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# UNITY IN DIVERSITY

## BASIC PRINCIPLES, METHODS, AND TECHNIQUES OF GRAPHICS RESTORATION

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### **Abstract**

The present paper considers approaches and techniques for restoration of museum graphics based on different kind of paper; discusses the problems arising during the restoration of such delicate and sensitive to external influences objects as large-size drawings on tracing-paper performed in different techniques – watercolour, pencil drawing, or iron gall ink. The approaches providing the possibility to solve these problems are also suggested. Regarding the analysis of scientific and practical experience in this field, the adapted approach for delicate materials restoration is described. This approach is based on synthesis of oriental restoration materials and conservation techniques with conventional European methods and materials.

*Keywords:* watercolors, architectural drawings, tracing paper, synthesis, approaches

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### **1. Introduction**

Collection of State Museum of the History of Saint Petersburg contains a lot of graphics performed in different techniques on various materials which were used by artists and architects for more than 300 years. Comparing with millenarian world art history, Saint Petersburg is relatively ‘young’ – it was founded by Peter the Great in 1703; this city conceived by tsar as a ‘window to Europe’ for Russia, became also the ‘window to Russia’ for Europe. The foundation of this new city, at the beginning of the XVIII<sup>th</sup> century, played a significant role in the development of the economic and cultural links between Russia and West Europe. As an essential point, it should be mentioned the great input of Saint Petersburg in the new town-planning concepts. A lot of brilliant ideas of most bright and famous architects from Russia, Italy, France, and Finland have been realized here. This city inherited the cultural values of many countries and nations, was and still is unique and unrepeatable. For more than

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three centuries, Saint Petersburg is developing and changing, absorbing and revising the most modern styles, technologies of foreign masters; however, its unique peculiarities and principles are carefully preserved. This is a city of great Russian and foreign artists, architects, and sculptors. Their names are deservedly included in Common World History and their ideas and concepts affect the development of culture in Europe. Baroque, classicism, historicism, Art Nouveau, and avant-garde architectural styles are harmoniously combined in the city image.

Funds of the State Museum of the History of Saint Petersburg are carefully preserving and storing of the masterpieces of great artists and architects. The onset of museum collections formation has been started in 1920s. The base of these collections is the collector's items connected with town-planning, building and improvement of public services in Saint Petersburg – Petrograd – Leningrad from the very beginning up to nowadays. Museum is storing the original drawings of Saint Petersburg architects fulfilled in the frameworks of architectural competitions both for Saint Petersburg and other Russian cities. Museum collection is permanently supplemented by modern objects.

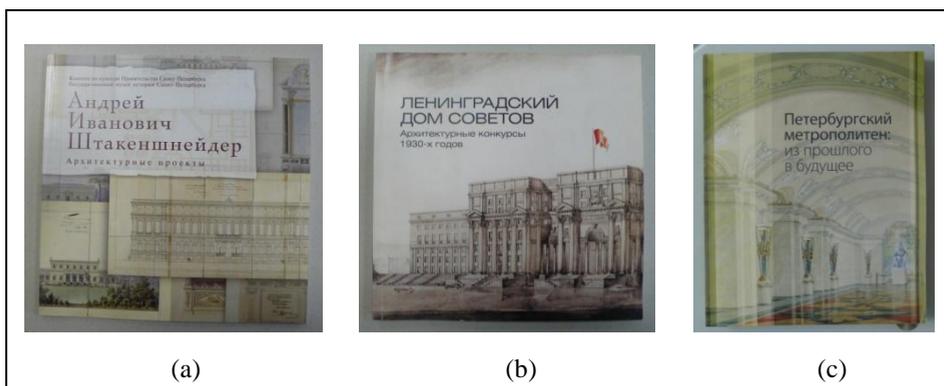
## **2. Historical context and museum collection**

Our city is still developing: since the middle of XX<sup>th</sup> century and till nowadays, a new city structure, the Subway underground net, appeared; this appearance strongly affect the historical structure of the city.

Regarding for the intensive building and development of modern business and technical structure of the city, the problem of preservation and restoration of the historical heritage is fairly important. To our regret, a lot of historical objects were destroyed during the years of Stalin repressions and during the Second World War. Unfortunately, a great number of religious architecture and art objects were destroyed or damaged at that time. The essential point of last decades was the reconstruction and restoration of the religious objects, both churches as the architectural objects and their interiors as art objects, along with the new churches building. In this context, the problem of correct combination of the reconstructed churches with the newly developed city structure, and, foremost, subway underground network becomes fairly important [1].

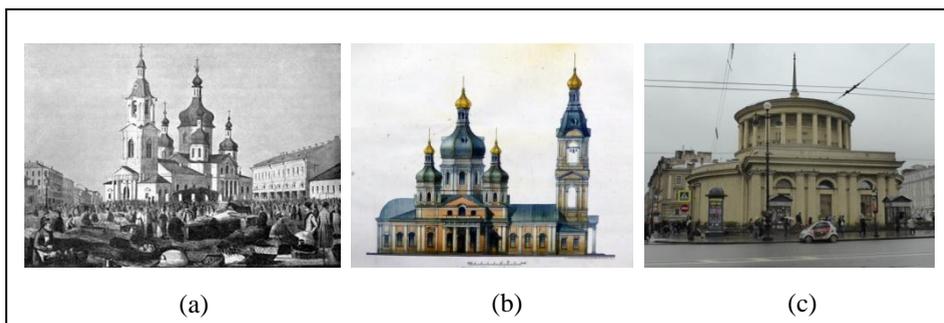
As was mentioned above, the problem of the religious art restoration and reconstruction is quite important since these processes should be coupled with the intensive development of business and technological structure of the city and with the intensive building of the new city regions. This problem is also very complex due to the fact that a lot of religious objects (churches, cathedrals, bell towers) were rebuild or reconstructed in order to give them utilitarian function (museums, schools or even storehouses); some objects were completely destroyed. State Museum of the History of Saint Petersburg stores a lot of drawings fulfilled during the time of 'Stalin's empire' formation. They present non-realized architectural projects showing the frames of new ideology –

gigantic stadiums, swimming pools, cultural and sport objects that were planned on the place of destroyed churches (Figure 1) [2].



**Figure 1.** Museum catalogues of the exhibitions of the architectural drawings.

In the end of XX<sup>th</sup> – beginning of XXI centuries, the restoration of the religious objects in Saint Petersburg started. Surely, the basic religion is Orthodoxy. However, Saint Petersburg is a multiconfessional city: the Buddhist Temple, the Synagogue, the Mosque, Catholic Churches along with a lot of Orthodox churches were restored at that period. But still it is a lot of work to be done and restoration works are continuing.



**Figure 2.** Destroyed cathedrals on Sennaya Square and Vosstaniya Squares: (a) gravure view of the cathedral on Sennaya, XIX<sup>th</sup> century; (b) reconstruction project – integral view (suggested in 2013); (c) subway station Vosstaniya Squares (photo 2014).

The problem of reconstruction of the completely destroyed in 1960s Cathedrals at Sennaya and Vosstaniya Squares (Figure 2) is not solved yet due to the changes of the geological structure during the subway building. Our Museum stores the documents, photos, gravure sheets, and measurement lists describing the different periods of these Cathedrals existence.

Preservation of the Museum collection is very important since this collection is one of the most valuable sources to solve the problems appearing during the restoration of the historical image of the city. This collection is indispensable in the discussions on principles and approaches of the restoration

of the architectural objects in the modern city structure. Our funds store a lot of historical materials that are integral part of city development documentation [3, 4]. These documents are: architectural drawings, plans, photos, engravings, watercolour and gouache paintings, placards, decorative and applied arts objects.

Restoration department of the Museum provides conservation and restoration of the works from the Museum funds. Graphics workshop deals with the graphics collection that is chronologically and thematically subdivided between the following funds:

- City Views Fund (stores paintings and graphics showing the city views of cities worldwide),
- Fund of Saint Petersburg history paintings and graphics,
- Fund of soviet and modern architectural graphics,
- Fund of soviet and modern paintings and graphics,
- Fund of printed graphics (from the middle of XIX<sup>th</sup> till the beginning of XX<sup>th</sup> centuries),
- Library Fund,
- Manuscripts and Documents Fund.

Museum funds are frequently enriched by the objects from private collections. These objects are of great historical value, but their condition is quite different and a lot of them require restoration for further storing and exhibition.

Our Museum also stores a lot of decorative and applied art objects. Usually, these objects combine a number of various materials (wood, textile, leather, metals, etc.). Obviously, these materials possess different properties and characteristics that are changing in time in different ways; moreover, these materials can negatively affect each other. Restoration of such objects requires specific approaches.

### **3. Materials and methods**

#### ***3.1. Methods and basic principles of restoration: problems of large-size architectural drawings on tracing-paper restoration***

Reconstruction of the historical buildings and, particularly, religious buildings, in large extent became possibly due to the fact that our Museum stores a lot of architectural drawings and measurement lists.

However, to our regret, many objects from this fantastic collection require serious restoration. This task is very complex due to the fact that most of the original lists of architectural drawings are fulfilled on tracing paper; hence, some specific approaches should be applied. There are also a number of architectural drawings having the extremely fragile paper base that usually possess a tendency to coiling. Usual and serious problem here is that conventional wetting cannot be applied here due to the peculiarities of the paper material.

Such problem usually manifests itself during the restoration of the drawings dated by 1930s; usually the size of such drawings exceeds one meter,

so, they are large-size objects. Paper of this period is usually of low quality. It contains a lot of lignin and, due to its chemical composition, has a tendency to non-uniform darkening. Tracing-paper of this period is extremely fragile and dry; even a delicate wetting, results in its serious deformation. Obviously, exhibition of such objects is impossible, they require the application of complex approaches. Since the large-size paper in such a fragile state is extremely opened to injury during unwinding. Graphic techniques are hydrophobic, and the base of the paper list is usually tinted, wetting procedure requires individual approach that is generally determined by the nature of the colouring agent used. Chemical analysis of such colouring agent is necessary in each case.

The end of XIX<sup>th</sup> - the beginning of XX<sup>th</sup> centuries is known to be a period of experiments with different materials in all fields of art, Science, and technique. Materials used by artists at that time often become fragile with time due to their non-common chemical composition. Architectural drawings discussed below belong to that period.

### ***3.2. Tested approaches for tracing-paper restoration***

The problem of choosing the optimal approaches and techniques applied for art and architectural objects on tracing paper is extremely important. Three approaches were developed and tested, the detailed description of these approaches is presented below.

***N1*** - West European approach with modern equipment– experience of the pencil drawing on tracing-paper restoration (1930s) in restoration group of Boijmans Van Beuningen Museum (Rotterdam, The Netherlands).

***N2*** - Oriental approach with oriental materials - was tested during the restoration of oriental pictures in the restoration laboratory of the Oriental Manuscripts Institute of Russian Academy of Sciences.

***N3*** - Synthesis of oriental and European techniques - restoration of the large-size architectural drawing in the restoration department of the Museum of the History of Saint Petersburg.

All objects discussed in the paper have the most common typical problems for the restoration, presenting: (i) sensitivity to even a little wetting, (ii) complex unbending operation, (iii) complex choice of the materials to fill in the lost fragments due to the absent of modern materials with the characteristics close to the restored one.

#### ***3.2.1. N1 - West European approach***

Details on the joint project on the restoration of architectural drawings are available at <http://www.peterenpaul.nl>. Joint international project on the restoration of architectural drawings from the museum funds was organized by State Museum of the History of Saint Petersburg and Boijmans Van Beuningen Museum (Rotterdam, The Netherlands) in honour of 300<sup>th</sup> anniversary of Saint Petersburg. Different restoration approaches and possible methods were

considered. An experience on pencil drawing on the tracing-paper obtained in this project is very important.

The tracing-paper discussed is very stiff and fragile; the pencil drawing was unstable to even a gentle touch. The tracing paper was hardly deformed, its corners were twisted, the side areas had a lot of ruptures, lost fragments, and cleavages. Previously, the tracing paper was stacked on a cardboard by some glue. The drawing was delivered to the restoration department without the cardboard. However, some parts of it were present on the back side of the drawing, in the places where the glue connection was extremely strong.

It looks like that some attempts to remove the cardboard (Figure 3) were carried out. It was possibly done by tracing-paper wetting; these attempts were the reason of tracing-paper deformation and corners twisting. In addition, a lot of streaks appeared on the drawing – from light yellow to dark brown colours.

As it was mentioned above, tracing paper restoration drastically differs from the restoration of objects on any other paper base. It is due to the fact that, at even a gently wetting, the tracing paper shows the tendency to deformation and twisting. In the discussed case, the restoration process was complicated because the graphite of pencil drawing had a very weak linkage with the tracing-paper; the connection of the front size of the drawing to any surface could damage the painting.

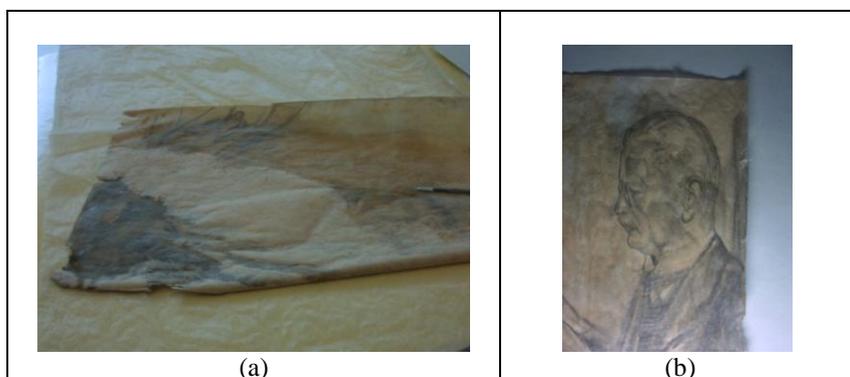
It was decided to fulfil all operation on the multilayer wafer (sandwich from Eltoline tissue) providing the tracing paper placing in a quasi-suspended position. The fragments of residual multilayered duplicating cardboard were as far as possible removed by the scalpel, slightly pressing the part of the tracing paper from which the cardboard was removed; all process was carried out in a dry state in order to avoid further deformation. The cardboard parts that could not be removed by the above described procedure were removed on a vacuum table using the Laponite ‘poultice’. Laponite was fixing the tracing paper on the vacuum table by its own weight, at the same time it wetted the tracing paper and residual cardboard.

After some time, when the gathers straightened enough and the residual cardboard fragments swelled, the vacuum pump was switched on and the cardboard and the poultice were removed using spatulas and tampons; at that the polluted tampons were permanently replaced by the clean ones. This operation also partly removed the yellow areas; by the end of the process, the tracing-paper got its natural uniform light beige colour, all yellow and brown areas were completely cleaned. The vacuum table was set on until the complete tracing-paper drying. During the whole work of the vacuum table, we were carefully controlling the process in order to avoid graphite transition onto the lining. Just before the vacuum pumps were switched on, the drawing has been covered by the sheet from dense printing felt. The covered tracing-paper was left in such state for some time for additional tracing-paper drying.

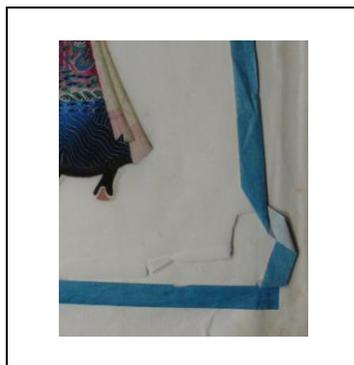
The ruptures and the contacts of the insets replenishing the lost fragments were fixed by special restoration transparent strips with a glue layer. The gluing was carried out by ‘dry-method’. After the end of the restoration, the drawing

was placed between the layers of dense restoration cardboard until the complete straightening. At the last step, when the tracing-paper was completely straightened, the necessary tinting was carried out after treatments.

The approach described above is quite applicable when the restoration laboratory is well fitted with by modern materials and equipment, which is typical for large museums. Unfortunately not all museums possess such facilities.



**Figure 3.** (a)Residual cardboard on the back side of the tracing-paper. (b) the back-side of the tracing-paper after cardboard removal.



**Figure 4.** Tetrapanax damaged – fragment.

### 3.2.2. N2 - Oriental approach

Approach used for the restoration of album China drawings, drawn by mineral water-colours on tetrapanax (objects from the funds of the Oriental Manuscripts Institute of Russian Academy of Sciences, Saint Petersburg, Russia).

The experience of the restoration of oriental drawings carried out on tetrapanaxpapyrifer (pith-paper) – the material widespread in Thailand, Japan, and China, but rather unusual in Europe. Physical and chemical properties of tetrapanax differ from those of tracing paper; the most important difference is the fibre structure. Tetrapanax is not a paper, however, it is widely used by

oriental artists as a base for drawing due to such attractive properties as the specific texture and transparency. On the other hand, tetrapanax and tracing-paper are similar in external characteristics: semi transparency, milk tint, fragility, tendency to deformation at even low wetting or moisture level. The restoration process was described in detail in the Proceedings of the International Science-Practical Conference [5] (Figure 4).

### *3.2.3. N3 - Oriental and European approach*

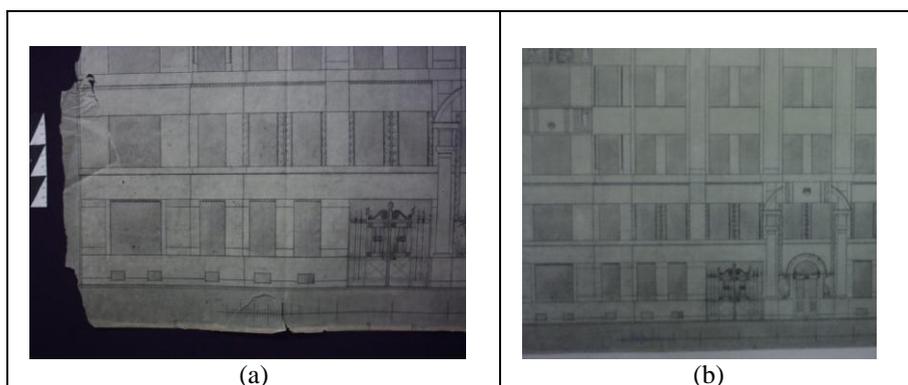
This section describes the restoration of the architectural drawing ‘Apartment house on Zverinskaya street, 20’; it was the drawing by water-colours, ink, and graphite performed on the tracing paper by architect Y.G. Gevritz in 1911. Restoration was carried out in the restoration department of the State Museum of the History of Saint Petersburg. The drawing was a large-size one (640x790 mm) with unevenly cut edges. It had a lot of ruptures and lost fragments both in the central part of the drawing and on its sides.

The tracing-paper was quite dense, deformation was small enough, however, even a dense tracing-paper is unstable to any wetting. To our regret, the restoration department of the Museum has not enough modern equipment. Another problem at that time was the absence of the press possessing the proper working surface. The large area of the lost fragments indicates the necessity of the base replenishment and margins increase. The necessity of duplication for better storing and exhibition was also found out during the restoration process.

In contrast to above discussed tracing-paper from Boijmans Van Beuningen Museum (N1), this tracing-paper (N3) had only surface pollutions - dirt strains that can be removed by dry mechanical cleaning. This cleaning was performed within classical dry approach using scalpels, crumb rubber, and dry tampons. The special tests were carried out; they showed that the paints are stable to wetting, so, the problem was in possible deformation of the tracing paper at wetting. For this reason, all restoration processes – rupture strengthening, lost fragments replenishment, and duplication – were carried out on the preliminary prepared substrate made from plastic and transparent Melinex film. The tracing-paper was placed on the substrate back side up and it was uniformly wetted by ultrafine ‘water dust’ from the sprayer equipped with a special pump. In doing so, the tracing-paper became plastic enough to be straightened part by part at simultaneous wetting. This process required essential attention, since the paints behaviour and the wetting uniformity should be carefully controlled (tracing paper did not absorb water and its drying was very fast). Hence, the straightened parts of the drawing were immediately covered by polyethylene film which was preliminary twisted in order to accelerate the process. Straightening was carried out similarly to the case of Japan paper straightening – fan-like, from the centre to the sides.

As soon as the drawing was straightened, the tracing paper was duplicated by two layers of mica paper, preliminary prepared for proper size and fibre direction (longitudinal fibre direction in one layer corresponded to transverse

direction in another one). Just after the duplication, the drawing was covered by a sheet of dense polygraphic felt; the size of the tracing-paper exceeds the felt size by 0.5 cm from each side.



**Figure 5.** Architectural drawing on tracing-paper (fragment): (a) before and (b) after treatment.

Thus, the sides of the tracing paper were free; the strips from the dense Japan paper were glued to these sides. The fibres in the connection places were brushed to make their direction be normal (perpendicular) to the edge. When the strips were glued and the cloth sheet absorbed the basic wet, the tracing paper was placed between two felt sheets and neutral cardboard and left under the press of some cardboard sheets until the complete drying. The cloth sheets in this procedure were changed several times a day. The dried tracing-paper was glued to the preliminary prepared restoration cardboard using the above mentioned Japan paper strips and the lost fragments were replenished by the paper specially selected by colour and quality. Replenishing operation was carried out in ‘dry conditions’, the edges of basic paper and replenishing fragments were joined butt-to-butt. At the end of replenishing operation, the tracing paper was placed between the sheets of filtering paper under the press of ten restoration cardboard sheets; pressing was carried out until the complete tracing-paper straightening. Necessary tinting was performed by coloured graphite pencils. When the restoration was completed, the tracing paper was placed into the passe-partout for permanent storing (Figure 5).

#### **4. Conclusions**

The modern equipment and technical support, such as vacuum tables, electrical scalpels, ultrasound steam generator, and many other equipments, significantly facilitate the restoration process. For example, the vacuum table gives an opportunity to expose large-size object straightened at minimal wetting, making possible the work with objects sensitive to wetting.

The use of Japan paper strips provides the uniformity in the distribution of the tracing-paper tension (in all directions). This is very important in the work

with large-size drawings. Another significant advantage of this method is the fact that tracing-paper here does not lose its basic properties – plasticity and transparency in contrast to the tracing-paper duplication approach using a sandwich from dense sheets.

Coupling of different techniques, modern technologies, and new materials with the traditional approaches of old restoration schools that are considered as ‘classical’, combination of oriental materials and methods with European methods could be very useful for each individual case.

Approaches described above can be applied not only for tracing-paper based objects, but also for large-size objects, as well as for objects requiring extremely delicate handling due to the peculiarities of their base nature. At that, the classical ‘reciprocity principle’ with respect to materials used, preservation of historical format, and material base of the object should underlie all restoration processes.

The basic idea at choosing the specific restoration approach should be the necessity to select the most important scientific data from all the diversity of the available information in order to predict the results of the application of some technology.

## Acknowledgment

The author is grateful to Boijmans Van Beuningen Museum administration for the possibility to use most modern equipment for restoration experiments with a wide spectrum of objects based on different materials and performed in different techniques.

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