Protection (Springfield, Illinois: Charles C. Thomas, 1957), p. 119.

[64]Executive Office of the President, Office of Civil and Defense Mobilization, Standards for Physical Security of Industrial and Governmental Facilities (Washington: United States Government Printing Office, 1958), p. 17.

[65]Vernon R. Bishop, "Floodlighting for Security," Industrial Security, VIII (April, 1964), pp. 42-44.

protection equivalent to that provided by the chain link fencing, which protected the remainder of the premises.

The fencing used by both organizations was of the chain link design, with openings no larger than a two-inch square, of number eleven gage or heavier wire, with twisted and barbed selvage top and bottom. The minimum height of the chain link portions of the fences used at both organizations was seven feet.

The wire fences were topped with a forty-five degree outward and upward extending arm bearing three strands of barbed wire stretched taut and so spaced as to increase the vertical height of the fence by approximately one foot.[66]

All perimeter openings to both facilities were protected by members of the security organizations with the following exceptions: (1) The Atlas security organization did not provide patrolmen to observe some of its many railroad gates during those times when the railroad switches at the facilities. The locks used on these railroad gates were provided by the railroad. (2) At the Bartell Division, the plant's powerhouse was not under full-time security observation. Employees were able to come and go at this facility with no control at all. Both of these physical security defects were serious and tended to balance each other out,

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[66]Executive Office of the President, Office of Civil and Defense Mobilization, op. cit., p. 15.

with regard to the physical security each organization provided for its facilities.

Neither security organization provided its patrolmen with any sort of firearms. This was standard policy laid down by the corporate central security staff, and it was followed religiously by both security organizations.

Both organizations provided adequate communications. Both used a combination of two-way radios, telephone and various recall devices to provide an adequate communication system.

Both security organizations had complete control over the lock and key systems used at their respective facilities. These organizations installed, maintained, and provided supervision over all locks and keys used on the premises, with the exception of some locks which came already installed on various office furniture.

II. SECURITY MEASURES

The patrol measures of the two industrial security organizations differed only slightly. Patrols at the Atlas facilities began at midnight and continued until 6:00 a.m. during working days. Patrols were made during all hours on those days when production was not running. The Bartell security patrols began at 6:00 p.m. and ran until 6:00 a.m. every working day. As at the Atlas facilities, patrols were

run during all hours of those days when the facilities were not in operation.

Both organizations used a mechanical device to supervise the patrols. The Atlas security organization used a compulsory tour service in conjunction with the central-station type of fire alarm system.[67] This system provided for an effective patrol of the premises on a regular schedule and kept the patrolmen in contact with the alarm company's central office, which reported directly to the Atlas security main office any irregularity in reporting.

The Bartell patrols were not supervised with an electronic supervisory device of any type. Instead, the conventional watchman's clock was used. While this method was somewhat more flexible in routing patrols and definitely less expensive, it did leave much to be desired. It did not provide a continuously supervised patrol and this was a factor which cut down somewhat on the effectiveness and efficiency of the patrol. Some of the patrols conducted at the Bartell Division were done on electric scooters, rather than by foot. This reflected a lack of manpower to adequately patrol the premises and resulted in a less efficient patrol. The Atlas security organization had enough men to

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[67]American District Telegraph Company, Watchman's Compulsory Tour Service. (U.S.A.: American District Telegraph, 1960).

conduct all of its patrols on foot, which resulted in a more complete and sensitive patrol than one conducted on a mechanical device such as this electric scooter.

As previously mentioned, all employees at both organizations were observed by a patrolman as they entered and exited the plant on foot. Exceptions to this were the employees working at the Bartell Division's powerhouse. Salaried personnel who parked their cars inside the controlled areas of both organizations were not observed while on foot.

Materials being removed from either facility had to be accompanied by a "shipper" for company property or a "package pass" for personal property. The materials were checked visually for the proper paperwork by a patrolman at the point of exit.[68]

Scrap metals were weighed (both production and maintenance) in the presence of a member of plant protection at both organizations.[69] A "shipper" was issued for the load hauled by trucks, which described the type of metal and listed the weight. The shipper was checked against the load by the patrolman at the point of exit.

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[68]National Industrial Conference Board, Industrial Security III, Theft Control Procedures (Studies in Business Policy No. 70. New York: National Industrial Conference Board, 1954), pp. 27-32.

[69]Ibid., p. 6.

Both security organizations periodically followed loads of scrap, obsolete parts, scrap cardboard, paper, and other trash to the place where it was to be unloaded and disposed of. At this point, the load was rechecked as it was unloaded to be sure that only the authorized materials were transported from the plant.

The Atlas Division did not allow salvage parts or other materials to be sold to the employees. The Bartell Division sold such products on a limited scale. The thinking on this practice follows two themes. One is that it actually cuts down on the amount of pilferage by employees and the other is that it is very difficult to adequately control and thus may lead to greater losses.[70]

Employee lunchboxes were not inspected by the Atlas security organization. The Bartell security organization ran periodic unannounced inspections of lunchboxes. By not following this practice, the Atlas Division provided an excellent means for removal of company property from the plant.

All hourly-rate employees of both divisions were provided with badges, which had to be displayed to a patrolman at the entrance to the plant in which they worked.

Visitors, vendors, and contractors also had to acquire

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[70]John Richelieu Davis, op. cit., p. 259.

badges to gain entrance to the premises and they had to wear the badges on their person. In order to obtain this badge they signed a waiver, stating in effect that they would not hold the respective division or the corporation liable for any personal injury they might sustain while on the premises. Persons in this category, with the exception of contractors, had to be accompanied by a division employee acting as an escort while they were on the division's property.

Both industrial security organizations provided, with assistance from others, a written disaster control plan for tornadoes. The Atlas organization also had a similar plan for flood waters since a river ran through the premises. Instructions were provided throughout the plant, which designated what employees were to do in an emergency and what routes should be taken in case of evacuation. Supervisors were given special instructions on their responsibilities for safely directing employees to proper shelter areas.

Generally, both industrial security organizations provided similar levels of physical security and used very closely related security measures.

III. THEFT HAZARDS AND PROTECTION PROVIDED

The Atlas Division did not produce any high theft articles. However, it did store considerable amounts of parts used in repair of automobiles of past model years. Many parts

which were used in the assembly of automobile engines were also stored for use on the assembly lines. Thus, while the Atlas Division did not produce these products, there were still many available.

The measures taken to safeguard these articles were: intensified patrols of those areas in which these articles were stored, use of locked metal wire cribs in the areas where the parts were used, and weekly inventories to account for the number of parts used.

The Bartell Division was a producer of these same small high theft-prone parts. The division also served as a warehouse for these parts. In order to safeguard them they were secured in both the area in which they were produced and in the area in which they were stored. Wire mesh boxes were used for this purpose which could be locked. Special precautions were also taken at receiving and shipping docks. All truck drivers were required to remain in their truck cabs while their trucks were being loaded and unloaded, or to go into a special room provided for them.

The parts located at the Bartell Division were probably of greater theft attraction than were those stored at the Atlas Division since the parts referred to as being theft-prone at the Atlas Division were both replacement and current-year parts. This meant that a large portion of the parts were several model years old. Many were ten years old or

older. These parts were thus not as high a hazard as the smaller portion of new parts.

At the Bartell Division, all of the high theft-prone items were of the current model year. This of course increased the percentage of the parts located in this division which were highly theft-prone items as compared to the Atlas Division.

This chapter has described hazardous security areas and the protection provided. It has demonstrated the fact that both industrial security organizations provided very similar physical security. They used many of the same security measures as they were faced with the same general type of theft problems. Although the quantity of high theft items produced by the Bartell Equipment Division may be somewhat higher in number, it is felt that the rate and amount of thefts will reflect, at least to some extent, the effectiveness and efficiency of the particular organization.

CHAPTER VIII

CENTRALIZED CONTROL

The centralized control placed upon both industrial security organizations had a great deal to do with promoting a similar quality of industrial security. This refers to both the fire and police-type activities. This control came from two sources--the common fire underwriter and the corporations's central security staff.

I. UNDERWRITING COMPANIES INFLUENCE

The fire underwriting company, as has been previously indicated, was the same for both industrial divisions. Several times each year personnel from the fire underwriter company conducted a very comprehensive inspection of each division in order to detect weaknesses in its fire protection program.

The Fire Lieutenant at the Atlas Division and the Fire Marshal at the Bartell Division accompanied the inspectors. These inspections were very exacting and lasted several days in most instances. Recommendations were made in writing to the division security organization and a copy was sent to the corporation's central security staff. It was expected that each division would abide by these recommendations, although in certain cases they could be negotiated.

It readily may be seen that the influence of the fire underwriter had a great impact upon the fire protection provided by both security organizations. Each division was inspected in relation to a set of rules and regulations formulated by the fire underwriters. This partially explained why the fire protection provided at both security organizations was very similar.

II. CORPORATION CENTRAL SECURITY STAFF CONTROL

The second regulating force each security organization had to comply with was the corporation's central security staff. This included both the police and fire protection it provided.

As previously mentioned, the central security staff reviewed all of the inspection reports submitted by the fire underwriting company. The corporation security staff insured that any glaring errors discovered by these inspections were fully and immediately corrected.

The corporation provided a very extensive manual which set forth the standards each division should follow in its handling of hazardous materials.

A second inspection of division facilities by members of the corporation's security staff was also conducted. The purpose of this inspection was to inspect all phases of industrial security protection provided by the respective

organization. References were made both to the manner in which hazardous materials were handled and the manner in which each security organization complied with central office manuals.

A second manual was provided by them which indicated procedures the corporation central security staff advocated. This included both procedures in fire and police-type activities.

As will be explained in the following chapter, each security organization was required to submit a quarterly report which accounted for its activities. This was also a tool which promoted uniformity of protection provided by the two industrial security organizations.

It has been demonstrated that there were basically two organizations which tended to bring about the performance of uniform practices at both security organizations. These two were the fire underwriting company and the corporation's central security staff.

The Atlas Division had a central security staff of its own, which constituted yet a third organization which measured and suggested improvement for the security organization. However, this did not change the regulations as compared to those at the Bartell Division. Possibly, it provided more extensive inspections at the Atlas Division.

It has been the purpose of this section to describe

the central type of regulating organizations which existed and which had a definite influence on the security organizations. These regulating organizations tended to serve as a means of providing security protection which was based upon the same set of standards.

CHAPTER IX

DATA COLLECTION INSTRUMENT AND RESULTS

The purpose of this chapter is to acquaint the reader with the measurements used to collect the data that is presented in the remainder of this chapter.

The data that is presented (with the exception of the number of times municipal fire departments were called upon for actual assistance in combating a fire) was taken from the Plant Protection Quarterly Activity Report. This report was prepared for the yearly quarters ending March 31, June 30, September 30, and December 31. It was required that each industrial security organization for every division in the Universal Products Corporation submit such a report to the central security staff by no later than the fifteenth of the month following the end of the quarter.

The data which this thesis is primarily interested in is that which came from these quarterly activity reports in the areas listed below:

1. Number of no-loss fires reported.
2. Number of loss fires reported.
3. Approximate total loss caused by fires.
4. Number of employees in the plant fire brigade.
5. Number of times company property loss

reports were received.

6. Value of company property reported lost or stolen.

7. Number of times employee property was reported lost or stolen.

8. Value of company property recovered.

9. Value of employee property recovered.

The number of times the local fire department was called upon to furnish actual assistance to the industrial security department was taken from departmental records. This particular item was not required on the Plant Protection Quarterly Activity Report.

A fire, for the purpose of this report, is defined as the unintended ignition of matter for which extinguishing action is required. The number of fires reported included all fires as previously described which came to the attention of the reporting department.

Fire loss included the cost of fire extinguishment replacement and water damage caused by water coming from either fire hoses or sprinkler systems, in addition to actual property damage caused by the fire.

The fire brigade membership size included all members, thus taking into account production workers, maintenance men, electricians, and pipefitters. This did not include members of the industrial security organizations.

From interviews with those persons who filled out these activity reports, the investigator believes that both organizations were reporting their results in the same manner and were following closely the guidelines laid down by the corporation's central security staff. The corporation provided both detailed written instructions and actual classes to insure that the reports were made out in a uniform manner.

Thus, it is believed that the data provided on the following pages of this chapter reflect measurements made by both industrial security organizations which were being carried out in a similar, if not almost identical, manner.

TABLE I

NUMBER OF NO-LOSS FIRES REPORTED BY THE ATLAS MANUFACTURING DIVISION AND THE BARTELL EQUIPMENT DIVISION

For quarter ending	Atlas Manufacturing Division	Bartell Equipment Division
Sept. 30, 1960	0	16
Dec. 31, 1960	0	29
Mar. 31, 1961	3	22
June 30, 1961	1	21
Sept. 30, 1961	2	18
Dec. 31, 1961	1	9
Mar. 31, 1962	1	15
June 30, 1962	2	19
Sept. 30, 1962	1	18
Dec. 31, 1962	1	15
Mar. 31, 1963	3	17
June 30, 1963	3	7
Sept. 30, 1963	0	8
Dec. 31, 1963	0	9
Total	18	223

TABLE II

NUMBER OF LOSS FIRES REPORTED BY THE
ATLAS MANUFACTURING DIVISION AND
THE BARTELL EQUIPMENT DIVISION

For quarter ending	Atlas Manufacturing Division	Bartell Equipment Division
Sept. 30, 1960	1	8
Dec. 31, 1960	0	6
Mar. 31, 1961	0	8
June 30, 1961	0	6
Sept. 30, 1961	0	4
Dec. 31, 1961	0	9
Mar. 31, 1962	2	6
June 30, 1962	0	5
Sept. 30, 1962	0	4
Dec. 31, 1962	0	10
Mar. 31, 1963	0	8
June 30, 1963	0	10
Sept. 30, 1963	0	7
Dec. 31, 1963	1	6
Total	4	97

TABLE III

FIRE DAMAGE REPORTED BY THE ATLAS MANUFACTURING DIVISION AND THE BARTELL EQUIPMENT DIVISION

For quarter ending	Atlas Manufacturing Division	Bartell Equipment Division
Sept. 30, 1960	$ 2,500	$ 2,656
Dec. 31, 1960	—	2,225
*Mar. 31, 1961	—	62,982
*June 30, 1961	40	16,539
Sept. 30, 1961	176	115
Dec. 31, 1961	88	1,316
Mar. 31, 1962	5,006	819
June 30, 1962	297	666
Sept. 30, 1962	245	1,256
Dec. 31, 1962	—	5,659
Mar. 31, 1963	167	5,592
June 30, 1963	167	2,611
*Sept. 30, 1963	—	26,921
Dec. 31, 1963	800	1,516
Total	$ 7,386	$130,863
*Total with the indicated quarters removed	$ 7,386	$ 40,960

NOTE: These figures also include replacement cost of extinguishing materials used, and water damage done by discharge of automatic sprinkler systems.

TABLE IV

NUMBER OF EMPLOYEES IN PLANT VOLUNTEER FIRE BRIGADE AT THE ATLAS MANUFACTURING DIVISION AND THE BARTELL EQUIPMENT DIVISION

For quarter ending	Atlas Manufacturing Division	Bartell Equipment Division
Sept. 30, 1960	697	230
Dec. 31, 1960	704	"
Mar. 31, 1961	695	"
June 30, 1961	715	"
Sept. 30, 1961	734	"
Dec. 31, 1961	734	260
Mar. 31, 1962	690	"
June 30, 1962	689	"
Sept. 30, 1962	690	"
Dec. 31, 1962	644	"
Mar. 31, 1963	674	"
June 30, 1963	646	"
Sept. 30, 1963	674	"
Dec. 31, 1963	540	"
Average	680	243

TABLE V

NUMBER OF TIMES MUNICIPAL FIRE DEPARTMENT FURNISHED ASSISTANCE TO THE ATLAS MANUFACTURING DIVISION AND THE BARTELL EQUIPMENT DIVISION

For quarter ending	Atlas Manufacturing Division	Bartell Equipment Division
Sept. 30, 1960	0	0
Dec. 31, 1960	0	0
Mar. 31, 1961	0	1
June 30, 1961	0	1
Sept. 30, 1961	1	1
Dec. 31, 1961	0	1
Mar. 31, 1962	0	0
June 30, 1962	0	0
Sept. 30, 1962	0	1
Dec. 31, 1962	1	1
Mar. 31, 1963	0	0
June 30, 1963	0	1
Sept. 30, 1963	0	3
Dec. 31, 1963	0	1
Total	2	11

TABLE VI

NUMBER OF COMPANY PROPERTY LOSSES REPORTED BY
THE ATLAS MANUFACTURING DIVISION AND
THE BARTELL EQUIPMENT DIVISION

For quarter ending	Atlas Manufacturing Division	Bartell Equipment Division
Sept. 30, 1960	12	16
Dec. 31, 1960	6	6
Mar. 31, 1961	11	15
June 30, 1961	7	18
Sept. 30, 1961	4	7
Dec. 31, 1961	10	14
Mar. 31, 1962	8	16
June 30, 1962	11	10
Sept. 30, 1962	5	8
Dec. 31, 1962	3	12
Mar. 31, 1963	14	13
June 30, 1963	14	11
Sept. 30, 1963	10	5
Dec. 31, 1963	8	9
Total	123	160

TABLE VII

VALUE OF COMPANY PROPERTY LOSSES REPORTED
BY THE ATLAS MANUFACTURING DIVISION
AND THE BARTELL EQUIPMENT DIVISION

For quarter ending	Atlas Manufacturing Division	Bartell Equipment Division
Sept. 30, 1960	$ 140.00	$1,006.68
Dec. 31, 1960	131.00	165.00
Mar. 31, 1961	244.25	598.19
June 30, 1961	115.70	1,419.58
Sept. 30, 1961	24.00	266.30
Dec. 31, 1961	171.50	178.80
Mar. 31, 1962	173.00	1,627.54
June 30, 1962	120.00	413.78
Sept. 30, 1962	40.50	416.65
Dec. 31, 1962	65.00	571.00
Mar. 31, 1963	671.50	568.05
June 30, 1963	701.15	518.60
Sept. 30, 1963	48.35	366.52
Dec. 31, 1963	177.00	590.00
Total	$2,823.45	$8,706.69

TABLE VIII

VALUE OF COMPANY PROPERTY RECOVERED BY THE ATLAS MANUFACTURING DIVISION AND THE BARTELL EQUIPMENT DIVISION

For quarter ending	Atlas Manufacturing Division	Bartell Equipment Division
Sept. 30, 1960	$ 58.00	$ 104.30
Dec. 31, 1960	76.00	354.42
Mar. 31, 1961	—	1,213.09
June 30, 1961	30.00	2.00
Sept. 30, 1961	—	28.50
Dec. 31, 1961	—	—
Mar. 31, 1962	—	—
June 30, 1962	—	22.50
Sept. 30, 1962	5.00	43.50
Dec. 31, 1962	50.00	25.00
Mar. 31, 1963	13.30	20.00
June 30, 1963	—	
Sept. 30, 1963		
Dec. 31, 1963		
Total	$232.60	$1,813.31

TABLE IX

NUMBER OF THEFTS OF EMPLOYEES' PROPERTY AS REPORTED BY THE ATLAS MANUFACTURING DIVISION AND THE BARTELL EQUIPMENT DIVISION

For quarter ending	Atlas Manufacturing Division	Bartell Equipment Division
Sept. 30, 1960	7	10
Dec. 31, 1960	10	18
Mar. 31, 1961	4	14
June 30, 1961	9	12
Sept. 30, 1961	11	10
Dec. 31, 1961	15	22
Mar. 31, 1962	14	21
June 30, 1962	13	16
Sept. 30, 1962	15	18
Dec. 31, 1962	17	22
Mar. 31, 1963	17	17
June 30, 1963	13	14
Sept. 31, 1963	21	15
Dec. 31, 1963	9	22
Total	175	231

TABLE X

VALUE OF EMPLOYEES' PROPERTY TAKEN AS REPORTED BY THE ATLAS MANUFACTURING DIVISION AND THE BARTELL EQUIPMENT DIVISION

For quarter ending	Atlas Manufacturing Division	Bartell Equipment Division
Sept. 30, 1960	$ 41.00	$ 224.21
Dec. 31, 1960	91.00	613.50
Mar. 31, 1961	18.00	510.40
June 30, 1961	70.45	67.45
Sept. 30, 1961	51.00	231.95
Dec. 31, 1961	464.50	501.00
Mar. 31, 1962	265.40	649.34
June 30, 1962	523.44	514.67
Sept. 30, 1962	818.70	532.78
Dec. 31, 1962	1,787.00	1,538.30
Mar. 31, 1963	300.00	359.70
June 30, 1963	412.95	468.00
Sept. 30, 1963	350.50	551.00
Dec. 31, 1963	216.50	523.83
Total	$5,410.44	$7,286.13

TABLE XI

VALUE OF EMPLOYEES' PROPERTY RECOVERED BY THE ATLAS MANUFACTURING DIVISION AND THE BARTELL EQUIPMENT DIVISION

For quarter ending	Atlas Manufacturing Division	Bartell Equipment Division
Sept. 30, 1960	$ 1.00	$ 18.91
Dec. 31, 1960	11.00	117.29
Mar. 31, 1961	1.00	103.50
June 30, 1961	29.00	63.35
Sept. 30, 1961		
Dec. 31, 1961	15.00	226.50
Mar. 31, 1962	19.00	204.22
June 30, 1962	106.00	33.06
Sept. 30, 1962		27.00
Dec. 31, 1962	72.00	155.00
Mar. 31, 1963	44.00	10.00
June 30, 1963	264.20	17.00
Sept. 30, 1963	122.00	82.00
Dec. 31, 1963	10.00	368.00
Total	$694.20	$1,425.82

CHAPTER X

ANALYSIS

This chapter is the culmination of all previous chapters.

I. INDUSTRIAL FIRE PROTECTION

The number of no-loss fires reported by both industrial security departments over the three and one-half year period of time differed considerably. The Atlas Manufacturing Division had ~~four~~ 18 no-loss fires reported as compared to ~~ninety-seven~~ 223 at the Bartell Equipment Division. This is approximately ~~thirty~~ 12 times as many no-loss fires as occurred at the Bartell Division. This great discrepancy can be attributed to two things.

Although both organizations stated that they recorded no-loss fires in the same manner, perhaps they did not. This could at least in part explain the great difference in the frequency of the no-loss fires. It should be noted that these figures were out of proportion with other data collected on industrial fire protection at the two organizations.

Another possible reason for the great difference in the number of no-loss fires reported is that Atlas Division made all members of its security organization responsible for industrial fire protection. All members of the force

were conscious of the need for detecting fire hazards and preventing fires. This fire consciousness did not exist at the Bartell Division, at least not to the degree that it did at the Atlas Division. This meant that at the Atlas Division all the members of the security department were conscious of the need to detect fire hazards and to correct the situation before a fire took place. At the Bartell Equipment Division, this became the "other guys' job," (firemen) of which there were only twelve members.

The number of loss fires and fire loss value is considered by the investigator to be quite accurate for this simple reason: neither division could collect for losses it had incurred unless they reported them on their quarterly activity report, from which the data for this thesis has been taken. Thus, no division would hold back reporting these figures since by so doing they would not have been compensated for their losses by the fire underwriting company. There was also a check provided against reporting greater losses than actually took place as the divisions were required to clear these losses through an adjuster sent out by the common underwriting company.

There were ~~223~~ 97 ~~no~~ loss fires reported at the Bartell Division over a three and one-half year period of time as compared to ~~10~~ 4 reported at the Atlas Division over an equal period of time. The figure at the Bartell Division is

approximately ~~twelve~~ 24 times greater than that at the Atlas Division.

Over this same period of time, the Atlas Division sustained losses of $7,386 due to fire damage compared to $130,863 at the Bartell Division. Even when the three largest fire loss quarters are taken from the fire loss total, the Bartell Division sustained $40,960 in losses or approximately four and one-half times the value losses at the Atlas Division. These figures include not only fire losses per se, but also include water damage, and approximate material costs in connection with replacement of fire fighting equipment.

While the Bartell Division did have greater fire hazards, it is felt that the hazards do not justify such differences in the losses. With ~~twelve~~ 24 times as many loss fires and four and one-half times the damage done (even after the three largest fire loss quarters have been removed, see Table III on page 103), it is necessary to question whether this does not reflect to some degree the efficiency of the non-integrated type of organization as compared to the integrated organization.

When examining the number of fire brigade members at both organizations, a direct reflection of the difference in organization is seen. The integrated security department of the Atlas Division, not having a fire department of its own,

places a greater importance upon the need for fire brigade members and over the three and one-half years under study has averaged a fire brigade membership of 680 members. Bartell Equipment Division, with a special fire department, has averaged 243 members in their volunteer fire brigade. This is a basic difference in the type of organizational structure under study; the integrated membership had one fire brigade member for every 19 employees as compared to one fire brigade member for every 51 employees at the Bartell Division, (including both the hourly-rate and the salaried employees at both organizations).

The data pertaining to the number of times the municipal fire department had to be called upon to bring into the plant fire equipment and personnel, and actually lend in the fighting of a fire is interesting. While the Atlas Manufacturing Division had no fire department and no fire trucks (except a panel truck loaded with first aid fire extinguishing equipment), it had to call upon the city fire department for assistance only two times over the three and one-half year period. The Bartell Division called upon the municipal fire department eleven times, even though they had a fire department, which consisted of four fire vehicles and eleven full-time firemen plus a Fire Marshal. This seems to indicate an inability to cope with the fires at the Bartell Division. However, remember that the Bartell Division had

~~eleven~~ 24 times as many loss fires, yet only had to call upon the municipal fire department five times as much as the Atlas Division. Another factor in the number of loss fires were the increased hazards at the Bartell Division, but fire protection should have been present accordingly. Even considering the circumstances, the much greater number of loss fires at the Bartell Division can not be justified except perhaps in terms of the effectiveness and efficiency of the fire department which was functionally separated from the patrolmen. It would seem that the functionally integrated industrial security organization was more efficient and effective in controlling fire due to their fire conscious patrolmen and increased emphasis on the plant fire brigade.

II. THEFTS

The number of thefts of company property over the three and one-half period was 123 at the Atlas Division compared to 160 thefts of company property at the Bartell Division, or approximately33% more thefts at the Bartell Division as compared to the Atlas Division.

The total amount of thefts of company property over the three and one-half years was $8,707 at the Bartell Division, compared to $2,823 at the Atlas Division. In other words, the Bartell Division incurred approximately three times the losses in value of company property as was sus-

tained at the Atlas Division.

The percentage of recovery of company property by the respective security departments was 8% for the Atlas Division and 21% for the Bartell Division.

It can be seen that the Bartell Division had more thefts of its property and a greater value was taken (approximately three times as much). The Bartell Division also recovered a greater amount of the company property which was stolen (almost three times as much).

It would seem that an explanation for this might be that the greater specialization in actual investigations were producing a greater percentage of return. However, specialization did not account for amount in value of thefts. It is suggested that the greater amount of high theft hazards which were present at the Bartell Division could account for the greater amount of thefts of company property. On the other hand, perhaps it could be attributed to the difference in organization of the industrial security departments.

The number of thefts of employee property over the three and one-half year period under study was 231 at the Bartell Division compared to 175 at the Atlas Division. It should be borne in mind that there were 500 less employees at the Atlas Division. It is interesting to note that the difference in number of thefts from the company and from

employees between the Atlas Division and the Bartell Division was approximately 33% in each instance.

The total amount of property stolen from employees was $5,410 at the Atlas Division compared to $7,286 at the Bartell Division. This approximates the difference in number of thefts from employees in the respective organizations, namely, a 33% increase at the Bartell Division over the Atlas Division. This strengthens the belief that the 300% increase in dollar value of thefts of company property at the Bartell Division over the Atlas Division was due primarily to the greater value of the items stolen from the Bartell organization, because if the item value in the companies were approximately the same, the total value loss of company property should be in relationship to the difference in frequency of thefts, which entailed a 33% increase rather than a 300% increase.

The percentage of recovery of stolen employee property is 13% at the Atlas Division compared to the 20% recovered by the Bartell Division. This again reflects the greater ability of the Bartell Division to recover materials stolen, yet an inability to prevent the thefts. This may indicate that specialization is beneficial in recovery. However, perhaps due to the smaller percentage of the security staff membership directly interested in preventing thefts, (twelve of the members of the organization were

strictly firemen) and this type of police work becomes the "other guys' job," just as it did in the case of the patrolmen regarding fire protection. This feeling did not exist at the Atlas Division where every member of the force was both a policeman and a fireman and where equal emphasis was placed in both areas.

CHAPTER XI

CONCLUSIONS AND SUMMARY OF THE THESIS

This chapter includes both the final conclusions and a summary of the thesis. It is hoped that upon reading this final section of the thesis that the reader will arrive at some conclusions of his own, and have his own interest in this subject area kindled.

I. FINAL CONCLUSIONS

The data provided seems to indicate to some degree that the greater amount of balance and generalization of duties achieved by the integrated type of organization seems to lend itself towards a scheme of organization which produces an overall more effective and efficient industrial security organization. The only place where greater specialization seems to be indicated as being needed is in the area of investigation of thefts from both employees and company. Perhaps an investigation specialist similar to the Fire Lieutenant would create a situation in which a greater proportion of recovery could be obtained. With this one exception, there seems to be a generally greater advantage (both from the point of view of industrial fire protection and protection of company and employees' property from theft) in the integrated type of industrial security organization.

However, specialization for fire investigation and theft investigation is indicated. Every member of an integrated industrial security organization is held responsible for all phases of industrial security work, thus producing a membership which is not likely to note a theft hazard or a fire hazard and feel that it is the fireman's job if he is a patrolman or the patrolman's job if he is a fireman.

While this creates a greater number of persons held responsible for all security activities, it also tends to develop more keen observers of all that is going on about them. This produces more worthwhile observations and a greater span of attention. Boredom is greatly reduced in the integrated industrial security organization as compared to the non-integrated type of organization because of the many more duties the patrolman is responsible for in relation to the duties of his counterpart in the non-integrated type of industrial security organization.

The investigator sincerely feels that the results of this one particular study clearly indicate that there are grounds for believing that the integrated type of organization as compared to the non-integrated type of industrial security organization is more effective and efficient.

II. SUMMARY OF THESIS

The purpose of this thesis is to determine whether

the integrated or the non-integrated type of organizational structure produces the more efficient and effective industrial security organization. In order to determine this, the author had to first find two industrial security organizations which were very similar in all respects with the exception of their organizational structures. Only by holding other variables constant could a valid measurement be made as to the merits of the particular type of organizational structure. The investigator considered many industrial security organizations before selecting these two as the most similar in all respects except for organizational structure.

The two industrial security organizations used in this study are felt to be very well suited to the purpose of this study because the physical facilities being protected, the personnel of the security organizations, the fire hazards which were present and the manner in which protection was provided, the theft hazards and protection provided and the amount and type of centralized control were all very similar. These were the primary areas which had to be explored and determinations made as to their similarity. It was found that these groupings were indeed similar at each division. The differences which were noted have been pointed out to the reader and considered when conclusions were drawn.

With the variables generally remaining constant, the investigator was able to make his measurements regarding

each industrial security organization's effectiveness and efficiency. These measurements were drawn from quarterly reports submitted by each security organization to the corporate security staff. The data from this was analyzed and conclusions were drawn. The conclusion which was drawn from the data was that there was a significant difference in the effectiveness and efficiency of the two organizations with the integrated organizational structure being apparently more effective and efficient.

The study of two industrial security organizations is not enough to arrive at any conclusions regarding the effectiveness and efficiency of other industrial security organizations. Other studies would be necessary before a conclusion that one type of organization is always more effective and efficient than the other. However, the results of this study indicate that there is a significant difference in the contribution of these two isolated cases.

It is hoped that by reading this study, someone else might be stimulated to study this question and contribute further knowledge as to which type of organizational structure tends to provide the most effective and efficient industrial security organization.

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APPENDICES

APPENDIX A

FIRE PROTECTION INSPECTION GUIDE

1. Occupancy of plant
2. Building construction
   - A. Walls
   - B. Columns
   - C. Roofs
3. Products and/or processes
4. Underground looped? Size
5. Primary feed from
6. City main size Plant connection size
7. Secondary supply
8. Gravity tank capacity
9. Total water reserved for fire protection
10. Other sources
11. Water level indicator
12. Water temperature indicator
13. Automatic heating device for tank
14. Number of fire pumps
15. Maximum pressure
16. Diesel Capacity
17. Electrical Capacity
18. Electrical power for pump separate from plant's power
19. Pumps tested weekly

20. Number of fire hydrants Size of connections
21. Same size and direction of turn as local fire department's
22. Number of hose houses Number of feet of hose in each
23. Age of underground Date last tested
24. Number of inside hose drops Feet of hose on each
25. Type of nozzel Clearly designated
26. Percentage of manufacturing area sprinklered
27. Percentage of office area sprinklered
28. Number of heads held in reserve
29. Lines tested Flushed
30. Types of sprinkler systems
31. Types of riser alarms
32. Alarms on all risers
33. Carbon dioxide alarms
34. Siamese connection provided and clearly designated
35. Post indicator and sectional valves all opened and sealed
36. Wrenches attached
37. None leaking or inoperative
38. Valves checked daily by whom
39. Valves identified for system controlled
40. Number of fire trucks Types of fire trucks
41. Equipment on each

42. Extinguishers
    A. Water pressurized
    B. Dry chemical
    C. Carbon dioxide size
    D. Foam size
    E. Carbon tetrachloride used
    F. ABC dry chemical
    G. G-1
43. Extinguishers hydrostatically tested
44. Maximum pressure P.S.I.
45. Hose tested yearly Extinguishers tested yearly
46. Extinguishers regularly inspected
47. Extinguishers clearly identified
48. Extinguishers recharged promptly
49. Equipment in good condition
50. Maintenance required by specified personnel
51. Fire walls adequate
52. Draft curtains adequate
53. Roof type:
    A. Sawtooth
    B. Flat
    C. Monitor
54. Mechanical vents or skylights have heat release device
55. Gas, water, and electric pipes color coded

56. Contents and direction of flow indicated

57. Main valves identified and accessible

58. Emergency lighting and power

59. Fire alarm system has emergency power

60. Console system has emergency power available

61. Fire and water flow reporting system

62. Name of system Type

63. Plant protection headquarters communication system

64. Do fire, patrol tour, and water flow alarms register on console board

65. Is direct connection to local fire department provided

66. Is there a local fire alarm system provided for the plant fire brigade

67. Type of breathing apparatus Quantity

68. Oxygen and acetylene separated

69. Cylinders kept secured

70. Cyanide and acids separated

71. Nitrates and cyanides separated

72. Combustible absorbent used on floors

73. Safety cans provided for flammable cleaners

74. Flash point of solvent used in cleaning

75. Spray booths located in what plants

    A. Accessible in case of fire

    B. Exhaust vented to outside

    C. Cleaned regularly

D. Sprinkler protection provided

E. Booths properly maintained

F. Sprinklers provided in exhaust stakcs

G. Electrical equipment approved

H. Conveyor enclosures from booths have sprinkler protection

I. First aid fire equipment available and adequate

76. Paint mixing rooms

A. Sprinkler protection provided

B. All electrical equipment approved

C. Other automatic protection provided

D. All rotating and mixing tanks grounded by a copper ground

E. Concrete floors have conducting surface

F. Non-sparking tools used

G. Doorways curbed and scuppered

H. Room provided with adequate drainage for sprinklers

I. Adequate fire doors on all exits

J. Explosion vents in ceiling

K. Window panes scored on outside

L. Mixing tanks vented to outside

M. All dispensing valves are of safety type

N. Mixing room located along outside wall

O. Ventilation adequate and operating

P. First aid fire equipment available outside room

77. Dynamometer and fuel testing cells

A. Number of cells

B. Sprinkler protection provided

C. Other automatic protection provided

D. Adequate ventilation and exhaust provided

E. Fuel supply regulated against excess pressure

F. Engines interconnected with fire protection system to shut off when system actuates

G. Area restricted from smoking and flames

H. Drainage adequate for sprinkler system

I. Automatic cut off of fuel in event of fire

J. Electrical equipment approved.

78. Flammable liquid storage rooms

A. Barrels and tanks grounded

B. All electrical equipment approved

C. Ventilation adequate

D. Sprinkler protection provided

E. Pumps have automatic shut off in the event of fire

F. Grounding wire provided for dispensing containers

G. Barrels provided with safety type dispensing valves

H. "No Smoking" signs adequate and conspicuous

I. Lowest flash point of any liquid

79. Flammable liquids not stored in separate rooms

A. Not over one day's supply

B. Sprinkler protection provided

C. Grounded straps needed Used

D. Dispensing done by gravity or pumps

E. Barrels not stored in numerous locations

80. Heat-treating operation

A. Oil quench tanks have automatic protection

B. Backed up by sprinkler protection

C. High temperature alarm provided

D. Emergency dump tank and automatic dump valve provided

E. Capacity of dump tanks

F. Sprinklers provided in exhaust stacks

81. Hazardous metals (magnesium)

A. Special fire protection equipment provided

B. Shavings and chips kept in covered cans

C. Area kept clean of combustibles

D. Sprinkler protection provided

82. Closest fire station

83. Cutting and welding procedures

APPENDIX B

SECURITY INSPECTION GUIDE

1. Description of lighting
2. Description of perimeter barrier
3. Are all perimeter openings to the plant manned by member of the industrial security organization
4. Protection provided for railroad gates
5. Visitor, vendors, and suppliers policy
6. Pass procedure
   - A. Deliveries and pick-ups
   - B. Outside deliveries
   - C. Employees removing personal property
7. Type of inspection made of vehicles leaving company property
8. Inspection of employees' lunchboxes policy
9. Patrol of facilities
   - A. When
   - B. Type of patrolman supervisory system
   - C. Method of contacting patrolmen on patrol
   - D. Industrial security vehicles and equipment used
   - E. Types of communication
10. Lock and key under industrial security department
11. Procedure regarding issuance of master keys to security personnel

12. Salvage practice
13. How are obsolete parts disposed of--If mutilated, is it done on company property and under observation of a patrolman
14. Describe disaster control program
15. Procedure regarding scrap (metal, cardboard and paper)
16. Description of high theft hazards and measures taken to cope with these hazards
17. Is there a central control board combining patrol, fire
18. Who performs investigation activities
19. Patrolmen functions in the event of a fire
20. Description of daily reports turned in by patrolmen
21. Is all flow of employees under the observation of members of the security department
22. How are thefts reported and how are they processed
23. Are parking lots patrolled
24. Are members of security organization armed