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THE IMPORTANCE OF THE LEGAL PHOTOGRAPH IN FORENSIC FIRE SCENE INVESTIGATION

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Abstract

This paper tries to draw the attention of the judicial authorities to the importance of the legal photograph in the fire investigation, and especially to the methodology and tactical rules applied when performing it. At the same time, it offers practical solutions to fixate the fire outbreak and fire marks that have a fundamental role in establishing the cause and circumstances of the fire occurrence. It also shows in a descriptive manner the main technical means that can be used in taking photographs when performing forensic fire scene investigation, with particular emphasis on the electronic and optical systems that facilitate operating and obtaining three-dimensional spherical images, as well as making measurements where these are impossible to obtain through metric methods at the fire scene.

Keywords: *photograph, fire outbreak, fire marks, photograph device, crime scene investigation.*

1. Introduction

In order to elucidate the causes and circumstances in which a fire occurred, crime scene investigation plays an important role, since it represents "a process of deep significance in finding the truth"[1], and it is the first activity performed by the judicial body, establishing a direct and immediate contact with the fire scene, which, in our opinion, is the source of evidence, as "it is the richest in traces or data"[2].

In the literature, this activity has different definitions. Some specialists[3] consider the crime scene investigation to be a task of utmost importance, of an immediate and irreplaceable character, while others[4] deem it as the most

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[1] N.Volonciu, *Tratat de procedură penală*, Ed. Paideia, Bucharest, p. 279.

[2] E. Stancu, *A Treatise on Forensic Science*, 4th edition, Universul Juridic Publishing House, Bucharest, p. 323.

[3] C. Suciu, *Forensic Science*, Didactic and Pedagogic Publishing House, Bucharest, 1972, p. 503.

[4] C.E.O'Hara, *The Fundamentals of Criminal Investigation*, 4th edition, Charles Thomas Publisher, Springfield, Illinois, SUA, 1976, p. 45.

important part of a criminal case. In our opinion[5], the definitions given so far do not account for the role and influence of psychological factors on this activity, which is the reason why we believe that the crime scene investigation is a forensic psychology activity in the search and discovery of traces/micro traces and in deciphering the offender's behaviour with the help of post dictions and predictions made on the basis of changes produced by the interaction between the offender, objects/tools/substances used and the environment in which the fire occurred.

One of the important procedures used to fixate the fire scene and the results of the crime scene investigation is the legal photograph.

Without the photograph, the forensic investigation of criminal offenses in general and of fires in particular, is unthinkable. This finding is a postulate, the photo illustration representing an important means for crime scene fixation and demonstration. In the literature, the legal photograph is defined as a branch of the forensic technique which adapts and develops methods for the photographic fixation of the results and the manner in which any tracing activity is conducted, as well as the methods applied to the laboratory research of material evidence[6]. Being part of the official crime scene report, which is the most important means of fixating the results of the fire scene investigation, the legal photograph has probative value equal to the report.

2. The methodology of taking legal photographs

In the case of a fire, photographs must be taken so as to capture its evolution. More useful are the photographs taken in the first phase of the investigation, because they highlight the location where the fire originated. Subsequent photographs are less probative due to lack of visibility, smoke, flames and the fact that it is difficult to approach the scene of the fire, in this case only remote photographs being possible.

Also, photographs must be taken to capture moments of the fire extinguishment intervention, such as: locating the intense combustion zones, the propagation of the combustion in time, deploying the intervention means, etc.

At the same time, during the intervention, it is required that the onlookers or the persons helping to extinguish the fire should also be photographed, because in case of arson, the offender might as well be among these people.

In the case of fires, it is important that the photos be taken as soon as extinguishment takes place, in order to fixate the fire marks, before removing debris or possibly before the collapse of construction structures.

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[5] Gh. Popa, *Forensic Science Technique,* lecture, Prouniversitaria Publishing House, Bucharest, 2008, p. 44.

[6] I. Mircea, *Forensic Science*, Lumina Lex Publishing House, 1998, p. 18.

Depending on the goal, the content and the sequence in which they are taken, fire scene photographs can be classified thus[7]:

a) The orientation photograph – covers the entire picture of the fire scene with all its surroundings and helps orientation in the field. Aerial or height photographs are recommended for an overview highlighting of the roof damage, in case of buildings. Depending on the nature and extent of the fire scene, it may be *unitary*, when taken from one position, or *panoramic*, in case of photography on segments. In turn, the panoramic photograph can be *circular*, when the scene stretches on a vast area and cannot be contained in a single image (*e.g.* a wooded area), or *linear*, when the scene to be photographed is large and also cannot be contained in a single image (*e.g.* a large building located on a street).

b) The sketch photograph – reflects the fire scene with all its peculiarities, but without the surroundings, and focuses on the main, central object of the crime scene investigation, *i.e.* the fire outbreak to which the action of the offender directly turned, as well as the external site, consisting of: the access areas, the intense combustion zones, the propagation areas, areas with damages, melting, oxidation, thermo degradation, or the interior fire marks characterised by dividing lines etc.

Depending on the size of the fire scene and the extent to which it is covered with various objects, the following can be taken: panoramic, sector, opposite and cross photographs. *Panoramic sketch photography* is achieved using the method applied in the case of the orientation panoramic photograph. *Photography by sectors* is achieved after the fire scene has been first divided into areas delimited so that each one can be photographed from one position. The photographs thus obtained may be compiled so as to obtain a unitary image. *Opposite photography* consists of fixating the fire scene from two diametrically opposed positions, thus obtaining two sketch photographs in which the objects from the central area are shown on both images. *Cross photography* consists of fixating the same place from its four extremities so as to be diametrically opposite in pairs and the objects in the center should be present in all four images.

c) The photograph of the main objects comprises only part of the fire scene in which the objects that are directly related to the crime appear, such as: the fire outbreak, corpus delicti objects, objects that have changed position or have been damaged, and all types of traces. All appliances (electrical, thermal etc.) found in the fire outbreak must be photographed, as well as pieces of furniture in the position in which they were found, marked with identification numbers. If the

[7] Gh. Popa, *Forensic Science Technique*, lecture, Prouniversitaria Publishing House, Bucharest, 2008, p. 22.

case may be, photographs are taken of the installations (electricity, gas, heat, extinguishing installations etc.), a priority being switchboards, switches, sockets etc. These objects are photographed first in relation to the objects and traces in their close proximity in order to give the forensic investigator the possibility to determine their position in relation to the others and to allow ascertaining the direction in which the fire spread. For example, if a fire had as ignition source a cigarette left on a bed or an armchair, the bed or the armchair shall be photographed in relation to the furniture and walls around to highlight the area with more intense thermo-degradation.

Then, the fire marks and each object shall be photographed individually, using a measuring instrument (ruler, measuring tape, decimetre tape etc.) to help establish the dimensions by examining the photograph.

When the light conditions for photograph taking are not the most suitable, the main objects shall be lit using artificial light sources.

d) The detail photograph is achieved so as to render the metric details of the objects and traces photographed. To elucidate the cause and circumstances in which the fire occurred and spread, it is mandatory to apply a detailed photography of[8]:

- fire specific traces, such as the fire outbreak and the fire marks represented by all the traces (visible and (sometimes) measurable effects) after extinguishment, resulting from the fire: damage or thermo-degradation of combustible materials, collapse of structures, mechanical deformation, surface thermal effects (carbonization, oxidation, colour changes), melting, expansion, smoke and soot deposits etc.

In some cases, photographing the fire marks is difficult because adequate lighting cannot be provided due to faulty lighting installation and the lack of natural light, especially in large premises. In this case, artificial light sources shall be used. In other cases, the fire marks must be photographed on sectors, especially in areas with extensive carbonization.

- traces created by people (mainly traces of hands, feet), transportation means, burglary/forced entry instruments. When photographing them, the manner in which the traces were created (static, dynamic, surface or depth) should be taken into account;
- objects (wicks, lighters, matches) or traces of flammable substances (gasoline, diesel, oil etc.) used in the fire in case of arson.

It is mandatory to photograph doors and windows on both sides, as well as all the walls of the premises, not only the wall closest to the fire outbreak, in order to allow a comparative evaluation.

[8] S. Calotă, Gh. Popa, G. Sorescu, S. Dolha, *Research on fire causes*, Universul Juridic Publishing House, Bucharest, 2010, pp. 231-240.

It is recommended that other premises (rooms) of the building or the area around the room of the fire outbreak should be photographed, as well, even if they are not thermodegradated, in order to fixate the type of furniture, the state of the installations or finishings etc.

Photographing details shall be achieved using a camera set on a tripod or reproducing table, with the camera lens oriented perpendicular to the object photographed with a standard measuring device in proximity. In order to highlight details, objects shall be lit differently, depending on their nature and the manner in which the traces were created.

Thus, in photographing depth traces two light sources shall be used, one of a higher intensity seated behind the camera, and another, of lower intensity, set on the side of the trace or object. When photographing surface traces, two light sources shall be used, located on both sides of the trace, at an equal distance from it, so that the light angle should be sharp.

3. Technical means used in taking photographs

Photographs can be taken with a colour digital camera, or preferably with an optical- electronic device/system[9] (a combination between a video camera and a camera) used to fixate the crime scene. It is composed of an optical system and electronic equipment which facilitate operating and finally obtaining a spherical image of the highest quality. Through software programmes, immersive (three-dimensional) measurements may be applied to the resulting spherical image.

Spherical images allow for a virtual tour of the area of interest, from the standing point where the system is installed, being possible to zoom in, in order to examine certain details, or even to make measurements if these cannot be achieved at the fire scene using metric methods. These images allow a multiangle visualization (*i.e.* 360° on the horizontal axis x 180° vertical axis) and illustrate a fire scene just as it would appear in the original. The device records the visual field by performing a single rotation of 360° horizontally around the vertical axis.

Thus, due to the fact that the angle of the camera lens is 180°, the entire area around the fire is recorded and the time during which this work is performed varies according to the resolution and the brightness of the visual field. Sequential scanning with vertically separated zones having a dynamic range of 26 diaphragms (unlike the 35 mm film cameras that have a dynamic range of 12 apertures) allows viewing in any intensity of light. Both the objects in the shadow and those brightly lit will be visible, depending on the preferences of the forensic investigator.

[9] Technical inspection instructions - Using the SPHERON VR spherical image recording device - National Forensic Science Institute, Bucharest, 2014.

By viewing the entire field of the fire scene all the existing objects/traces are fixated, so that even if some of them initially seemed unrelated to the case, they can be used later on, establishing the size, the position compared to other evidence, characteristic details etc.

Once the images have been recorded at the fire scene, using the camera, they can be transferred to a separate workstation that has spherical image processing software installed. This software has been specially designed to provide maximum compatibility with the system requirements and to provide a user-friendly working interface for spherical images, but also to use other Windows applications such as Microsoft Word, Microsoft Excel, Windows Media Player, Microsoft. NET Framework etc., allowing the input of various documents, photographs, videos etc. in the case file.

The program also features a document management system through which all the information obtained during the investigation of the fire can be organized in an intuitive way. After completing the case file, it is exported in executable format and can be accessed from any workstation that has a Windows operating system. However, its content cannot be modified, as it is protected against all kinds of changes by a unique digital signature.

In case of a fire scene investigation, video footages with aspects from the intervention performed by both firefighters and forensic investigators can also be used. Also, TV footages can be used, since their images, although projecting sensationalism may sometimes include technical elements of interest. Equally, the recordings made by amateurs could be valuable to determine the cause and circumstances in which the fire occurred. Their probative value is determined only in conjunction with other evidence.

4. Conclusions

We can say without fear of error, that the legal photograph plays an important role in the fire scene investigation as it serves to illustrate and establish the seat of the fire and the surroundings, the changes caused, the material evidence existing in the fire perimeter, the areas of intense combustion, the means of intervention, the manner in which combustion spread in time, the colour of the smoke and the flames. By viewing the entire field of the fire scene all the existing objects/traces are fixated, so that even if some of them initially seemed unrelated to the case, they can be used later on, establishing the size, the position compared to other evidence, characteristic details etc.

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