



NEW DESIGN HAND-WOVEN CARPET LOOM

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Received: 10 th June 2024		<i>This article discusses a new design of a carpet loom for hand-woven carpet production. The article provides information about the stages of preparing the loom for weaving carpets, the sequence of these stages, and how to choose carpet products to reduce noise when purchasing carpets.</i>
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In our country, the development of national craftsmanship, including the art of hand-weaving silk and wool carpets, has been passed down from generation to generation as a valuable heritage from our ancestors. The aim is to harmonize these unique art pieces with market demands, engage unemployed individuals, especially young people, women, and low-income families, by widely involving them in this field, ensuring their employment, training, and improving their skills. This is in line with the Presidential Decree No. PQ-181 dated 20.05.2024, "On measures to take the leather-footwear, sericulture, and carpet weaving industries to a new stage of development," which also emphasizes the importance of the carpet weaving sector.

Our country's textile industry is entering a new era of development. According to the President's new decree aimed at developing the textile industry, it is planned to increase the export potential of the sector to 53 billion US dollars by the end of 2024, and to increase the utilization of production capacities from 65% to 83% starting from 2024 through state support of the textile and knitwear industries. The ultimate goal is to make Uzbekistan a regional textile center and increase annual exports to 10 billion dollars by 2027.

Starting from the 2023/2024 academic year, the Tashkent Institute of Textile and Light Industry has radically reformed its activities. In cooperation with the universities of Eje and Lower Rhine in Germany, as well as the "Paris Fashion Academy" in France and the Kosygin Textile University, a joint educational program has been developed and implemented to train specialists in high demand in the textile industry (engineers, technologists, designers, marketers). The opening of the carpet weaving direction at TTESI is also a practical expression of the above reforms.

There are different kinds of vertical looms. In some designs the warp and carpet can be rolled up on both beams making it possible to let out new warp as the work progresses. At the same time, the carpet is being wound up on the lower beam, making it possible to weave really large carpets. In order to produce a handmade carpet it takes a lot of extensive work and the use of different tools. The most important tool in carpetmaking is the loom. Today, one can find many different types of looms and in this section we will focus on the commonly used ones.

Introduction on Handmade Carpets Production:

- Handmade carpets production is one of the oldest crafts prevailing in Arab community, due to its simplicity and high profitability, as well as being very important for home furnishings.
- Carpets production provide many job opportunities, as well as providing job opportunities for women and those belonging to low-income sectors.
- Handmade carpets is one of the high priced goods, and sometimes they are considered as rare property. Moreover, in some instances, auctions are hold to sell some types of used handmade carpets.
- Handmade carpets production is facing many threats all over the world due to the advanced technological renaissance and the great industrial boom in the field of carpets production, which reduced the dependence on human beings and increased the dependence on machines.
- Handmade carpets production and all handcrafts encountered many problems upon starting the dependence on machines due to the high price of handcrafts, whereas machines production save time and cost, in addition to being less priced than handmade carpets, however, handmade carpets are distinguished by their shape, material and quality.
- Carpets have different types and characteristics, according to the pile length, pattern, frame, final finish of the carpet and how the warp threads are placed with the weft and knots. • Carpet fibers have three main types, which are polypropylene, nylon and wool. The three types are famous for their attractive colors, classy designs, the smoothness and density of the pile yarn, quality and high value.

Initial designs are hand drawn on graph paper and filled in with color (Figure 4.7-a). The designs then go to the people who write the „code“ or special language called Talim, which tells the weaver what colors to use, on each line. The original designs are archived and copies are sent to the weavers. Once the design is complete the yarn is

dyed. Color schemes are driven by styles and trends. Carpets are woven by hand on a structure called loom. Weaving of carpets is different in many aspects from the weaving of a fabric. The carpet is generally woven in a warp, i.e. a chain of vertical threads, fixed almost vertically in front of the weaver. Required length of warp threads wrapped over upper beam is called warp-beam. The warp-beam is supported by a pair of columns, which is about 1.8 m high.

Tuft of wool or silk is inserted between two warp threads and knotted. The knotting continues along the whole row. Then, the row is pressed using a tool called beater. Carpet's knotting is carried out according to the carpet design. The carpets are received and inspected. They are then cleaned and scrubbed, which is either done manually using wooden plank or done by electric razors, after which, the carpets go in a tumbler that removes any excess wool that was shaved off. Many bags of shaved wool are sold to cushion makers, who use it for stuffing cushions.

They are then washed and laid outside in the large courtyard on clean river rocks to dry, or in some cases, hung out to dry. The backs of the carpets are hit with fire to seal the knots and keep them from becoming loose. Once they are dry, the process of getting them ready for sale begins. They are inspected repeatedly at every step in the process. This results in finding small errors in the pattern, which are corrected by a team. The rugs are stretched to make sure they are exactly straight and true to measurements. Rows are checked to make sure they line up the way they are supposed to. They are cleaned after each process.

Carpets are often made of wool, or other natural materials like cashmere, jute, sisal, seagrass, and coir. Blends of different fibres are available as well. This report focuses on natural and recycled materials. Synthetic woollen carpets are much cheaper than those made of natural wool, but they are usually also less durable. See an example of **handmade cashmere and wool blend carpet**. The same applies to carpet backings, which can be made of natural materials such as jute or cotton. Reinforcing latex backing is particularly important for tufted carpets. Sizes are usually indicated in feet (1 foot = 30.48 cm). Typical sizes include:

- 6' x 9' ≈ 180 x 270cm
- 6.5' x 10' ≈ 200 x 300cm
- 9' x 12' ≈ 250 x 350cm
- 10' x 10' ≈ 300 x 300cm
- 10' x 14' ≈ 300 x 400cm

Ask your European buyers in the early stages of collaboration what specific sizes they may be looking for.

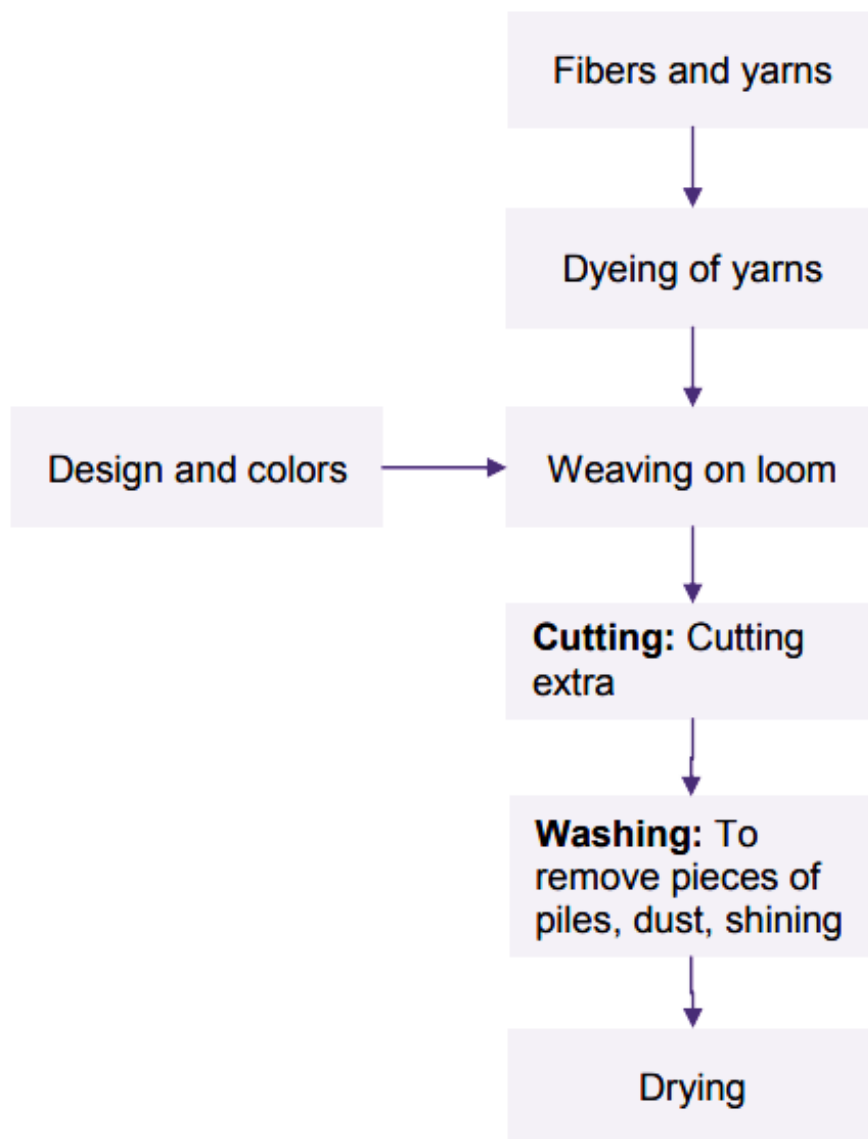


Figure 1. Handmade Carpet Manufacturing Process

For the wool to become yarn one needs to comb and spin it and this requires the used of various tools. When the weavers are manufacturing a carpet they do have a wide range of tools, such as combs and knives for example, at their disposal.

Carpets come in a wide variety of designs, styles and patterns, both traditional and contemporary. They can range from colourful to plain, to suit consumers' personal tastes. Carpets can also be printed to add patterns and colours.

Different techniques exist for making carpets, from weaving or knotting to tufting. The fineness of the work is a key quality aspect that is reflected in the fineness of the design. The price is largely determined by the type and quality of the materials used. Yarns vary from jute, sisal and cotton to wool, silk and blends. The finer the yarns, the higher the quality and sales price. Other elements that influence the cost of a carpet are the production methods, the nature of the pattern, and the size of the carpet.

The article provides information about the students in the carpet weaving direction who have created a new design carpet loom. Hand looms are positioned horizontally. On horizontally positioned looms, mainly narrow carpets were woven. The loom in a compact form belonged to nomads, and it could be easily folded and moved to another place without difficulty. Wool and cotton fibers were mainly used as raw materials.

The advantage of the new design loom is that it is convenient to use and allows a wider range of synthetic fiber threads to be used.

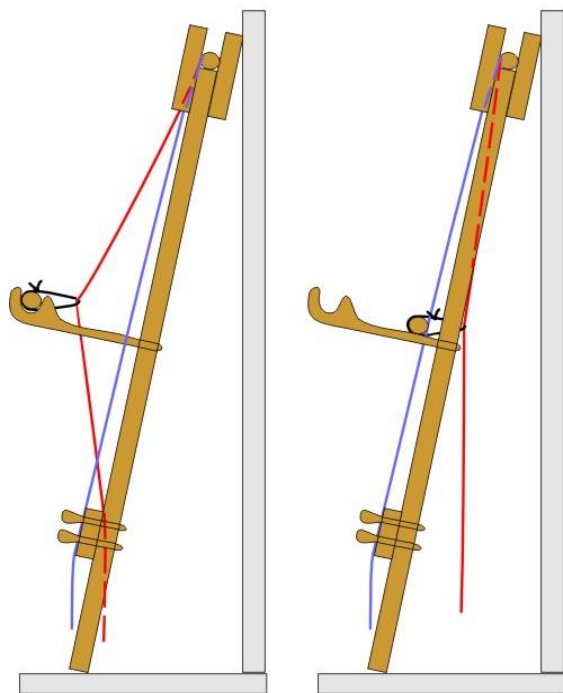


Figure 2: New design hand carpet loom.

Figure 3: General view of the hand carpet loom.

Before starting to weave a carpet, the loom and tools must be adjusted to working condition. The carpet is woven according to the following processes:

- A technical drawing of the carpet with the necessary dimensions is prepared.
- The loom is marked with dimensions corresponding to the technical drawing.
- The warp thread is passed through the loom in sequential stages.
- The upper and lower threads are wound on the heddle part of the loom.
- The wrapped warp thread is brought to a cloth state (the weft thread is passed 3-4 times between the upper and lower threads, changing position).
- The initial wrapping part is wound on the warp thread brought to a cloth state.
- The first row of the carpet is woven according to the technical drawing with a hook knife.
- After each woven row, the edge parts are wrapped around the 4 edge threads of the warp.
- The weft thread is passed over the woven rows.
- After each row, the weaving is straightened with a special carpet shear

The dimensions of the woven carpets should be checked with exact measurements, and their quality should be monitored.

Carpets are usually purchased for specific purposes, primarily to create a comfortable environment at home. This scientific research studied the noise reduction properties of carpets. This scientific research studied the noise reduction properties of carpets. By selecting the right carpet product, it is possible to create a comfortable living environment by reducing noise in residential homes.



Pic. 3: Appearance of non-woven carpet products.

On the contrary, certain types of carpets do not isolate strong noise waves from the outside and may reflect them more strongly on the smooth surfaces of the carpet. For reference, thick pile carpets can reduce noise by 10-15 dB to 20-35 dB. The quality of carpet products produced on a hand loom in the carpet production laboratory at TTESI was tested, along with their noise isolation properties.

The analysis showed that the soundproofing capabilities of carpet products depend on five main factors:

- Carpets with a thick pile can reduce noise by up to 40-70%.

- The density and length of the carpet pile contribute to noise isolation.
- The thickness and density of the ground warp threads also play a significant role.
- The manufacturing technology, with the tufting method being one of the most effective, involves using synthetic threads for the base part.
- The size of the carpet should be chosen to cover the open floor area without leaving spaces uncovered.

When choosing carpet products, it's also important to remember that long-pile carpets, while good at noise isolation, can also be allergenic. They absorb various pollutants and dust. If the number of knots in 1 m² exceeds 300,000, the carpets need to be regularly ventilated and cleaned.

Ensuring the quality of carpet products involves correctly selecting the raw materials, adjusting the weaving loom according to necessary technological factors, accurately determining the pattern and color harmony, and controlling the carpet quality according to GOST standards. The method of quality control for hand-woven carpets is carried out using a carpet measuring tool.

The carpets' quality is checked based on the requirements, and their dimensions are recorded considering their types. The surface of the woven carpet is smoothed, ensuring uniformity of the pile. If the wool tufts on the pattern ornament of the front side are uneven, they are pulled out, and if the wool is caught in the hand, it is considered technically unsuitable. If it does not align correctly when checked from the back, the back is considered technically good. Carpets should be cut to the same size, and the seams on the back should be even, ensuring that the wool is held firmly. If these rules are followed, the carpets are deemed to meet technical requirements. Defects in carpet weaving are identified through observation and corrected manually.

REFERENCES:

1. N.B. Yusupova. "Carpet Product Manufacturing Technology and Artistic Design," Tashkent: Munis Publishing, 2024, 530 pages.
2. P.S. Siddiqov, N.B. Yusupova, I.B. Rakhmonov. "Dependence of Pattern Rapport of National Textiles like 'Khan Atlas' and 'Adras' on Machine Design," Namangan Engineering Technology Institute Scientific Technical Journal, ISSN 2181-8622, 2018, No. 1, pp. 54-59.
3. K.YE. Razumeyev, N.B. Yusupova, D.T. Nazarova, S.SH. Tashpulatov, J.YE. Danadilov, Z.B. Ongarbayeva. "Improvement of Quality of Cotton Suit Fabrics Depending on Their Supporting Surface," Izvestiya vuzov. Textile Industry Technology, Ivanovo, 2019, No. 5 (383), pp. 85-88.
4. N.B. Yusupova, D.T. Nazarova, S.A. Khamrayeva, Z.F. Valiyeva. "Evaluation of the Structure of Costume Fabric over Its Surface," International Journal of Advanced Research in Science, Engineering, and Technology, ISSN: 2350-0328, India, 2018, pp. 6738-6742.