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# Operating Procedures and Techniques of the Technical Replication of the Original Documents

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**Abstract** In the recent practice of document identification, the problem that the original samples cannot be extracted is often involved. The principals have no choice but to submit the prints, faxes, photos or electronic scans of the samples to the identification bodies. However, many features of the copies will be blurred, deformed or even lost during the process of replication. The copies will also make the identification work more difficult, and will affect the identification comments. In this case, the identification bodies need to go to relevant departments to do some verification and technical replication of the original documents on the spot. How to restore the samples to their maximum limits is the problem that all the document appraisers must be confronted with.

**Keywords:** Forensic science, Document identification, Technical replication, Operating procedures, Techniques.

## 1 Raising of the Problems

In the practice of document identification, the ideal state is to identify the papery original documents of the samples. Under the circumstance that the principals cannot present the original documents, the appraisers can identify the copies of the samples (including the prints, faxes, electronic scans and photos etc.) Because of the restrictions of the copies themselves, for example, the feature blur, deformation and loss will make identification more difficult and finally affect the comments, some of which are tendentious and some even incompatible.

In recent years, I've encountered numerous cases that the principals cannot present original documents. The reason is not that the original documents have been lost, but that the paper materials are stored in the archives of related units and cannot be

drawn directly. Original documents, such as articles of association in administrative departments for industry and commerce, signatures or seals in the shareholders' resolutions, handwritings or seal samples retained on the band certificates by the suspects are all unavailable. According to the files management regulations of Industrial and Commercial Authorities, the identification bodies can go to the units above to inquire the papery original documents together with the Court, but cannot get them out. To reduce the impact of the copies, sometimes the principals are required to replicate the originals. However, because the principals are unaware of the identification demands, the copies are usually unsatisfactory. Even the professionals, by using different ways, will reach different identification conclusions due to the lack of scientific and standardized instructions. Therefore, based on the

practical experience of the technical replication of the papery originals on the spot in the identification centre in recent two years, I've explored the operating procedures and techniques of the original documents.

## 2 Equipment Requirements

Because of the restrictions of the technical replication itself, the appraisals cannot use large-sized apparatus, and can only carry some miniatures and portable equipments.

### 2.1 Measuring Equipments

Calipers, protractors, straightedge

### 2.2 Electronic Coping

#### Equipments

SLR cameras with standard lens (including a macro lens, dimensions), compact cameras of small-sized lens, portable scanners.

### 2.3 Observation Equipments

Magnifiers, miniature microscope with cold light source

### 3 Operating Procedures

#### 3.1 Check on the Spot

As the copies for inspection may be forged or altered, there is a need to check on the spot, whose aim is to test whether there is a difference between the paper originals and the copies provided by the principals in contents. The appraisals need to check the originals and the copies or electronic scans, photos provided by the principals, and examine the numbers, dates, contents and inscriptions of the originals. If there is no difference between the originals and the copies or the scans, the identification work can be continued. But if the two don't match with each other, records of the differences will be taken and the principals will be informed in time.

#### 3.2 Inspection on the spot

Inspection on the spot is to preliminarily define the formation of the documents such as whether the

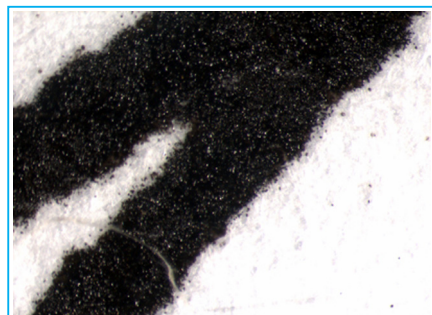


Fig. 1

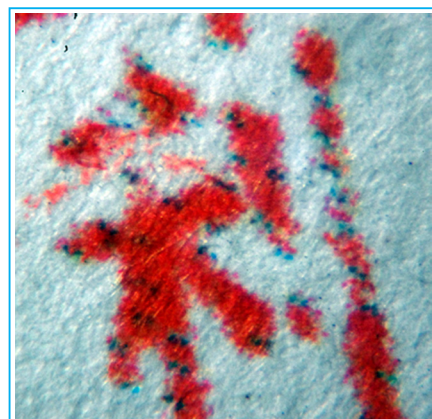


Fig. 2

writing is hand-written or printed (Figure 1), whether the seal is chopped or printed (Figure 2), identification of the sort of the typewriter, whether the originals are printed successively at one time. How the originals are formed is hard to recognize with the naked eye. The apparatus need to use a microscope to observe the paper originals on the spot. If they find that there is something wrong with the formation of the documents, they need to take photomicrographs, and take down the feature points. Besides, as to the identification of the seals, they need to measure and take a record of the features' data of the edge lines' diameters, pentagonal patterns with calipers, straightedges and protractors.

#### 3.3 Remake

Photographic remake is an important link in technical replication, and it requires a high level of operation. The remake of the technical replication includes the full view of the originals and the handwriting to be identified or the feature points of the seals. Remake usually causes longitudinal tensile deformation, transverse tensile deformation and the change of the seals' diameter. The reason is that the shooting angle of the camera cannot be absolutely perpendicular to the paper face, And this can be hardly overcome. Because the copy stand and light source are not easy to carry, the appraisals usually have a handheld remake. Handheld remake will cause more obvious deformations. Because of the deformation problems of remake, the comparison between the remake (Figure 3, Figure 4, Figure 5) and seals or scans (Figure 6) cannot be evaluated by diameter, but can be compared in such aspects as the fonts, distribution, detailed features of the seals. The fonts and distribution of the seals will not change with the tensile deformation, and are relatively stable.<sup>[1]</sup>

#### 3.4 Scanning

Overlap analysis cannot be made between remakes and electronic scans.

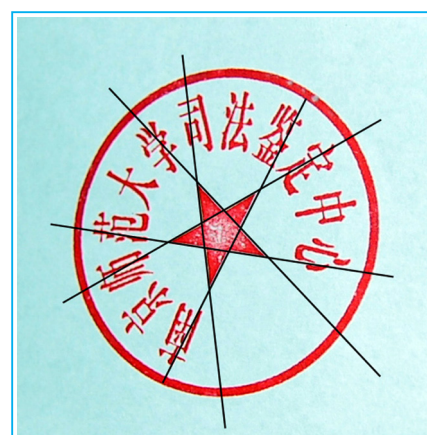


Fig. 3



Fig. 4

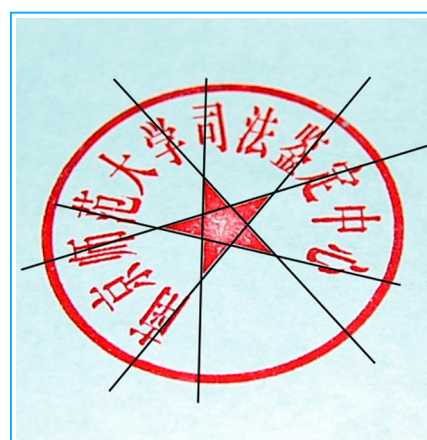


Fig. 5

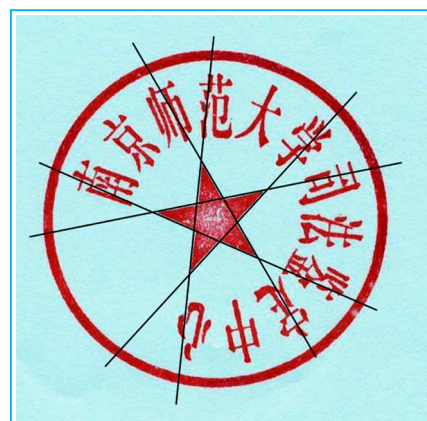


Fig. 6

If the originals are seals, the identifiers need to carry portable scanners to scan the seals and record the electronic scans. In the later identifications, the copies will be scanned by the same resolution, and the two scans will have overlap analysis on the photoshop software platform.

### 3.5 Coping a Record

In judicial practice, the examination of the identification conclusion must contain the “originality” of the materials. The judge, as a layman, shouldn’t easily doubt the reasonableness, but must master the “originality”. The fourth paragraph of Article 24 of the *General Procedures of Forensic Identification* (hereinafter referred to *General Procedures*) makes rules for extractions on the spot: ‘There should be at least two forensic experts when there’s a need to extract materials on the spot, and the principals should be informed to the site to witness the process.’ But there are no related regulations of technical replication of the originals in *General Procedures*. The technical replication of the originals is different from extracting samples on the spot. The latter is the procedure before identification, while the former is a procedure and technical means of identification. Referring to the fourth paragraph of Article 24 of *General Procedures*, it is considered, to ensure the legality of the identification work, there should be at least two forensic experts to operate on the technical replication of the original documents. After the replication, the identification bodies need to issue a *Records of the Technical Replication of the Original Documents (Records)*. *Records* should mark the time, place, equipment used, operators of the technical reputation. Finally, the appraisals, principals, workers of the units where the originals are stored will sign their signatures and mark the date.

## 4 Techniques

### 4.1 Photomicrograph

Because of the restrictions of the site, photomicrograph can only take the way that the lens are aligned with the eyepiece of the microscope. Such kind of shooting is more flexible, but has a difficulty imaging. Pay attention to the following points:

#### 1) Select Lens

Because that the lens of the eyepiece of the microscope, the lens of the digital camera can’t be too large, or the images in the microscope cannot be found. Usually, compact cameras with small lens are selected instead of SLR cameras of standard lens.

#### 2) Optical Alignment

First, focus the microscope on the light, better choose white light instead of warm light, for images in the white light are clearer. Portable microscopes for seal examination usually have cold light sources themselves. And the light emitted just meet the requirements.

#### 3) Mining Point

Find the feature points which need to be photographed under the low magnification of the microscope and then convert to high magnification.

#### 4) Focusing

First adjust the digital camera to a state in which there should be no macro and no flash, and then focus the lens on the eyepiece of the microscope and focus until the images of the digital camera are the largest and clearest.

#### 5) Shooting

There should be no flash when shooting. If there is flash, the images will be dark.

### 4.2 Macro Photograph

Macro photograph is used to remake the writings or the features of the seals. Macro photograph is different from the photographs above. Generally, the image ratios from 1:1 to 1:4 are macro photographs, but when they reach from 10:1 to 200:1, they

are photomicrographs. The best way of macro photograph is to use special macro lens, whose resolution is high, aberration very light, contrast high and color reproduction good. Macro photograph has a quite strong resolving power when shooting closely. The image quality of the feature points is guaranteed without too much changes within focus range. Usually, there is a label on the macro lens. The resolution should be determined first according to the size of the feature points. Focus in advance, and then get close to the feature points to shoot. In this way of shooting, the image quality of the feature points are guaranteed. Another way is to use zoom lens with macro lens. Though this way is flexible, the image resolution is lower and more severely deformed.<sup>[2]</sup>

The objects of macro photograph are writings or detailed features of high value in seals. Remakes of the detailed features of handwritings should focus on the shakes, curves, strokes, restarts, stagnations.<sup>[3]</sup> Remakes of the detailed features of the seals should focus on the brought defects, border defects, azimuth lines etc. When laying the dimensions, pay attention that the dimensions are needed by the overall remake of the writings or seals. Better not to cover the shooting objects. There is no need to lay dimensions when remaking the feature points of the handwritings or seals.

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