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SOI: [1.1/TAS](http://s-o-i.org/1.1/TAS) DOI: [10.15863/TAS](https://dx.doi.org/10.15863/TAS)

International Scientific Journal Theoretical & Applied Science

p-ISSN: 2308-4944 (print) e-ISSN: 2409-0085 (online)

Year: 2017 Issue: 04 Volume: 48

Published: 30.04.2017 <http://T-Science.org>

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**SECTION 25. Technologies of materials for the
light and textile industry.**

PROBLEMS OF QUALITY MATERIALS FOR SOUND INSULATION IN THE THEATER CURTAIN

Abstract: The main reason for the destruction of the materials for curtains of great height are determined. The change of methodology for the evaluation of mechanical properties of materials for curtains are proposed.

Key words: intermission-sliding curtain, material rapport, pattern of the base material, weave cloth, fitting fabric pattern.

Language: English

Citation: Chalenko EA, Kirsanova EA, Kazakova EV (2017) PROBLEMS OF QUALITY MATERIALS FOR SOUND INSULATION IN THE THEATER CURTAIN. ISJ Theoretical & Applied Science, 04 (48): 211-215.

Soi: <http://s-o-i.org/1.1/TAS-04-48-34> **Doi:**  <https://dx.doi.org/10.15863/TAS.2017.04.48.34>

Introduction

The red line along which the tableau curtain moves serves as the boundary between the main stage and its front part [1].

The tableau curtain belongs to the category of permanent equipment for the stage. Heavy fabrics of the silk group such as velvet and plush are more

often used for the manufacture of curtains. The manufacturing process begins with the preparation and cutting of face and lining cloths. The hem of the curtain is turned over the lining, basted and after pre-mounting of the curtain hanging on the railing (Fig. 1) is finally fixed by machine stitching.

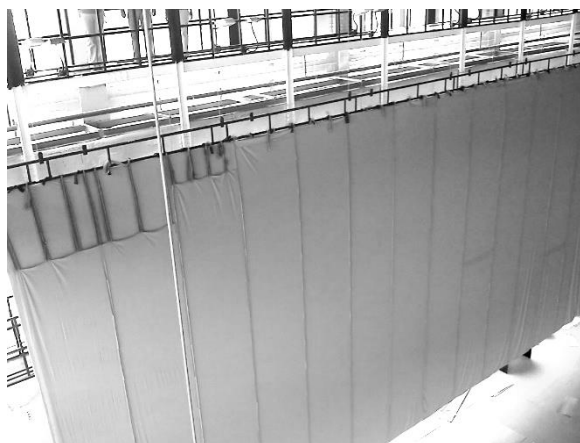


Figure 1 - Photographs of the curtain lining which is fixed to the railing.

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Acoustic soundproof lining of special velvet is always used in modern tableau curtain [7].

The curtain manufacturing is carried out according to the classic technology, in which the panels before the process of stitching are nailed to the floor of the Studio for alignment [1, 2-4, 8].

Application area

The study of the methods of processing historical curtain showed that almost all the processes of its manufacture were made by hand,

starting with joining panels of the main material (Fig. 2, a), and finishing with the processing of the upper edge (Fig. 2, b) and attaching fringe to the fabric (Fig. 2, c). These methods of processing do not allow to obtain good quality finished product, are very time-consuming and, in addition, do not give even load distribution.

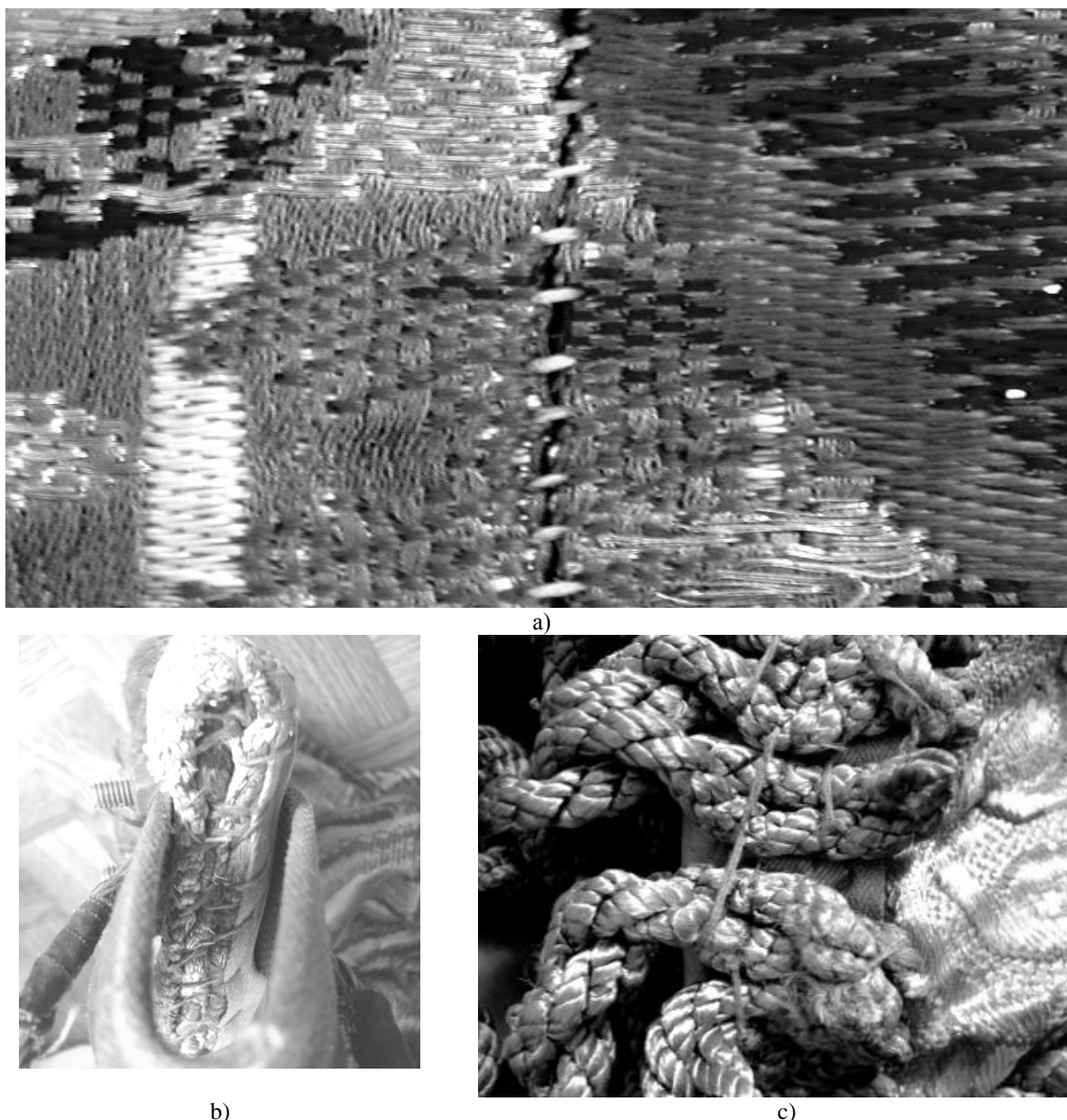


Figure 2 - Photographs. Methods of processing the Bolshoi theatre historic curtain.

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Materials

During the reconstruction of the Bolshoi theatre of the Russian Federation much attention was paid to the properties of the materials used. Fabric, finishing and binding materials were fireproof and made of modern fibers. During the work on the “stage dressing” the aim was not to restore, but to recreate. This work was performed in such a way that the

created object was similar to the original, but changes were made in the symbolics of the material pattern taking into account the historical realities. Modern methods of manufacture which helped improve quality and significantly reduce the time of work were used [2-4].

Considering the parameters of technical specifications for reconstructing the curtains special equipment and components were chosen (table. 1).

Table 1

Characteristics of materials used in the restoration of the Bolshoi theatre curtain.

Material name	Raw material composition
Face cloth	Polyester Trevira CS, Metallic thread Thread 100% Polyester
Lining cloth	100% Polyester
Technical fabric	Polyester Trevira CS, Canvas (tarpaulin)
Haberdashery products, agramantika	Viscose
Technical tape, slings	Cotton, polyester, polyamide, polyester, capron
Sewing thread	Cotton, polyester
Accessories	Non-ferrous metal, steel
Fasteners	Metal
Cord for hanging	Capron, polyester

Methods.

Substantial research has been done to determine the methods of predicting fabric mechanical properties.

Materials research has been conducted on the resistance to abrasive influences and mechanical loads.

Results and Discussion

We conducted research on different materials for abrasion and tensile strength. Technical fabric made of fibre “trevira” and aramid fabric showed the best results of durability. They also have low weight and thickness and are made of flame-retardant fibers (similar to Kevlar), which significantly reduced the thickness of the package materials during processing of the hem and top of the curtains.

The calculated value of breaking length of 830 m, which should ensure its operational reliability, was determined for stage velvet Amadee WP. When determining the breaking strength of samples of velvet it was found that by reducing the speed of lowering the lower clamp, the value of the breaking strength decreases, and, consequently, there is static

stretching of the material. The relative deformation of the sample is less than 10 %, and conventionally these materials are low-plasticity. The destruction of the material is carried out under conditions of static stretching, in which only potential energy effects the material. The maximum height of the curtain, when the destruction of the material will take place is determined for the selected material. It is 5.83 m.

We decided to join the panels of the main and lining materials on the modern stitching equipment for handling medium and heavy materials (Fig. 3). However, the mass of the joined panels was about 11.9 kg for linings and 25.8 per kg for panels of the main fabric. Therefore, the joining of only two panels leads to the formation of an object with mass from 23.8 to 51.6 kg and width from 2.8 m to 3.1 m. Handling such heavy objects on the sewing equipment was a serious problem, and in the manufacture of curtains of different types, it was necessary to join from 3 to 17 panels. Thus, we decided not to move the material relative to the sewing equipment, but the equipment relative to the joined pieces of material. For these purposes a special wadding-sewing complex, consisting of a table having 20 m length and a mobile trolley for sewing machines and the operator, which moves on rails along the table was designed.

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Figure 3 - The use of modern sewing equipment for joining curtain panels

Allowances of the joined panels were pressed open to reduce their thickness, but it was necessary to use household ironing equipment because the industrial equipment for wet-heat processing includes

stationary steam generators and are not designed for processing objects with such length. Pressing work had to be done on the floor because of the large mass of the processed cloths (Fig. 4).

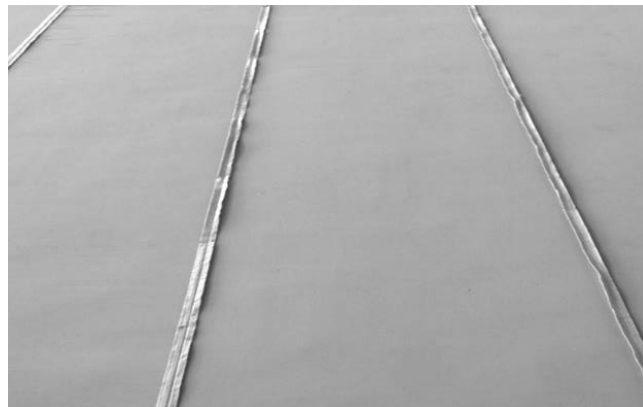


Figure 4 - Pressing open allowances of the joined curtain panels

During the usage of curtain the destruction of the upper part of the lining made of acoustic velvet takes place. It happens during attaching when the binding is stitched to the upper zone or when holes are cut in tarpaulin, reinforced by leather pads for attaching the curtain to the rings and the carriages of the railing, and the distances between the rings are determined by the technological capabilities of the railing on which the curtain moves.

Conclusions

In the development of the curtains processing technology, it was necessary to select the method of processing: manual or with the use of modern

equipment. The fundamental choice was made in favor of the modern sewing equipment use, because machine stitches possess high strength characteristics. In addition, the quality of panel joining with the use of sewing machines is better than in manual joining. Moreover, in the manual method there are 15-16 stitches on each 10 cm line, while the line of machine stitching has 29-35 stitches on each 10 cm line have depending on the desired adjustments and the length of each stitch is exactly the same giving more uniform load distribution. This can not be achieved by manual method. The use of sewing equipment to handle such products with large area, high mass and thickness was impossible50

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years ago, but today, in the 21st century, modern technologies allow qualitatively to join materials of different density and thickness.

However, to prevent the destruction of the curtain, it is advisable to use the index of length breaking, the minimum length at which the sample mass is equal to the breaking load i.e. the conditional length at which the material is destructed under its own weight [6, 9, 10].

The "Golden" front tableau curtains of the Bolshoi theatre, the working height of which is 12.5

m can be given as an example. The height of the curtain is 13 m. Thus, from the above calculations one can see that the operational reliability of the curtain does not meet the requirements and after four years of usage the destruction of its insulating layer takes place.

Thus, when manufacturing curtains it is necessary to take into consideration the change of materials properties under static tension and find necessary engineering and technological solutions.

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