Technologies for decorating the walls’ surface in timber-frame housing construction

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Abstract. The article discusses the features of decorating the surface of walls in wood-frame housing construction, taking into account its features, improving technologies and the interchangeability of materials and structures. The importance of low-rise construction in Russia in the context of government decisions is indicated. It analyzes the current state of the finishing materials’ range for wall decoration and their evolution. The formulations of binders, soils and methods of their application are given.

Introduction
The global task of modern construction is not only to master the high technologies of building construction, but also to multiply the best traditions of the artistic-shaped and volume-plastic solutions. In the future there are the effective forms of creative community that will provide their creations with the highest professional level for the bachelors’ practical activities in the fields of “Reconstruction and Restoration of Architectural Heritage”, “Architecture”, “Design”. Modern architecture in its best creations is a conglomerate of the creative efforts of architects, designers, artists.

The Governmental project of the Russian Federation “Low-Rise Russia” is being successfully implemented throughout the country and in the south of Russia. [14] The low-rise construction program can be implemented, inter alia, using the wood-frame housing construction technology. The main directions for the development of low-rise wooden housing construction are determined by the sub-program “Low-rise wooden housing construction” of the federal target program “Own House” (1999). The wooden architecture of Russia has come a long and difficult way - from a primitive log house (residential crate, “source”) to grand palaces in the choir, the creation of which was prepared by the creative imagination take-off and construction equipment of many generations of “drevodels”- craftsmen.

The priceless artifacts about the development of wooden architecture give us chronicles, the ancient icons and ancient plans of the Russian cities. The researchers of Russian wooden architecture note the influence of various socio-economic factors causes natural and climatic conditions on the multiplicity of the buildings’ types, although the design of the stand is taken as the basis for their construction.

Technologies of wood-frame housing construction
At the beginning of the century, timber-frame housing construction became popular due to the flexibility of organizing the individual construction. It gives a great variety of forms of architectural and planning solutions, a good level of operational quality, economy, environmental friendliness. The
main technologies of wood-frame construction are considered Finnish and Canadian. Canadian construction technology involves the construction of a frame that is treated with various types of chemical protection against burning, decay, rodents, etc.

The improvement of this technology has led to the search and development of the new building materials that meet its requirements - this is an I-beam, oriented chipboards (OCB), moisture and vapor barrier films, heat insulation, modern finishing and roofing materials. Drywall can be used for the interior cladding, which opens up an access to creative work with decorative wall covering, using environmentally friendly materials [11]. Taking into account the emergence of the new art materials based on synthetic polymers - resins, their dispersions, emulsions and various versions of their mixtures, it makes sense to consider the traditional and modern wall coverings. This will give the students the opportunity to get colorful layers with high decorative and technological characteristics.

The feasibility and effectiveness of work in this direction can be confirmed by the significant experience in the creation and use of such materials in construction. The students need to know the possibility of using the impregnating synthetic polymeric materials to strengthen the bases, primers and paint layers of decorative wall coverings in order to preventively protect them from atmospheric influences and other destructive factors. The formulations of such compositions and the methods of their application have been developed, and are now widely used in the preservation and restoration of decorative wall coverings. Each generation receives its spiritual values materialized in the art works from the previous ones, clothed in the corresponding art form.

The wall decoration background

The history of murals and decorative wall coverings has a long and beautiful background, which is reflected in the most ancient forms of fine art. Vivid examples of the Paleolithic era left tangible evidence of fine art. At the end of the 19th century, the discovery of cave paintings and engravings followed, resulting the independent area of primitive archeology. The Paleolithic monumental cave art generated the art of painting, the art of graphics and, thanks to the natural reliefs of the cave walls, a bas-relief. Rock art was concentrated mainly in the south-west of Europe, Azerbaijan (Kobystan), and Africa. Engraving and bas-reliefs on the caves’ walls were made with rough incisors, paints of natural origin were used in painting. The most commonly used glandular ocher, from which yellow to brown paints were obtained (for oxidation, the ocher was calcined over a fire). Black paint was extracted from magnesia dioxide, brownish-red from burnt iron ore. The binder solution was animal fat.

Paint could be applied with a finger or a wand. In a number of caves: Lyasko, Gabiyu, Kunyak, etc. - numerous lamps and cups or tiles for the preparation of paint were found. In a number of caves - Montespan, Labuish and others, clay modeling was taken on the caves’ floor. It should be noted the use of natural reliefs on the walls in caves, when the protrusions and depressions by a small correction turned into figures of animals or people. The bulk of the rock art plots is composed of epy animals’ images, large herbivores: mammoth, rhino, wild horse, red deer, fallow deer, wild boar, chamois, moose.

The images of a lion, bear, lynx, and wolverine prevail of the predators. The images of women, hunting scenes predominate of the humans. On the whole, Paleolithic visual activity went the general way, characteristic of any process of cognition - from living contemplation and natural reflection of being to abstract symbolization of dominants (logical interpretation of reality), to their artistic enrichment on the life practice basis as the highest criterion. Since that time, fine art takes on the consciousness aesthetic form character. Unfortunately, the evolution of types of decorative wall coverings is not commensurate with the format of publication and will be considered later. The basis of modern wall decoration was the study of the experience of artists and masters of the past, which became the primary task of professionals and the condition for the longevity of their creations.

The materials’ evolution, the process of their interchangeability is a natural phenomenon. Throughout its development, decorative wall coverings are formed on the basis of substrates of various compositions and properties, a wide variety of coating materials, numerous techniques and technologies, methods and techniques for creating a decorative form on a plane.
Technology Evolution and Technology Features

The technology of using the adhesive properties of eggs for fixing paints was born in ancient times. Thus, we got a natural (natural) emulsion for tempera, which is one of the oldest materials for painting walls. Vitruvius testified that in ancient Greece lime plaster with a glossy surface was used (“affresco” - raw, and “fresco a secco” - dry”). According to Vitruvius’s recipe that reached us, the surface of the fresco was covered with a mixture of oil and wax, after which it ended with a coating of melted wax [9]. The mural of the fresh mortar by the Romans was called in udo (“raw”).

Lime plaster had seven layers - sand crushed with marble chips was added successively, the layers were compacted with milk, pumice, and crushed brick. The components - animal glue, pure lime with casein, binders from egg white, glue depended on the type of pigments used. Low weather resistance and fragility provoked a rapid development of the technology, improvement of compositions and adhesion to the surface. Technological qualities of tempera paints often depend on emulsions-bases. The technological characteristics are:

1) Casein-oil tempera- good adhesion to surfaces, a variety of application methods, free painting technique (a la prima, glaze), do not change the color and tonal parameters when dried, high strength and weather resistance. The composition is: pigment (dry or water paste) - 1 part, casein-oil emulsion - from 0.25 to 0.5 part.

2) Tempering yolk and whole-egg paints in the modern interpretation have an artificial base made of artificial yolk-oil and yolk-oil - varnish emulsions, allow saturated colors, great strength and weather resistance, quick drying and a stable paint layer. The ingredients are: egg yolk - 1.0-hour, oil varnish - 0.25 hours, linseed oil-0.12 hours, poppy oil-0.12 hours, carabolic acid - 1.5 hours, pigment paste - 1.6 hours [7]. The upper layers of the soil are made with emulsion, glued up to four times by gluing with animal glue, laid with gauze, then dried and primed. Soil, gesso-primer, is a layer that smoothes the surface flaws, has strength, and pulls the particles to the surface. The composition is: chalk - 1.0-hour, sizing - 0.7-hour. [7] Gypsum is added to the gesso-gypsum soil, gypsum is added to the gesso-soil, whitewashed and crushed porcelain or faience are added to the gesso soil. To preserve the colorful layer of the painting, varnish is coated - for each type of tempera, they are selected individually. Copalic for the yolk-oil tempera, pentaphtol – for the egg tempera, etc. Also, the recipes of the so-called polish specially prepared for fixing the paint layer - a solution of shellac and alcohol are preserved.

Summing up our excursion into the technology of decorative wall covering until the first half of the twentieth century, we can conditionally distinguish its algorithm:

1) plastered surface leveled;
2) glued with the compositions based on animal glue (carpentry, sturgeon, etc.);
3) glued fabric (gauze, canvas, two-thread, etc.);
4) primed with various primers (three-layer primer for canvas under yolk and all-egg tempera, casein-oil primer, vitriol, alum, etc.
5) glazed with putty filler
6) cleaned or sanded the surface;
7) primed under the paint layer.

“Sgraffito” - in translation - “scratching” (Italian), a technology based on the sequential application of the thin colored layers of the lime-sand, lime-cement-sand or cement-sand mortars on the architectural plane, in the removal of not dried top with special tools coating layers to the bottom, differing in color and tone, in accordance with the transferred pattern. When using this type of decoration, lime-sand, tinted with alkali-resistant pigments, plaster mortars are used. The lime-sand mortar for sgraffito consists of lime dough - 1 hour, sand - 2 hours, alkali-resistant pigments - 1.2 hours, water - 0.5 hours. The culmination is the formation of a complex multi-color multi-layer image. Another option for decorating is mural painting; this is a pictorial work made on the surface of a wall or ceiling.

Mural painting is the painting on plaster, facing materials and is inextricably linked with architecture. A variety of textured solutions for the plaster, which creates the effect of volume, color
tension, changes the visual perception of the objects’ dimensions. For mural painting, water-soluble, densely rubbed pigments with calcareous wet whitewash are used. As one of the options, modern wall paintings were modified to the picture planes, modular paintings or photographs, which are projected onto the wall surface with the effect of the author’s painting.

The rather popular “graffiti” painting has a long tradition and is widely used in the form of monumental paintings, demonstrating spontaneous technique. To fix the painting, UV protection is applied, fixed with a layer of varnish or acrylic glaze. In search of the increasing methods of the mural artistic expressiveness, the technique of the first layer is used - imprimatur. Imprimatur performs two functions - it reduces the permeability of the soil and creates an average tone, generalizing the color relationships and creating a given color. This Flemish technique was used by the great painters, leaving a rich legacy of formulations for the color composition of the first layer.

The oldest type of decorative finishing and cladding is mosaic. We have reached the masterpieces of the world art made of this material. The centuries-old safety of the mosaics was ensured by the materials from which they were created - through the centuries we admire their decorativeness and the flickering of the set. However, the weak point, the so-called “Achilles heel” of this type of decoration is the base-soil, on which the set is made. Ancient Sumerian mosaics were typed in clay soil, ancient Greek and Roman mosaics – in calcareous and calcareous-oil soils, ancient Byzantine and Old Russian masters used calcareous gesso-soils. The modern level of the materials’ mechanical processing and the variety of binders have made this decoration method affordable and diverse.

Starting to the interior decoration and designing the interior design in a timber-frame house, it is necessary to study this type of housing construction, since there are certain restrictions on the use of finishing materials. It is necessary to note that:

1) the inner surface of the wall is sheathed with drywall, therefore, the materials and binders used must be complementary and adhesive to the base;
2) the supporting structures of a timber-frame house are designed for a certain load, so do not overload the walls with a heavy decor;

Structural, textural and relief decorative plasters are very popular. Within the wood-frame technology, they can be used panoramically, fragmentarily, combined with other finishing materials. The combination of different materials opens up the scope of professional activity, improvisation and creative expression.

Sgraffito technology is recommended to be used fragmentarily, explicatively, in the form of the wall panels, combining with textured decoration. Carefully studying the varieties of frescoes, it is important to understand how to competently pre-prepare the surface for decoration. The classification of frescoes is as follows:

1) Non-woven murals;
2) Canvas Based Murals;
3) Self-adhesive Murals;

The frescoes have justifiably proven themselves for the intensive use on the surface of walls due to certain advantages: high quality, a variety of design solutions and options, ease of care for the products. To give the interior a distinctive personality, plaster stucco molding was used (the sources lead to ancient Egyptian, ancient Roman and ancient Greek architects). Decorative gypsum stucco has successfully integrated into various styles, preserving the accessories of classical antiquity, singing mascarons, castle stones, flowerpots, moldings, volutes, ornaments, columns, rosettes, cornices, pilasters, etc. Ultramodern trends have replaced the gypsum bas-reliefs and stucco moldings with their utilitarianism. The disadvantages of using gypsum stucco in wood-frame housing construction are fragility, seeming old-fashioned, heaviness.
acceptable in a wooden house. Panels and pictures are easily tinted and painted in any color – with the use of brushes and spray guns, paints in aerosols.

Gypsum stucco was replaced by the products from polyurethane, duro-polymer, polypropylene, even polystyrene - openwork, corner elements, moldings, cornices, etc. are used to decorate walls, ceilings, rustication corners, ledges in small rooms. Duro-polymer is made of expanded polystyrene under high pressure, so the stucco molding has a high density (380 - 420 kg / m). The advantages of duro-polymer products are:

1) Affordable price;
2) Wear resistance;
3) Environmental friendliness;
4) Biostability;
5) Heat resistance;
6) Moisture resistance;
7) Ease of installation;
8) Easy coloring in any color;

The variety of finishing materials allows the professionals to enjoy the freedom of choice, to focus on eclecticism, the main grain of which is based on achieving the meaning in the ordering of artificial styles’ mixing.

Summary
The problems of creating the innovative technologies are endless, complex and await their researchers. For further professional activities, the bachelors of the above areas will have a long and interesting excursion into the study of appropriate techniques for using materials in the process of creating art forms in wall decoration.

The range of the questions is expanded by the study of the centuries experience accumulated in the development of wall decoration, preparation and use of materials and their components. The rapid development of technology, creative thought, the search for new compositional-style, volumetric, spatial, color and texture solutions will urge them to keep up with the times, in line with the social society order.

The leveling of the conflict with nature takes on a planetary character, in this regard, in the construction programs, the relationship with the outside world should be conceptually reviewed. The achievements of scientific thought are the creation of environmentally friendly, comfortable and bio-positive housing [12]. In any activity, the primordial purpose of mankind, humane moral guidelines and personal responsibility to the nature and health of people should be taken into account.

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