AARMS Vol. 13, No. 1 (2014) 167–182.

(Specialized) Technical and medical reconnaissance of disaster–affected areas

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Following a disaster in the affected area secondary impacts also prevail besides primary ones. It is important to know these impacts because rescue operations should be based on them. The implementation of the activities with the aim of managing the consequences is commanded and controlled by the onsite commander in all cases. As a leader, he makes decisions based on assessment. This method is appropriate if it is built on the reconnaissance information and data of the affected zone. Depending on the features of disasters, the most frequent reconnaissance methods of the disaster area are the technical and medical reconnaissance. In this article, the authors review the purposes, functions and correlations of these scopes of tasks with the decisions of the onsite commander. On the other hand, they systematize the types of technical reconnaissance and the applicable reconnaissance methods and tools. Furthermore, they examine the main tasks, requirements and elements of medical reconnaissance.
Keywords: disaster area, specialized reconnaissance, building diagnostics, cable search, public utilities, specialized medical reconnaissance

Introduction

In natural and man–made disasters, it is crucial to identify the appropriate rescue tasks from the aspect of intervention and rescue activities, and the outcome of disasters.

The adequate reconnaissance of the disaster–affected area is essential for the thorough and safe response and efficient damage control.

The former requires special expertise and tools and relates to the entire territory of the affected area. Following the occurrence of a disaster, response and recovery units need abundant information on the needs of the disaster response forces. [13: 1]

The primary and secondary assessment of the situation is based on the data provided by the reconnaissance of the disaster area; thus, it is a fundamental element of rescue operations. Following a widespread catastrophic incident, onsite commanders must make decisions based on the incoming data and information. The consequences of “hasty” or improvised decisions, regardless of the information collected, may be the use of an inefficient and unduly expensive technique, thus causing unprecedented damages in human lives and property. Therefore, we may say that reconnaissance and its special type called specialized reconnaissance is essential in the course of recovery following a disaster.

Due to the unexpected occurrence of disasters and the urgency of intervention, it is necessary to get prepared for the reconnaissance of the areas potentially prone to disasters already

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in the prevention period. The question arises as to how we can define disaster assessment (reconnaissance); which are its special forms; what the differences between technical and medical reconnaissance are; and how they can be related to the decisions made during the response activities. Hence, the functions, types, possible tools or instruments and the techniques of reconnaissance procedures must be defined. In this article, the authors answer these questions and systematize the theoretical and practical issues of the two main forms of reconnaissance.

1. Definition and types of reconnaissance of disaster–affected areas

The meaning of reconnaissance of areas damaged by natural or human–related disasters is collecting information, which delivers data on the features of the disaster area, the possible ways of protection, the probable consequences of the phenomenon and the possibilities of preventing the disaster's escalation. The evaluation of data gained in the course of reconnaissance takes place according to the following:

- the evaluation of the general conditions of the disaster areas,
- the viability of the terrain and roads, assessment of the level of damages,
- the assessment of the location, the condition of shelters and the number and vulnerability of persons located outdoors,
- the assessment of the condition of public utilities, and the potential consequences of damages occurring in the systems,
- the exploration of the sectors of the terrain contaminated by radioactive, biological or chemical substances,
- the determination and definition of the location of the facilities and buildings, which are needed to accomplish the rescue, decontamination and supply tasks,
- the assessment and forecast of the present and the expected changes in the weather conditions. [1]

Following the assessment and verification of the information collected, the data is systematized and prioritized by its features and importance in order to ensure the immediate provisions. In the past, reconnaissance had to fulfill the requirements of continuity, up–to–dateness, being purposeful, timeliness, credibility flexibility and adequate detailedness. These requirements are valid nowadays as well, although they are supplemented by the rule of complexity and systems approach.

As we can see, the efficient assessment process is an indispensable element of thorough planning and response. Its main functions are to help the government and defense forces in treating the effects of disasters. On the other hand information originated from disaster assessment facilitates the interoperability of the response teams. Overall, therefore results are intended to measure the extent and the impacts of the disaster, and the government can make a decision about the necessary level and requirements of response and about the needs of international assistance, as humanitarian intervention with urban search and rescue teams (USAR teams) or humanitarian aid. Internationally, the efficiency of disaster assessment often based on the combination of two components; observation and semi–structured interviews taking into account that representative data or information can be useful as well. There is a close connection between observation and visual reconnaissance, since both of them are based on visual impressions besides smells and sounds. This type of disaster assessment often starts with a walk around the affected zone. Semi–structured interviews — held with local inhabitants, survivors, casualties, representatives of survivors or key officials — have no rigorous framework and specific protocol or order. Questions are not decided preliminary, thus interviewers have freedom to vary their questions to the interview context and to the people they are interviewing. [2]

In international interventions onsite reconnaissance inspectors usually use assessment checklists which help them in planning and implementing the assessment. These checklists include the major sectors of humanitarian activity consisting of questions that need to be observed and answered in the course of reconnaissance activity. In many cases, some of the questions require specialized reconnaissance. Checklists provide data in the following fields: [2]

- nature of disaster (Table 1),
- urban search and rescue (USAR),
- shelter and personal/household items,
- health,
- water and sanitation,
- food and nutrition,
- and logistics.

Subject	**Indicative information**
Main event.	Date and time (local and UTC). Duration. Strength.
Subsequent events and expected developments.	Aftershocks. Weather forecast. Water level rising/falling. Flooding expected to rise/recede.
Affected area.	Name of region, province, and/or district (be aware of conflicting local names). Provide GPS or other map coordinates. Major cities/urban centres/villages. Approximate size of affected area in square km. Topography.
Population.	Estimate total population in affected area. Estimate percentage of affected population. Socio–economic characteristics (rural, urban agricultural, industrial, nomadic, low–income).

Table 1. Assessment checklist of nature of disaster (Edited by the authors) [2]

The reconnaissance of disaster–affected areas can be grouped by its types and methods (Figure 1). By type we can distinguish general, specialized and particular reconnaissance. According to the methods of reconnaissance there are terrestrial and particular reconnaissance. The latter includes aquatic and aerial reconnaissance.

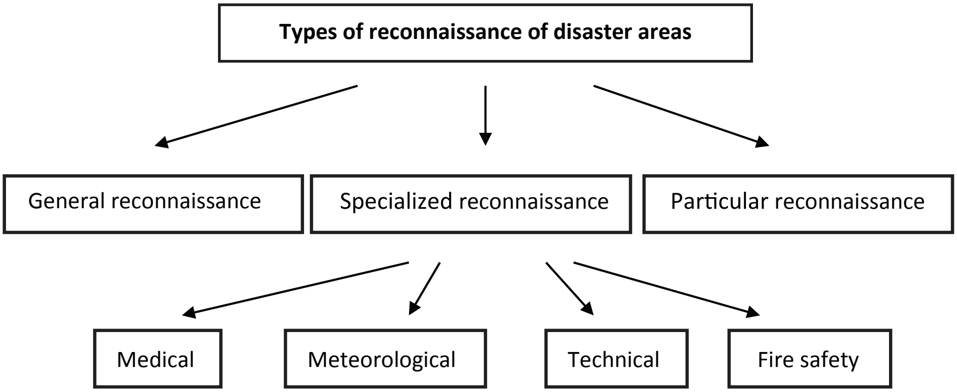

Figure 1. Types of reconnaissance of disaster areas
Edited by the authors [3: 82]

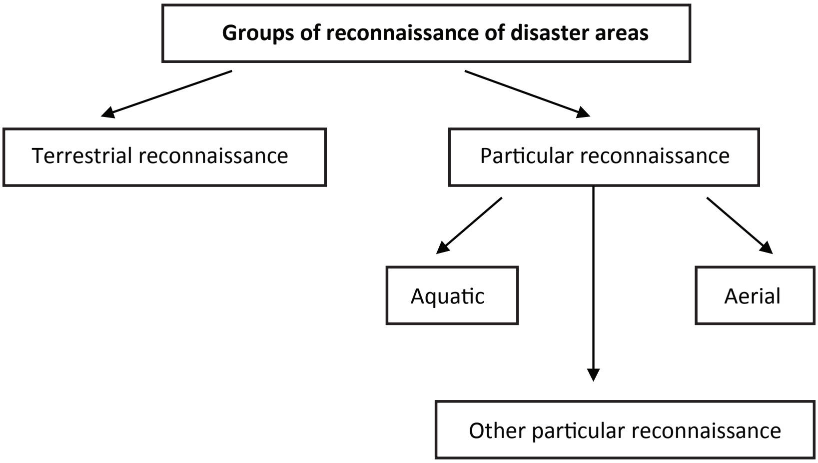

Figure 2. Grouping of reconnaissance of disaster areas
Edited by the authors [3: 82]

The type of assessment of disaster areas highly influences the method of reconnaissance. With regard to the methods, we distinguish terrestrial, aquatic, aerial and other reconnaissance (Figure 2). Aquatic and aerial reconnaissance are often called particular reconnaissance. In the following, let us examine the features of general and specialized reconnaissance.

General reconnaissance

During general reconnaissance the main objective is to collect basic information and data on the stricken area. Before this, the selection of the reconnaissance area and forces as well as the determination of safety regulations are necessary. The information gathered (i.e. reconnaissance data) is evaluated, reconnaissance inspectors make conclusions and forward it to the so–called head of protection and the response control persons, who can make their decisions on the further steps and actions necessary based on these raw data and results.

During the process of collecting information, the objective is to search for a source of information (a person, a facility or an object) irrelevant of the incident area. [3]

General reconnaissance is the first phase of situation assessment. In justified cases, search continues with the help of specialized reconnaissance.

Specialized reconnaissance

Specialized reconnaissance becomes necessary when the results of the general reconnaissance are not sufficient for the performance of tasks related to mitigation and recovery of damages. As obtaining important information is necessary, it requires the use of special forces and devices. Furthermore, specialized reconnaissance has to cover the entire territory of the disaster–affected area; for example, in case of damage to a chemical plant, the measurement of the concentration of poisonous substances is not only carried out in the immediate vicinity but also extended to the vulnerable area surrounding the plant.

The special monitoring of mission areas is carried out by specialized forces using special vehicles and devices. [4] The authors would like to call the attention to the fact that these actions or interventions are system–based activities and not independent ones.

The types of specialized reconnaissance are as follows:

- radiological, biological, chemical,
- meteorological,
- medical,
- animal welfare and phytosanitary,
- technical,
- and fire safety reconnaissance.

In many cases, the activities listed above are implemented simultaneously, since, depending on the characteristics of a given mission area, several specialized reconnaissance processes may become necessary in order to be able to make right decisions later. In case of terrestrial reconnaissance, gathering information and the reconnaissance of the danger source can be performed from a fix point, by vehicle, in form of patrolling or scouting. Aquatic reconnaissance is usually performed by reconnaissance platoons with tools and devices capable of working under and on water. Generally speaking, their activities are as follows: examination of the hydrological parameters and the identification of the phenomena and objects that endanger the operation of facilities. In case of aerial reconnaissance, the main objective is to determine the extent and the expected directions of the spread of the disaster with the help of aircraft.

The use of this technique is significantly effective in non–approachable or hardly approachable areas and during the escalation of disasters; the information on the escalation is immediately needed in order to prevent secondary impacts and to protect human lives. Examining the specialized forms of reconnaissance, besides aquatic and aerial reconnaissance, we may also mention some other special reconnaissance techniques needed to adapt to the special environmental conditions of the danger source. Such activities are, for instance, cave, mountain or satellite reconnaissance. They can be coordinated by specially trained and prepared specialists. [5]

After the presentation of the general features, types and methods of reconnaissance of disaster areas, let us examine what kind of tasks have to be done during the process of reconnaissance.

2. The scope of tasks of reconnaissance of disaster areas

The efficient and productive process of reconnaissance of disaster–affected areas consists of strongly correlated activities. Regarding chronology, reconnaissance operations have the following elements:

1. planning, identification of the affected areas;
2. designation of the reconnaissance observers/patrols/squads/groups;
3. the reconnaissance itself, collecting information, measuring and recording data;
4. the evaluation, aggregation and — if needed — verification of the information and data gathered. [3]

Regarding the sudden occurrence of disasters, usually there is not enough time for planning of the reconnaissance activities immediately before the response, thus these activities must be performed during the preparatory period. Recon forces and commanders can best rely on reconnaissance maps of the disaster area, because they provide extensive information on the location of recce squads, rescue forces and significant buildings or facilities, the allocation of the necessary technical equipment and the possible routes of relocation in order to be able to determine the reconnaissance directions and routes in the most precise and effective way. [3]

To gather information — which is considered the main target of reconnaissance — specialists apply the methods and techniques of identification, observation, assessment and search. The implementation of these tasks can be done through target spotting or patrolling with the use of equipment suitable for the given circumstances. The objective of this process is to map and ensure the requirements of the effective, successful and safe activity of the response teams besides protecting human lives and property. Furthermore, an absolutely relevant role of reconnaissance is to be able to detect the changes in the movement of the response forces in time in order to be prepared for rapid decisions. In case of changes suddenly occurring, an escalation or a new hazard, the former conditions are basic requirements for a fast and adequate realignment of implementation. [5]

Assessing the areas damaged by disasters, it is obvious that all involve damages of medical or technical nature. We can state that it is not possible to make reasonable decisions without collecting information on them. Therefore, in the following chapter we will analyze specialized technical and medical reconnaissance tasks and activities.

3. Specialized technical reconnaissance

The objectives of specialized technical reconnaissance are to provide analyzable data on the status, the conditions and the extent of sustained damages of buildings, infrastructural elements and the public utility system, the required number of forces to be involved, rescue and reconstruction efforts and the equipment needed during the response. Furthermore, during the process of specialized technical reconnaissance, experts analyze the ways in which buildings become ruined and the possibility of rescuing civilians from under the ruins, on the other hand, they also estimate the possible number of people trapped under the debris and the chance of being alive. Prior to technical rescue and intervention, by evaluating assessment information, it is important to find out if life–threatening conditions exist, the dimensions of the disaster zone and the features of hazards. Furthermore, it is necessary to prioritize response tasks, and — if it is reasonable — to carry out simultaneous activities.

Additionally, the experts must determine the method of supporting the response forces and ensuring the required equipment, and they also have to confine the incident sites by designating safety boundaries and prepare for a possible evacuation.

According to the above mentioned and based on disaster descriptions or reports, we may say that the two main elements of specialized technical reconnaissance are the assessment of the condition of buildings (generally called building diagnostics) and the localization of damages to the public utility system and the identification of the probable future consequences. The following chapter discusses the suitable methods.

3.1 Processes and methods of building diagnostics

Basically, the purpose of the diagnostic processes is to estimate the level of ruin of buildings and other structures. The aim of building diagnostics (implemented after the onsite assessment), is to determine the extent of damages. During damage assessment, the correlations and the priority of damage phenomena can be identified. During the specialized examination of the building conditions, it is highly important to scrutinize the load–bearing structures and support beams of buildings, as these elements strongly influence the extent of damages, the vulnerability of human lives and the possibility of collapse. Depending on the circumstances and the extent of damages, the examination of structures consists of the following activities:

- visual inspection,
- detection of structural faults (damage–free or non–damaged environment),
- examination of edges and joints,
- thermo–dynamical calculations and onsite measurements in case of the shift of support structures,
- examination of ceiling and roof structures. [6]

Following disaster incidents (e.g., earthquakes, gas explosions, terrorist acts, etc.), building structures are frequently distorted due to strain, sinking, cracking, heat convection and tear and wear of materials. To measure these changes inspectors use calipers, plumb lines, straight laths, and water level meters or bullets in order to determine the slope conditions. In case of minor mechanical damages, it is sufficient to use a wire brush, a chisel or a knife to diagnose damages. In case of covered structure elements, exploration procedures involving building demolition are carried out or thermal cameras are used.

In the following, we examine how the assessment of the conditions of the individual structural elements (foundations, subtractions, load–bearing structures, ceilings, etc.) can be carried out. [6]

Foundation assessment

During building diagnostics, foundation assessment basically includes the creation of a crack image and the examination of sinking. Speaking of damages resulting from disasters, the above–mentioned two cases are closely related to each other, since, as we can see in the drawing below [Figure 3], cracks increasing the vulnerability of the building are created as a result of sinking. The position and the rate of sinking can be assessed by visual inspection. Plumb lines (in case of vertical shifts), or a strung cord, a lath, a bullet or a water level meter can be used for the measurements of deformations. [7: 45]

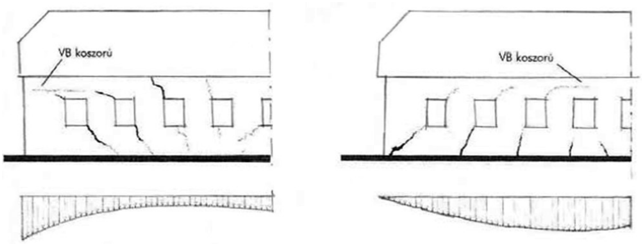

Figure 3. Rate of sinking depending on cracks [6]

If the rate of sinking and the damages of the foundation can only be determined by ground exploration, creating a maximum one–meter wide search pit up to the foundation plain might be required.

Examination of the insulation of the subtraction

The examination of the insulation of the subtraction can be implemented by the access to the insulation's endings or by opening them on a short segment. Therefore, inspectors can ascertain the materials and the layers of the insulation and they can make conclusions on the leak spots and the expected harmful impacts of the moisture on the building's structure. In case of mortar plasters or cladding, the separated cover surface can be explored with a rubber mallet or by hand. The damage to the water insulation rarely causes direct danger to life, though in medium or long term they can directly contribute to the decreasing of the load–carrying capacity of the wall structures and to the collapse of the buildings.

The examination of the vertical load–carrying and outer wall structures

During specialized technical reconnaissance the most important element of building diagnostics is the examination of the damages to the load–carrying and other wall structures that directly threaten the stability of the building's structure and can cause a direct danger to life. In case of the compression of the wall–parts, the reduction in size is relevant, on the other hand, during the examination of cracks, their lengths, directions, depths and spaciousness are relevant. These parameters have to be determined by measuring instruments. Based on crack–spaciousness categories, spaciousness exceeding 15 mm can cause the slanting and deformation of the walls or the distortion of the structure of the ceiling. The examination of vertical wall structures can be carried out using the following methods:

- *examination of deformation*, whereby the changes of the wall structures are measured using the earlier mentioned tools: plumb lines, straight laths, strings or measuring tapes. The danger of collapse of the building prevails if the projection of the wall's center of gravity approaches the contour of the baseline,
- *examination of the damages caused by moisture*, whereby the dampening of the walls can be measured (e.g. by tapping),
- through *thermal examination*, heat bridges and condensation damage caused by precipitation can be measured,
- using *thermal cameras* the heat radiation of surfaces can be examined by thermal maps.

The examination of ceilings

During the first phase of examination of ceilings, by virtue of visual inspection it is necessary to determine if the damages on the structure of the ceiling are superficial or spread over the load–bearing structures as well. During the examination it is absolutely important to take into consideration that the cracks in the monolithic reinforced concrete ceilings must not move deeper than the reinforcing bars. In case of structures made from wood, steel or reinforced concrete, small damage is enough to cause fatal damage.

The examination of ceilings can be performed the following ways:

- *examination of cracks*, during which it is necessary to ascertain if the direction of the cracks corresponds to the direction of the bridging, or is it perpendicular to it. The latter incurs a real danger, especially with wooden and steel beam supports, since it exponentially increases the risk of fractures and collapse. In reinforced concrete structures, when the thickness of cracks exceeds 0.6 mm, further examination is needed.
- *examination of stability*, which primarily means the checking of the joints of the support structures,
- *examination of rigidness*, whereby the permanent stoops of the structural elements are measured with respect to the limit values provided by standards,
- *examination of damage caused by moisture*, whereby primarily the surface damages caused by dampening can be measured,
- *thermal examination*, during which the insulation of ceilings can be tested.

Examination of facade balconies and hanging corridors

Collapse of facade balconies and hanging corridors is extremely dangerous to people who are located inside or next to the buildings, besides the rescue forces. Subsequently, in the course of building diagnostics, these structural elements must be approached with extreme precautions. Primarily, we have to examine the method and the level of how the walls and the ceilings are joined, afterwards, the examination of damage, corrosion, cracks, moisture and stability (which ensures the verification of the joints of support structures) can be completed in the way already mentioned above. In order to check the fixation of the bars and putlogs, it is necessary to examine the fastener elements.

Examination of flat roofs

It is necessary to examine the flat roofs to avoid accidents. It should be done by uncovering the ceiling layers. This process implicates:

- checking the condition of moisture insulation,
- examination of deflection in the case of the deformation of insulation layers,
- measurement of slopes,
- examination of cavities formed during the loosening of the connections of support structures and surface layers.

The visual inspection of flat roofs should be extended to the lower plain of the ceiling, since obvious signs indicate leaks, (which highly influences stability); it can be discovered using this method.

After the examination of building structures, we should focus on the methods and protocols of the examination of public utility systems, which is another important activity of technical reconnaissance.

3.2 Augmented Situational Visualization

In many cases damage occurring in the structure of facilities can be evaluated by observing key differences between the augmented baseline image and the real view of the building. This modern way of assessment is based on Interstory Drift Ratio (IDR), which is a global measure that can be calculated from external building dimensions and conveniently used to quantify the sustained damages. Generally speaking IDR is the relative horizontal displacement of two adjacent floors which can be measured by using special equipment called Augmented Reality (AR) see–through displays (glasses) (Figure 4) connected to a portable computer device. [8]

Figure 4. Augmented Reality (AR) see–through displays [15]

3.3 The special technical reconnaissance of public utility systems

Before mentioning the examination of reconnaissance procedures related to public utilities, we have to explain the elements of public utility systems. Public utilities are the collective concepts of pipe and lead systems that satisfy certain service providing demands of the population, industry, the economy or law enforcement, etc. Amongst public utility systems we distinguish the following branches:

- energy supply,
- telecommunication,
- water supply,
- sewage and rainwater drainage,
- gas supply,
- distant heating supply,
- and crude oil transport. [9]

The work aiming at the mitigation of damages to the public utility systems can be classified as a top priority response pre–task, since these can directly inhibit rescue activities and can create further harmful incidents. In the course of specialized reconnaissance, the evaluation of the location and conditions of public utilities takes place along with the assessment of the consequences of damages. Furthermore, the secondary impacts, damages and characteristics or the spread of the emergency can also be calculated. Following reconnaissance, the reconstruction of the public utility system is performed by technical rescue and special utility recovery units. Maps, data and site maps collected from the official registration of public utilities provide relevant assistance to the search activities. In order to assess and identify the damages to the utility system, localization and exploration of the pipelines are necessary with the help of instrumental observation and by opening research pits. [10]

In the following, we review the tools and equipment needed to perform the instrumental positioning of the underground pipeline system. [10]

Instrumental search of underground utility systems

The materials of cables and pipelines (which have been damaged or are needed to be examined), basically determine the applied protocol used during the instrumental search. The ultrasonic, electromagnetic or thermal camera technology can be either used in case of metallic or non–metallic pipelines. In practice, the most frequently used method is the induction pipeline search, whereby non–metallic pipeline need to be converted into an electrical conductor, (since the very basic requirement of this method is that electricity have to flow along the pipelines). The method for inducting pipelines is to fix a kind of metallic wire or string onto the body of pipeline in order to make it a conductor.

In the following, we discuss what technical devices are needed to perform the search, mapping and damage localization of the pipeline system. [10]

The radio frequency wire locators are suitable to perform both localization and depth measurement activities. Besides identifying the location of pipeline, they can also be used for examining the insulation, the condition of the pipelines and the damage to the cladding. We distinguish active sweep devices (which are in direct contact with the metallic pipelines) and passive sweep devices (which can be used in case of long pipelines with high performance signal emitters).

Magnetic wire locators are suitable for searching facilities containing metallic components, since these tools sense the magnetic field of ferromagnetic substances. Magnetic locators are generally lightweight, tractable instruments equipped with LCD monitors, on which the signal intensity can be permanently monitored. The maximum sweep depth of a device depends on the type and performance, but this value is generally approximately 8 to10 meters.

Ground Penetrating Radars (GPR) consist of the following three components: a sensor, a built–in hard disc and an antenna suitable for the reception of the signals and for the transmission of the received signals on a specific frequency into the ground following amplification. Regarding the functionality of GPR, they transmit short impulses to the tested facilities and detect the frequency and the run–time of the reflected signals.

During *reconnaissance by probe,* search is carried out by moving the transmitter cable on the ground surface. Both the receiver and the transmitter have to be calibrated to the same frequency. Before searching with digital probe, the presence of interfering signals (emitted by nearby computers, electric devices or other electric cables, etc.) has to be checked. This method is also suitable for the identification of the pipelines' location and their accurate depth, besides localizing the damages.

In case of *non–metallic pipelines,* searching is more difficult, as these public utility units do not conduct electrical signals used in the search process. Thus, a kind of an emitter must be transferred into the pipeline. The solution is a 50–meter–long search cable made of glass fiber (Figure 5), which is led into the pipelines by the searchers. After generating radio frequency into it, the pipelines can be located with the help of suitable receivers.

Figure 5. Glass fiber research cable suitable for searching non–metallic cables [16]

Based on the above, we can say that the range of devices used for searching pipelines is very wide. During the design of these devices, manufacturers focus on multifunctionality and multiple applicability. Instrumental reconnaissance can be accomplished successfully in a very short period of time by using site plans or utility system maps. Therefore, the damages occurring as a result of disasters can be assessed, besides locating the endangered pipelines. Generally, some tools and portable measuring devices are sufficient to carry out onsite inspections during the survey of buildings and public utility systems. Nevertheless, the use of many large and special instruments is reasonable in many cases to perform the targeted inspection.

4. Specialized medical reconnaissance

The unfortunate impact of disasters are damage, deaths, and human health impairment. The identification of tasks in these mission areas cannot be implemented without thorough assessment. In the following, we examine the definition, purpose, types, functions and the methods of implementation of specialized medical reconnaissance.

4.1 The definition, purpose and function of specialized medical reconnaissance

Specialized medical reconnaissance is an activity that has the function to complement data and information (collected from the damage areas caused by disasters or other emergencies) with additional special and medico–epidemiological information and details.

Its function is to support the head of rescue in the identification and implementation of tasks related to the disaster zones. Specialized medical reconnaissance is different from general disaster assessment, since it is more comprehensive and complex. Therefore, due to its feature, this activity can only be performed by experts and groups having basic medical qualification. Regarding the implementation of specialized medical reconnaissance, we distinguish two basic types of activities:

- specialized medical reconnaissance performed during medico–epidemiological disasters,
- specialized medical reconnaissance performed during non–medico–epidemiological disasters.

Assessment should give answers to the following questions:

- What is the root cause and what are the consequences and the primary and secondary impacts?
- What is the number of casualties and the diseased, what are the features of their injuries and the expected tendencies?
- What spontaneous or organized actions have already been taken? What kind of further medical consequences can be predicted?
- What kind of medical supply system is operating during normal conditions in the area and how can it be transformed into a disaster management medical organization?
- To what an extent did the disaster affect the given system, and how can the reserves be activated? Furthermore, what other forces can be involved in the implementation of rescue activities?

The subsidiary objective of specialized medical reconnaissance is that the head of rescue operations must identify the range, boundaries, zones and dimensions of response activities with a high level of professionalism and prudence, based on the incoming data and information. Another important role is to provide detailed information on the damage to the infrastructure in order to identify how they obstruct the implementation of the medical tasks (damages to roads or houses, etc.).

4.2 Phases and implementation of specialized medical reconnaissance

Specialized medical reconnaissance is performed by observers, scouts, patrols or recon squads. They perform their tasks by observing, patrolling, searching, sampling etc.

The main phases of the activities are:

- planning reconnaissance,
- implementing reconnaissance (collecting data and information),
- evaluating, aggregating and systemizing data,
- continuously rechecking data and processes.

The most important elements of disaster–medical specialized reconnaissance are:

- the estimated number and location of casualties,
- the identification of the types of injuries according to the following:
- by root cause (mechanical, thermal, radiation, chemical, etc.),
- by their complexity (mono–complex, poly–complex or combined),
- in case of complex injuries, the identification of the main injury,
- distribution of the severity of casualties, the proportion of children and the elderly who suffered injuries,
- circumstances that refer to further dangers of damage to health (e.g. the lack of hygiene, food and water shortage, climatic circumstances, epidemics, the condition and losses of local health care),
- the existence and condition of medical resources, pharmacies, storage, etc.,
- the direction of the mass flow of casualties, the possibilities of triage and collection of casualties,
- the possible ways of evacuation, the number of refugees, the direction of their movement,
- the condition of communal systems, the perspective hazard of undernourishment due to the lack of calories or protein. [11: Slide 23]

4.3 The relationship between medical reconnaissance, protection and rescue in the affected area

Protection and rescue are based on medical reconnaissance, as the fundamental goals of protection are saving human lives and property. Rescue activities are based on a series of decisions made by the head of rescue operations. These decisions cover the following:

- What has to be done in order to avoid the escalation of the situation?
- Which are the basic and important actions and which are the less important tasks that can be postponed for a short time, and finally, which are the tasks that can be delayed.
- What is the size of the affected area, where are the work sites situated and what kind of workplaces have to be established for the recovery of damage.
- How can the undisturbed conditions for rescue be ensured and what are the technical–medical and civil protection tasks that are needed to be carried out?
- What will be the direction of rescue and which are the forces and equipment that are needed to be put in action, furthermore, what is their location?
- How often should the shifts take place?

The answers to these questions are based on the data, information, evaluations and partial assessments provided and carried out by the assessment teams. On the other hand, according to this information, an overall view can be obtained of the tasks, the necessary forces and equipment, and other units that can be deployed. Considering these facts, the responsible persons can make decisions on the form, extent and elements that are needed to be activated and involved in medical disaster issues respecting the valid laws and hierarchy.

The main objective of specialized medical reconnaissance is to deliver information for risk analysis of the affected territory before a temporary medical relief camp can be built on the mission area. These assessment processes require professional skills in medical and humanitarian affairs including international humanitarian methodologies and laws, epidemiology, public health infrastructures, diseases, logistical needs etc. Furthermore, during international interventions, especially in developing countries, understanding of psychosocial and cross–cultural issues are absolutely relevant. Besides risk analysis, resource matrix — containing human resource assignments for the medical activities — and effective cooperation with the local forces are important elements of medical reconnaissance. [12]

Summary

The essential conditions for efficient response in the disaster–affected areas following disasters are obtaining information and collecting data, which can be performed by general or specialized reconnaissance units. In the latter case, the use of special recon units, equipment, and procedures become reasonable and have to be extended to the entire disaster area. One of the specific versions of specialized reconnaissance is specialized technical reconnaissance, whereby the survey of the condition of buildings and the survey of damage to public utility systems take place. Regarding civilians and rescue forces situated in the disaster–affected zone, the examination of the essential building structures is very important. It can be performed by visual inspection or building diagnostics carried out by measuring devices.

In the course of the former method, a general status assessment can be implemented for a rapid situation awareness. This method does not require the detailed examination of root causes. To accurately identify building diagnostic data, meticulous instrumental analysis is needed. In this article, we have systematized these tools.

One of the most frequently occurring secondary impacts of disaster are the losses resulting from the damage to public utility systems. Therefore, prevention is very important, besides the timely localization of damage occurring to the pipelines, which can also be provided for in the course of specialized technical reconnaissance. It can be concluded that without specialized technical reconnaissance, the vulnerability of the rescue forces is significant, besides civilians, since it is indispensable that the response forces must have adequate knowledge of the condition of the buildings and public utilities situated in the given area.

In the mission areas (occurring as a result of disasters and other hazards), technical damages must also be taken into account besides injuries, diseases or epidemics.

As a result of medical disasters, the features of the disaster zone are identified by the diseases, epidemics, injuries etc. Therefore, the necessary equipment, devices, forces and measures can only be identified by knowing these issues. Also based on the above, it is obvious that nowadays and even in the future, heads of rescue operations cannot avoid specialized medical reconnaissance in order to be able to make the right decisions. In the organizations responsible for protection, the number and the alert capability of experts, who are able to carry out this type of specialized reconnaissance highly influences the outcome of the disaster and the success or failure of the intervention. In this way, the importance of the reconnaissance of losses — especially medical and specialized reconnaissance — should be taken into account more seriously as one of the most significant tasks to be performed in the disaster areas.

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