Research on Methods Introducing Fire Supervision Information into the Work of Fire Fighting and Rescue

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Abstract: "Combination of fire prevention and extinction" is the legal principle of fire control. This paper analyzes the necessity of introducing the fire supervision information into the work of fire fighting and rescue, puts forward the idea of establishing a fire supervision information base, effectively establishes the theoretical framework of the fire supervision information base, and realizes the computerization of software which better verifies the adaptability and feasibility of this method.

1. Introduction

Military command theory points out that the operational environment is an important part of the operation plan, which restricts and influences the operation.[1] The environment of fire-fighting and rescue operations not only include the natural environment, such as weather, temperature, wind direction, wind force, terrain and hydrology, but also involve the artificial environment, which includes negative consequences of human activities on fire-fighting and rescue operations. There are two types of artificial environment. First is the non targeted artificial environment; this kind of artificial environment does not only have impacts on fire fighting and rescue operations, but also have impacts on other social activities. For example, road traffic jams, road construction, road height limit and width limit can affect the fire fighting and rescue forces to arrive the scene at the first time. This kind of artificial environment is easy to master to a certain extent. Second is the targeted artificial environment; this kind of artificial environment mainly affects fire fighting and rescue operations. For example, the fire lane is occupied; the exit is locked; fixed fire-fighting facilities are in failure. These can be regarded as all kinds of fire hazards and illegal fire-fighting behaviours, which directly affect the fire-fighting and rescue operations. This kind of artificial environment is difficult for the commander to grasp in advance. Generally, they can only be found in the process of on-site investigation or mission implementation after arriving the site or after the fire-fighting and rescue operation is launched. The commander needs to adjust the operation plan temporarily to ensure the effective fire-fighting and rescue operation. If these situations can be effectively grasped by the commander in advance, the commander will be able to properly arrange and deploy the operation, and effectively grasp the opportunity of fire fighting and rescue.

The original *Order of Fire Fighting Force on Duty* clearly stipulates that, "the fire supervision department (division) shall timely inform the headquarters, fire brigades and squadrons of existing problems, fire hazards and changes affecting the fire fighting and rescue of key fire safety units under its jurisdiction; the department should do a good job in coordination so that the on duty force can be familiar with key fire safety units and carry out fire drill; the department should participate in the pre-arranged planning, provide relevant information and fulfil other combat responsibilities." [2]

At present, the fire-fighting and rescue information base established by China's fire-fighting and rescue team mainly includes the information bases of various social departments, such as the expert information base, the fire geographic information base, the water source information base, the fire extinguishing agent distribution and storage information base, and so on. It has not yet effectively established the supervision information base aiming at fire hazards and illegal behaviours of social units and their possible impacts on fire fighting and rescue operations.

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2. Analysis on the Necessity of Introducing Fire Supervision Information into Fire Fighting and Rescue

In recent years, the fire supervision department of fire rescue team has carried out a series of special actions aimed at constantly improving the level of social fire prevention and control and ensuring the stability of social fire situation, and has eliminated a large number of fire hazards. Meanwhile, it has continuously improved the quality, level and strength of law enforcement, preventing and controlling the occurrence of mass casualties in fire accidents. We have made remarkable achievements, but the effectiveness of fire supervision cannot be done once and for all. People are always the main factor in social production and life; there are also a number of cases in which fire hazards and illegal fire-fighting behaviours affect fire-fighting and rescue operations. Typically, in 2009, the fire in the new CCTV building under construction [3], the location of the fire origin was relatively high, so it was difficult for mobile fire-fighting facilities to take effect. Water pressure of indoor hydrant pipe network could not meet specified requirements; internal attackers reaching the water gun position level found that the water pressure was insufficient and the water could not be discharged. They could not effectively control the spread of the fire in the first time, causing casualties and greatly reducing the effectiveness of fire fighting. These situations can be found by fire supervisors in daily supervision and inspection.

According to the provisions of laws and regulations, the discovered fire hazards and illegal fire-fighting behaviours shall be rectified, restored to the original state or stopped, and the unit and individual shall be punished according to law. In this way, the hidden dangers and illegal fire fighting behaviours could be eliminated and corrected; they should no longer impact the fire fighting and rescue operations. However, in the actual law enforcement, some buildings are important units related to people's production and life; some are special units listed in the special protection plan by the local government. To shutdown and rectify these units with potential fire hazards, responsible officers must contact with and be approved by the local government, so the order cannot be effectively implemented in the first time.

At the same time, another situation is found in the process of law enforcement and supervision; that is, habitual illegal fire fighting. It refers to behaviours that often happen around us; people are accustomed to these behaviours, but these behaviours actually violate fire laws, regulations and technical specifications. The habitual illegal fire-fighting behaviours do not necessarily cause fire accidents at ordinary times. But once a fire occurs, it is very easy to cause mass casualties. According to the statistics and analysis of fire accidents with mass casualties in China from 1990 to 2005, it is found that fires happened in densely populated places and caused mass casualties account for 30% of the total number of fire accidents; the number of deaths accounted for 60% of the total number [4]. A lot of fire accidents with mass casualties are caused by habitual illegal fire fighting, which is very harmful. The common habitual illegal behaviours of fire protection mainly include, safety exit locking, evacuation channel blocking, the open of fireproof door, which should be normally closed, goods stacked under the fire resistance shutter door, and invalid emergency lighting and safety exit signs. The causes of these habitual fire-fighting violations include objective factors, as well as the subjective carelessness and fluke of unit managers. For the sake of public security, the needs of the unit in production and operation, and the convenience of management, the fire-fighting safety is often sacrificed [5]. In view of habitual illegal fire-fighting behaviours, fire supervision departments should increase publicity, education, training, inspection and punishment, and promote the application of practical fire-fighting skills. The fire-fighting training department should also be prepared.

Therefore, the potential fire hazards and illegal fire-fighting behaviours of all social units should be mastered by the fire fighting training department and the commander of the fire rescue station. Potential fire hazards and illegal fire-fighting behaviours that may affect the fire-fighting and rescue actions shall be classified and stored to ensure that the fire-fighting supervision department can scientifically and effectively convey the fire-fighting supervision information to the fire fighting training department and fire brigade.

3. Information Structure Analysis of the Fire Supervision Information Base

In order to introduce the fire supervision information into fire fighting and rescue, it is necessary to study fire hazards and illegal behaviours that affect fire fighting and rescue operations and can be found in fire supervision and inspection, as well as specific consequences of these hazards and illegal behaviours. Therefore, the supervision information base is composed of two types of information, namely, information on fire hazards and illegal behaviours and information on impacts and consequences, as shown in Figure 1.
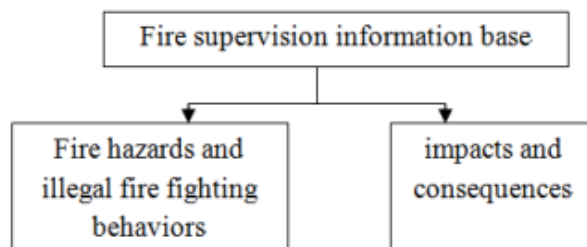

Fig.1 Information Structure of the Fire Supervision Information Base.

3.1 Information on Fire Hazards and Illegal Behaviours

According to *Regulations on Fire Control Supervision and Inspection* and the supervision and inspection category and content involved in the fire supervision and inspection record [6], contents that are likely to have substantive impacts on fire fighting and rescue operations (especially with regard to habitual fire violations) can be extracted. After the fighting squadrons know relative contents, they can take measures to avoid negative consequences, or adjust operational actions in advance to extinguish the fire more effectively in fighting and rescue operations. When carrying out supervision and inspection, the fire supervisor shall inspect whether there are fire hazards and illegal fire-fighting behaviours according to these contents. It mainly includes three categories, as shown in Figure 2.

First is building structure. Specific contents include, whether the exit is locked and blocked; whether the fire lane is occupied; whether the fire engine access is stored with sundries and blocked; whether the fire elevator is running well and safely; whether the climbing operation lane is blocked and occupied; whether the decoration layout blocks original doors and windows, and so on.

Second is signs of fire-proof facilities. Specific contents include, whether there are goods stacked under the fire-proof rolling shutter; whether the shutter can fall normally; whether the linkage is good; whether the fire-proof door, which should be normally closed, is open; whether the smoke exhaust and air supply device operates well; whether the emergency lighting is in good operation and can realize the good lighting effect of the fire site.

Second is fire fighting facilities. Specific contents include, whether the fire pump operates well; whether the linkage is in good condition; whether the indoor fire hydrant is in good condition, and whether the water pressure is up to standard; whether the municipal fire hydrant is in good condition, and whether the water pressure is up to standard; whether the fire pool is in good condition, and whether the water storage capacity meets the requirements; whether the fire water tank is in good condition, and whether the water storage capacity is up to standard; whether the water pump connecter is in good condition and easy to use, and whether it can supply water to designated pipe network according to the design requirements; whether the automatic fire extinguishing facilities, especially the linkage of automatic fire extinguishing facilities meets the standard, and whether manual operation is required.

Some fire hazards and illegal fire fighting behaviours may also have an impact on fire fighting and rescue operations, such as changing the building structure, destroying the fire compartment, using substandard building materials for decoration, and so on. However, these situations and their consequences cannot be eliminated or avoided by on-site commanders in advance, so they are not included in the information base.
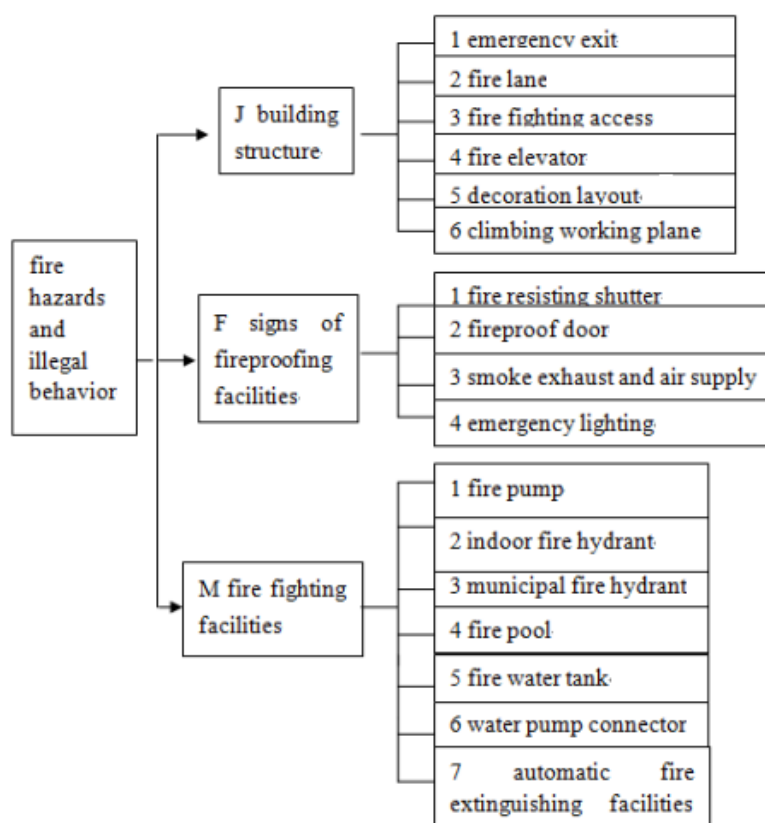
Fig.2 Structure of Fire Hazards and Illegal Behaviours.

3.2 Information on Impacts and Consequences

According to previous inspection results, we can judge whether these fire hazards and illegal fire fighting behaviours will impact fire fighting and rescue operations. The commander can grasp the situation in advance and be prepared to avoid negative influence. It mainly includes four aspects, as shown in Figure 3.

The first aspects include conditions that may cause fire spreading. Specific contents include, failure of linkage opening of automatic fire-fighting facilities (the commander can arrange personnel to start facilities manually at the first time, so the force on site should be increased); failure or insufficient function of the fire proof shutter and door (the commander can arrange personnel to restore and correct the state of fire-fighting facilities at the first time, so the force on site should be increased).

The second aspect includes conditions that may affect the start of the fighting. Specific contents include, blocking or occupying the fire lane (the commander may consider adjusting the vehicle access route, or arranging personnel to clean up in the first time); occupying the climbing operation lane (the commander may adjust the operation, arranging personnel to clean up and demolish in the first time).

The third aspect includes conditions that may cause water supply difficulties in the fire site. Specific contents include, the fire water tank is damaged or water storage is insufficient; municipal fire hydrant has no water or pressure; fire water tank is damaged or water storage is insufficient (the commander can take other measures in time in advance, such as remote water supply, fire truck water transportation, and increasing the number of water tank pumps on site); water pump connector is damaged and fire water pump cannot work (the commander can take other measures in advance, such as water supply by water hose, and water supply to pipe network by using indoor fire hydrant on the first floor).
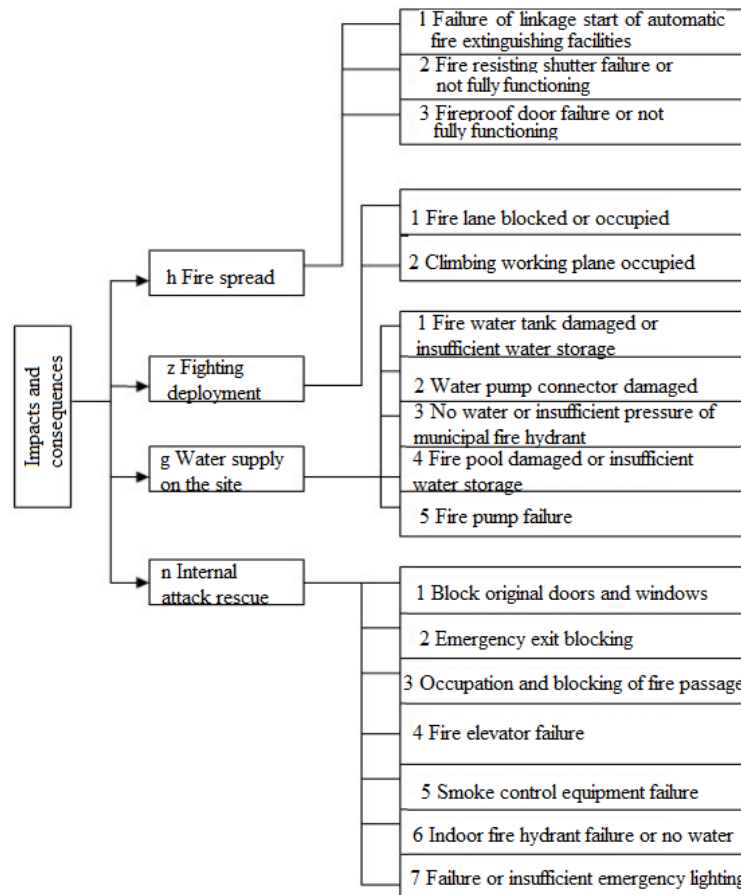
Fig.3 Structure of Impacts and Consequences.

The fourth aspect includes difficulties that may cause internal rescue difficulties. Specific contents include, blocking the original doors and windows; blocking the safety exit passageway (commanders can adjust the rescue route, arrange people to demolish, and call demolition tools); failure of the fire lift (commanders can adjust the internal attack method earlier, and adopt other means of climbing); failure of the smoke control equipment (commanders can adjust the method of internal attack ahead of schedule, increase smoke exhaust equipment, or arrange people to demolish); failure of indoor fire hydrant or no water (the commander can take other means in advance, such as water supply by water hose and increase external attack force); failure or insufficient emergency lighting (the commander can increase fire lighting).

3.3 Relationship between Two Types of Information

The two types of information have the relationship of causes and results, and there is a corresponding mapping relationship, as shown in Table 1.

Table 1 Relationship between Two Types of Information

Fire hazards and illegal behaviours	Impacts and consequences	Fire hazards and illegal behaviours	Impacts and consequences	Fire hazards and illegal behaviours	Impacts and consequences
J1	n 2	F1	h 2	M3	g 3
J2	z 1	F2	h 3	M4	g 4
J3	n 3	F3	n 5	M5	g 1
J4	n 4	F4	n 7	M6	g 5
J5	n 1	M1	g 5	M7	h 1
J6	z 2	M2	n 6		

4. Methods of Applying the Fire Supervision Information Base

After supervising and inspecting the situation, the fire supervisor shall select situations that

conform to fire hazards and illegal behaviours in the supervision information base, and mark the specific location of hidden dangers and illegal behaviours. Whether the mistake is rectified on the spot, will be rectified within a time limit or be blocked up, the situation should be marked and relevant information shall be briefly noted. According to corresponding relationship between two types of information, commanders of the training department can know possible consequence, as well as specific locations and remarks, as shown in Figure 4. In this way, the training department and commanders can know the law of hidden danger, as well as the occurrence and frequency of illegal behaviours. They can not only know whether consequences exist in the fire fighting and rescue, but also infer the possibility of their existence.
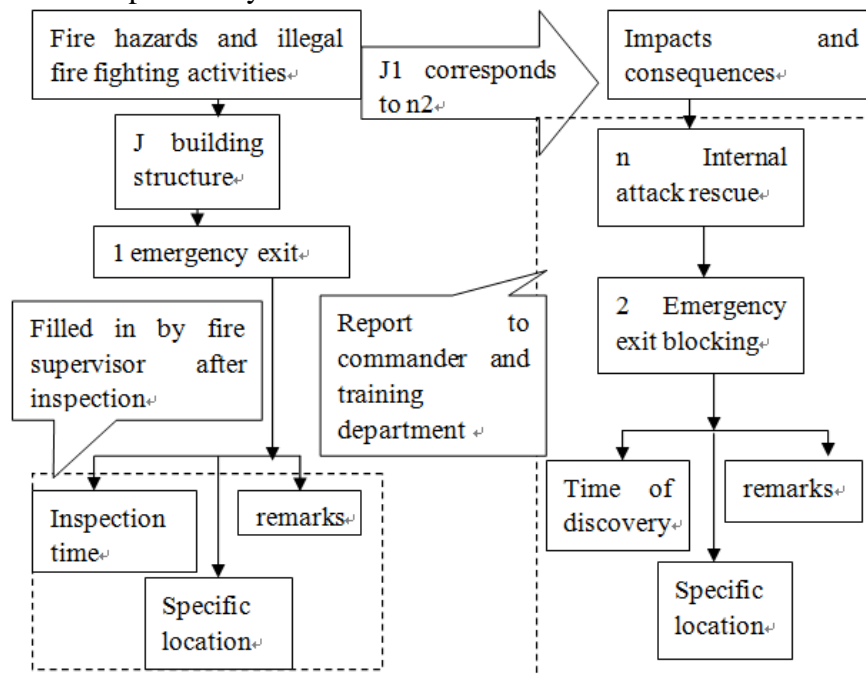

Fig.4 Methods of Applying the Fire Supervision Information Base.

5. Examples of Applying the Computer Software

As an application module of the "fire fighting and rescue planning software", the research content of this paper effectively realizes the practical transformation of theory. The adaptability and feasibility of this method are verified by the evaluation of relevant experts and the feedback of grass-roots fire rescue teams.

In addition to the administrator, there are three types of users' accounts in the software, namely the "fire station commander", the "fire supervisor" and the "unit information administrator". Each user can only use functions on corresponding management interface according to the authorization of the administrator. The fire station receives the alarm and dispatches firemen by pressing the "receive and dispatch" button; the fire supervisors input and modify supervision information by pressing the "input and modify supervision information" button; the squadron and training department input and modify unit information by pressing the "input and modify unit information" button.

When the fire station receives the alarm, if the disaster unit can be determined and this unit is included in the inspection scope of the fire supervision department, the fire station can click the "fire supervision information" button to enter the query page. According to inspection results of the unit input by the fire supervisor, situations affecting the fire fighting and rescue operation can be searched according to the time period, so that the commander can grasp the law of the occurrence and frequency of hidden dangers and illegal acts. They can not only know whether the impacts exist, but also deduce possible consequences. The contact information of the fire supervisor of that unit can also be provided to facilitate the commander to ask for relevant information.

6. Conclusion

The method in this paper is put forward mainly based on existing laws and regulations, and combined with the author's experience on fire supervision and inspection for many years. There are some unsatisfactory aspects in this paper; for instance, fire supervision personnel may have scruples and do not actually record the inspection results; the system does not effectively consider that situation. However, to some extent, this method has solved the unfavourable situation of "seeming separation" in the work of "fire fighting" and "fire prevention" for many years. At the same time, it provides a new way to improve the effectiveness of fire fighting and rescue work of fire rescue teams and can improve the comprehensive emergency rescue ability of fire fighting.

References

[1] Lu, L.H. Fundamentals of Military Command, Beijing: National Defence University Press, 2002, pp.33-36.

[2] Order of Fire Fighting Force on Duty, [online] Available: https://www.mps.gov.cn/n2253534/n2253535/c4125277/content.html

[3] Beijing Fire Brigade. Fire Fighting Report on the Construction Site of Cultural Center Affiliated to CCTV New Site. Beijing Fire Brigade, 2009.

[4] The Harmfulness Habitual Illegal Fire Fighting and Countermeasures, [online] Available: http://www.01ruodian.com/school/news.asp?id=5847

[5] Regulations on Fire Control Supervision and Inspection, [online] Available: https://www.mps.gov.cn/n2254314/n2254409/n2254443/n2254450/c3940113/content.html

[6] Fire Supervision and Inspection Legal Document (Format), [online] Available: https://wenku.baidu.com/view/754830b169dc5022aaea00b6.html