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FUNDAMENTAL PRINCIPLES OF ORGANIZING AND SAFELY CONDUCTING EVACUATION IN EMERGENCY SITUATIONS

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Abstract: This article examines the main principles of organizing the evacuation of the population, employees, and other persons from hazardous areas to safe areas in the event of emergencies. It analyzes the concept and types of evacuation, advance planning, organization of evacuation routes and exits, notification of people, registration at assembly points, the responsibilities of designated personnel, and the organization of evacuation drills. The article also considers the specific aspects of evacuation during fires, earthquakes, accidents at chemically hazardous facilities, and other emergency situations.

Keywords: evacuation, emergency situation, safe area, evacuation plan, evacuation route, assembly point, notification, civil protection, fire safety, occupational safety, emergency preparedness.

Emergency situations can pose serious threats to human life and health, the environment, industrial facilities, and material assets. Under such circumstances, one of the most important measures for reducing risks is the timely and orderly evacuation of people from hazardous areas. Properly organized evacuation plays a significant role in reducing the consequences of emergencies, preventing panic and disorder among people, and protecting human life.

Evacuation is the organized process of removing or relocating people from a hazardous area to a safe area when an emergency occurs or when there is a threat of its occurrence. The primary purpose of evacuation is to protect human life and health and to minimize, as far as possible, the impact of hazardous factors. Evacuation is not limited merely to people leaving a building. It also includes the advance notification of employees or the population, the designation of safe evacuation routes, management of the evacuation process, directing people to assembly points, accounting for evacuees, and, where necessary, providing medical or other assistance.

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Figure 1. Evacuation routes and the process of leaving a facility during an emergency

The effectiveness of evacuation primarily depends on the extent to which it has been planned in advance. Attempting to develop an evacuation plan only after an emergency has occurred can create numerous additional risks. Therefore, organizations, enterprises, educational institutions, commercial facilities, and service facilities should establish evacuation procedures in advance and ensure that employees are properly informed about them. When planning evacuation procedures, the specific characteristics of the facility must be taken into consideration. These include the number of floors in a building or structure, the number of people present, the composition of employees during working hours, the presence of visitors, hazardous technological processes, fire and explosion risks, the presence of hazardous chemicals, transportation routes, and the location of safe areas. Evacuation routes must enable people to leave hazardous areas as quickly and safely as possible. Corridors, stairways, exit doors, and other evacuation elements must always be maintained in a condition suitable for use. Blocking evacuation routes with various objects, locking exit doors, or placing items that interfere with the movement of people can significantly increase the level of risk. When determining evacuation routes, not only the normal movement patterns of people but also the possibility of moving away from the source of danger during an emergency must be taken into account. For example, during a fire, it may be dangerous to use a route through which smoke is spreading. In the event of a chemical release, the direction of dispersion of the hazardous substance and the direction of the wind must also be considered. An evacuation plan is an important information tool for organizing the safe evacuation of people. The plan may include a schematic representation of the building or territory, primary and alternative exit routes, stairways, emergency exits, the locations of fire-fighting equipment, first-aid facilities, and designated safe assembly areas. When developing an evacuation plan, it is important to

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ensure that it is presented in a clear and visible form. The plan should be displayed in areas of the building where people frequently gather, and its contents should be explained to employees.

Main Stages of the Evacuation Process

Stage	Activity to be performed	Main objective
1	Identification of the emergency	To obtain prompt information about the danger
2	Notification of people	To inform employees and the population about the danger
3	Initiation of evacuation	To remove people from the hazardous area
4	Movement along designated routes	To ensure orderly and safe evacuation
5	Arrival at the assembly point	To gather evacuated people in one location
6	Accounting for people	To determine who has been evacuated
7	Provision of necessary assistance	To assist injured and vulnerable individuals
8	Monitoring the situation	To obtain information about persons who may remain inside or be missing

Personnel responsible for managing evacuation must be designated in advance. Their responsibilities should include determining who will notify employees in the event of an emergency, who will monitor evacuation routes, who will account for people at the assembly point, and who will communicate with emergency services.

Main Responsibilities of Personnel Involved in Evacuation

Responsible person or group	Main responsibilities
Evacuation coordinator	Managing the overall evacuation process
Notification officer	Providing warnings and necessary information
Route monitors	Directing people along designated evacuation routes
Floor or department supervisors	Monitoring the evacuation of employees within their assigned areas
Accounting team	Determining the number of people at the assembly point
Medical assistance team	Providing assistance to injured and vulnerable individuals
Communications officer	Exchanging information with emergency services

One of the most important requirements during evacuation is preventing panic among people. Panic can result in pushing, congestion at exits, movement toward dangerous areas, and disruption of the evacuation procedure. Therefore, employees should be trained in advance on how to act during emergency situations. Actions such as running, pushing others, using elevators, entering unknown or

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hazardous areas, or delaying evacuation to collect personal belongings can increase the level of risk. People should move in an orderly manner along designated evacuation routes and follow the instructions of responsible personnel. Evacuation during a fire has its own specific characteristics. One of the major hazards of a fire is not only the flames themselves but also smoke and toxic combustion products. Therefore, people should avoid remaining in smoke-filled rooms and should use safe evacuation routes whenever possible.

The situation can be different during an earthquake. Attempting to immediately run out of a building during an earthquake may, in some circumstances, create additional risks. People inside a building should first protect themselves and, after the shaking has stopped, leave the building in accordance with the established safety procedures.

Evacuation becomes even more complicated in the event of an accident at a chemically hazardous facility. In such circumstances, it is important to determine the type and concentration of the hazardous chemical, its rate of dispersion, wind direction, and the boundaries of the hazardous area. In some situations, rather than evacuating people outside the affected area, it may be more appropriate to shelter them in a safe building or temporarily protect them in properly isolated rooms.

When organizing evacuation, the needs of children, elderly people, persons with disabilities, pregnant women, and other individuals with limited mobility must be given particular consideration. Responsible employees should be assigned in advance to assist such individuals, and alternative routes and necessary assistance measures should be identified. Another important stage of the evacuation process is accounting for people at the assembly point. Simply leaving the building does not mean that the evacuation process has been completed. Complete accounting of evacuated employees makes it possible to determine whether any persons remain inside the building or are missing. Assembly points should be located sufficiently far from the hazardous area, protected from secondary hazards associated with the emergency, and suitable for registering and accounting for evacuated people. The location of the assembly point should be communicated to employees in advance. Assessing evacuation time is also an important component of emergency preparedness. Evacuation time depends on the number of people, the width of exit routes, the length of evacuation routes, the availability of stairways, the movement speed of people, and other factors. During practical drills, evacuation duration can be measured under conditions that approximate real emergency situations, allowing existing deficiencies to be identified and analyzed. Evacuation drills are one of the most effective ways to assess employees' preparedness for emergency situations. During such drills, employees gain practical experience in responding to warning signals, following evacuation routes, reaching assembly points, and following the instructions of responsible personnel. One of the main deficiencies encountered during evacuation is the obstruction of evacuation routes. In industrial or administrative buildings, placing various materials, equipment, or other objects in corridors, stairways, or near exit doors can slow down the movement of people. Such conditions must be regularly monitored and eliminated. Another common problem is employees' lack of knowledge of the evacuation plan. Simply displaying a plan on a wall is not sufficient. Employees should know the primary and alternative exit routes, the location of the assembly point, and the procedures to be followed during an emergency. To improve evacuation safety, facilities should conduct regular preventive inspections, monitor the condition of evacuation routes, provide employee training, update evacuation plans when necessary, and conduct practical evacuation drills. The effectiveness of an evacuation system is determined not only by technical equipment but also by the level of preparedness of the people involved. Even if warning systems, signs, illuminated indicators, and evacuation diagrams are highly effective, the level of risk will not be sufficiently reduced if employees do not know how to act during

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an emergency. Therefore, ensuring evacuation safety requires three interconnected areas: advance planning, technical and organizational preparedness, and practical training exercises. Effective evacuation cannot completely eliminate all consequences of an emergency, but it can significantly reduce threats to human life and health. For this purpose, an evacuation plan should be developed based on the specific hazards of each facility, safe evacuation routes should be continuously monitored, the responsibilities of employees should be clearly defined, and a reliable system for accounting for people at assembly points should be established. Overall, evacuation is one of the most important organizational measures for protecting people during emergency situations. Its effectiveness depends not only on rapid actions at the moment an emergency occurs but also on advance planning, training, monitoring, and practical exercises. A properly organized evacuation system helps ensure that people leave hazardous areas in an orderly manner, reach safe locations, and prevent the consequences of an emergency from becoming more severe.

Evacuation Planning as an Integrated Safety System

Effective evacuation should be considered as an integrated safety system rather than as a single action performed after an emergency has started. A reliable evacuation system combines hazard assessment, organizational planning, warning and communication, clearly identified routes, trained personnel, assistance for vulnerable people, assembly-point management, and post-evacuation accountability. This integrated approach reduces the time between recognition of danger and the safe movement of people to an area where the immediate hazard is no longer threatening them.

Risk Assessment Before Evacuation

The quality of an evacuation plan depends strongly on the initial risk assessment. Before preparing a plan, an organization should identify the types of emergencies that are reasonably possible at the facility and determine how each hazard could affect the movement of people. Fire, explosion, structural damage, chemical release, gas leakage, earthquake, severe weather, technological failure, and other emergencies may require different protective actions. The assessment should also consider the number and distribution of occupants, working shifts, visitors, contractors, storage areas, hazardous processes, access for emergency services, and alternative exits.

Protective Actions Other Than Immediate Evacuation

Particular attention should be given to situations in which the safest response is not immediate outdoor evacuation. Some chemical releases, external fires, severe weather events, or other hazards may make remaining inside a properly protected area safer than moving through a contaminated or otherwise dangerous environment. Therefore, an emergency plan should distinguish between evacuation, sheltering, temporary isolation, and other protective measures and should establish who is authorized to make operational decisions.

Evacuation Routes and Exit Capacity

Evacuation routes must be planned so that people can move toward safety without unnecessary changes of direction, bottlenecks, or exposure to the source of danger. Primary routes should be supported by alternative routes in case the main route becomes blocked by smoke, fire, structural damage, chemical contamination, or crowding. Doors, corridors, stairways, emergency exits, and outdoor pathways should be kept accessible and clearly identified. Practical drills can reveal congestion near doors, stairways, narrow corridors, and other bottlenecks. Equipment, furniture, stored

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materials, and temporary structures should never unnecessarily reduce the usable width of evacuation routes.

Emergency Warning and Communication

An evacuation system is ineffective if people do not receive a warning quickly or do not understand what the warning means. Emergency communication should be clear, recognizable, and appropriate to the facility. Depending on the circumstances, notification may involve alarms, public-address systems, visual indicators, direct instructions from responsible personnel, telephone or digital communication, or combinations of these methods. Messages should explain what has happened, what protective action is required, which routes should be used, and where the assembly point or safe location is situated. Communication should also consider people with hearing, visual, language, or cognitive difficulties.

Human Factors and Evacuation Behavior

Human behavior has a major influence on evacuation performance. People may hesitate because they do not immediately recognize an alarm, attempt to collect personal belongings, search for colleagues or family members, use familiar but unsafe routes, or wait for confirmation that the emergency is real. Training and repeated drills can reduce uncertainty and help people respond more effectively under stress. Responsible personnel should remain calm, provide clear directions, prevent unnecessary crowding, and avoid contradictory instructions.

Assistance for Vulnerable Persons

An effective evacuation plan should identify how people who may require additional assistance will be supported. This may include persons with reduced mobility, temporary injuries, sensory limitations, young children, older adults, visitors unfamiliar with the building, or individuals who cannot independently interpret emergency instructions. Assistance arrangements should be established before an emergency and incorporated into drills where appropriate. The plan should not depend solely on one helper; alternative arrangements are useful if the designated person is absent, injured, or assigned to another emergency task.

Assembly Points and Accountability

An assembly point is not simply a place where people gather. It is an operational control point for determining whether evacuation has been completed successfully. The location should protect evacuees from the immediate hazard and should not obstruct emergency vehicles or rescue operations. Accounting procedures should be based on reliable information about the people who were present before the emergency, including employees, visitors, and contractors where applicable. At the assembly point, responsible personnel should report missing persons and relevant information to the evacuation coordinator or emergency services. Untrained personnel should not re-enter a dangerous building to search for missing persons.

Evacuation Drills and Performance Evaluation

Evacuation drills should be used not merely to demonstrate compliance but to identify weaknesses in the actual emergency-management system. After each exercise, the organization can compare the planned procedure with observed performance. Useful indicators include notification time, time to begin movement, total evacuation time, congestion points, accessibility of routes,

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effectiveness of communication, assembly-point organization, accountability time, and problems experienced by vulnerable persons. A structured post-drill review should record what worked well, what failed, why the problem occurred, and what corrective action is required.

Evacuation in Industrial and Chemically Hazardous Facilities

Industrial facilities may contain machinery, high-energy systems, flammable substances, toxic chemicals, pressurized equipment, electrical installations, and other hazards that can influence evacuation. The evacuation plan should therefore be integrated with the facility's emergency-response procedures. Employees should know how emergency actions interact with process shutdowns and other safety measures, while recognizing that they should not expose themselves to additional danger by attempting tasks beyond their training or authorization. At chemically hazardous facilities, protective action must be based on the characteristics of the substance and the developing situation. Wind and atmospheric conditions can influence the direction and speed of a chemical cloud, so predetermined routes should not be treated as automatically safe under every circumstance.

Evacuation and Fire Safety

During a fire, smoke movement can rapidly change conditions inside a building. People should use designated safe exits and avoid routes affected by smoke, heat, or fire. Fire doors and other protective features should be maintained in accordance with applicable requirements, and evacuation routes should remain free from storage and obstruction. Elevators should not be relied upon as ordinary evacuation routes during a fire unless they are specifically designed and authorized for emergency evacuation use.

Digital and Technological Support

Modern facilities can strengthen evacuation management through automatic fire detection, emergency voice communication, illuminated exit indicators, access-control monitoring, mass-notification platforms, and digital personnel-accounting tools. These technologies can improve the speed and accuracy of information, but they should not replace basic organizational preparedness. Systems require testing, maintenance, backup procedures, and trained operators.

Continuous Improvement of the Evacuation System

Evacuation planning should be reviewed whenever there are significant changes in the building, production process, workforce, occupancy, access routes, equipment, or identified hazards. A plan that was suitable several years ago may become ineffective after reconstruction, a change in room layout, installation of new equipment, or a change in the number of occupants. Continuous improvement therefore requires periodic inspection, training, exercises, documentation, and revision. The most effective evacuation system is one in which people know what to do before they need to make a decision under pressure.

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