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**COMPARATIVE CHARACTERISTIC OF REPAIR
(FINISHING) MATERIALS PRODUCED IN
FINLAND**

Bachelor's Thesis 2011

ABSTRACT

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Comparative characteristic of renovation materials produced in Finland, 35 pages

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The subject of the thesis is the comparison of finishing materials for repair. The thesis report was made for Mainfuse Oy, specialized on performing of repair works in Helsinki. The main sources are the information from the web-sites of the materials producers in Finland and Mainfuse Oy, also from the manuals and the textbooks of painting and wallpapering works.

In the first part of the thesis the paints and varnishes and the wallpapers produced by the biggest manufacturers in Finland were considered. The finishing materials were compared by cost, environmental safety, usability, resistance, etc, by the most important for repair characteristics. The second part of the thesis is the quality control guidance for decorating works, for painting by water and non-aqueous compositions and for wall pasting by rolled materials. The most common defects in the finishing works and their causes were considered. The repair works are carried out according to the MaalausRYL, the fourth part of the RYL Code of Building Practice in Finland. It is a manual of planning and performing finishing work of building surfaces, which is used by constructors and even on websites of the largest producers of materials to make the right selection of the products.

The found results are that choosing the materials for painting and wallpapering is complicated and based on specific knowledges and the guideline shows that the quality of finishing repair works depends on many things and have to be monitored very carefully.

Keywords: repair, finishing materials, paints and varnishes, wallpapers, comparative characteristics, quality control guidance.

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1 INTRODUCTION

Every owner wants to see his apartment as homely, comfortable and beautiful, so time by time he changes the style and the decoration. The selection of materials for quality repair gives a lot of troubles. Now a large number of various new products are on the market: new compositions and methods of use and new technologies. The building material market is diverse, and it is extremely difficult to understand for an unprofessional. A customer should have the necessary knowledge, should know the properties of similar materials made by different manufacturers to buy the quality goods at reasonable price.

The original purpose of the thesis is to clarify the choice of interior materials in renovation, taking into account the needs of a small contractor, who is more suitable for apartment renovation - they can ensure proper attention to the object, like Mainfuse Oy. Mainfuse Oy carries out repair works, surveys and research, facility management. The company serves private clients, companies, municipalities, facility managers and others. Since Mainfuse is located at Sorvaajankatu 9a419, 00880 Helsinki, the company's activity is mainly concentrated in the metropolitan area, but they are willing to work in other regions. The company has over 25 years experience in the construction business. All works are licensed and performed for quality standard ISO9001. VTT certificate is issued to carry out waterproofing work in high humidity condition. Only certified Finnish specialists are hired. (Mainfuse Oy.)

Because of the enormous amount of construction materials for repair only the materials for interior finishing will be considered in the diploma. The paints and varnishes will be compared by price, environmental friendliness, drying time, resistance to impacts and reagents, etc. The wallpapers will be compared by cost, environmental safety and usability.

The quality repair of apartments is a complex process, which has a speed limit and requires a sum of funds. The quality of surface finishing greatly affects to

the overall cost of repairs. The idea is to find out the most suitable by price and quality finishing materials produced by the biggest Finnish companies.

The repair implementation must be controlled. The evaluation of quality is made beginning on verification of supplied materials, storage way, compliance of application techniques and finishing on checking the final result. The defects must be repaired, their causes have to be found. The quality manuals for finishing works are presented in the second part of the diploma.

2 THE FINISHING MATERIALS

The finishing works are extremely important for repair of any buildings. It includes a range of services, which, naturally, must be performed by professionals. This principle will allow to produce all finishing works as soon as possible. In addition, for the high quality it is necessary to use modern durable materials that can withstand temperature changes, humidity and other factors. In a broad sense the group of finishing materials includes a variety of building materials: if they have external surfaces that not require an additional finishing (Камай.). This may be facing brick and textured light concrete blocks for walls, planed boards and cladding panels, tiles and decorative stones, roll and custom-made floor coverings, etc. Only the paint coating materials and materials for pasting by the biggest manufacturers of finishing materials in Finland will be considered, because they are intended solely for decorating and Mainfuse Oy carries out mainly finishing repair works. In addition to its main decorative artistic and aesthetic purposes the surface finish performs a protective function, keeping the surface from the action of unfavorable factors (humidity, temperature, corrosive substances), prolonging the life of the structure (Ibid.).

2.1 Varnishes and Paints

2.1.1 Tikkurila Group

Tikkurila Group was founded in 1862. This is one of the largest manufacturers of paints and varnishes in Europe, occupying a leading place in Northern and Eastern Europe. The Group offers a full range of domestic and civil construction paints and varnishes. Currently, the concern has the manufacturing facilities in seven countries and the commercial companies in eight countries. The manufacturing and production of the company are certified respectively with ISO 9001 of quality and ISO 14001 of environment. The wide distribution network operates using progressive technology of tinting. There is the list of materials produced by Tikkurila Group:

1. Varnishes and paints for walls and ceilings
 - coatings
 - water-soluble paint
 - organic solvent paints
 - water-soluble varnishes
 - organic solvent varnishes
2. Decorative Paints and Coatings
3. Paints and varnishes for wooden flooring and parquet
 - organic solvent paints
 - water-soluble paints
 - organic solvent varnishes
4. Paints for concrete floors
5. Varnishes and paints for wet areas (baths and saunas; bathrooms)
6. Fillers, putties and adhesives
7. Funds for the preliminary preparation of the surface
 - detergents
 - solvents
 - compositions for removing old paint

(Tikkurila Oyj – nearly 150 years of decoration and protection.)

2.1.2 Teknos Group

Teknos Group was founded in 1948. Teknos is one of Scandinavia's leading manufacturers of paint products for industrial use, which also has a strong presence in construction and household paints. Concern Teknos offers a full range of construction and household paints and has its own enterprises in all Scandinavian countries, as well as in Germany, Great Britain and Poland. In addition, the company has a network of representatives of about twenty European countries.

The quality of paints and varnishes Teknos complies with international standards: quality standard ISO 9001 and environment standard ISO 14001. Most paints and varnishes Teknos manufactures are water-based, without

solvents, making them easy to use and safe for the environment. To date, the concern Teknos is one of few manufacturers of paints, which can offer environmentally friendly alternative products for all objects, both in construction and in industrial paints. The produced paints by Teknos Group are as below:

1. paints and varnishes on solvents
2. paints and varnishes on water
3. varnishes
4. solvents and special materials

(Introducing Teknos.)

2.1.3 Fintex-Tetrakem Oy

The company Fintex-Tetrakem Oy operates for over 40 years in the production of chemical products. The company produces the adhesives, paints, fiberglass wallpapers and waterproofing. The main sales markets are Finland, Russia, Estonia, Poland and Latvia. The 40% of its turnover is exported. The trademarks are Tetrakem, Fintex, Neofix, Tetramassa, Palokatko Tetramassa, Superwellu, Plastfix. And two types of the materials are:

1. paints and varnishes on solvents
2. paints and varnishes on water

(Fintex-Tetrakem Oy.)

2.2 Materials for pasting

2.2.1 Sandudd Oy

Sandudd Oy was founded in 1885. Sandudd is the largest producer of wallpaper in Finland, in addition to their own production they import the wallpaper of the world leading manufacturers. The wallpaper factory and headquarters are located in Toijala. The non-woven wallpaper produced by this factory are designed for papering of walls and ceilings in residential and

industrial premises. They have a great variety of colors and patterns and are made in classic and modern styles, as well as in art-deco style, floral and eco-style. The environmentally friendly materials are used for the manufacture of wallpaper - a special paper and vlieseline, so Sandudd's wallpaper can also be used for child and medical institutions. Vlieseline is environmentally safe, since it does not contain vinyl, fiberglass, formaldehyde, and solvents, and is made of cellulose and textile fibers. The non-woven wallpapers for the walls are highly resistant to mechanical damage. The wallpapers produced by Sandudd Oy are:

1. paper base wallpaper
2. non-woven wallpaper

1. wallpaper for painting
2. wallpaper without additional finishing

(Sandudd Oy - Suomen johtava tapetinvalmistaja.)

2.2.2 Pihlgren & Ritola Oy

Pihlgren & Ritola Oy is the oldest continuously working wallpaper manufacturer in Finland. The mill is located in Toijala, Finland. The factory's boutique and the wallpaper museum are situated by the mill. P&R Oy manufactures the design wallpapers. Many of the wallpapers are designed by famous Finnish designers such as Birger Kaipiainen and Tapio Wirkkala. The collection includes many traditional Finnish wallpapers, models from the 19th century and the 20th century and contemporary models. Mainly the traditional materials and methods are used as well as some special papers. The production includes many kinds of printing methods like embossing or printing with special colors. (Designer Wallpapers.)

3 REPAIR AND MAALAUSTRYL 2001

That includes the concept - repair? Repair is a complex of works designed to restore the technical and operational-level facilities (Бадъин et al., 2006, p. 168.). It consists of sequential steps, each of which is filled with some nuances. Any mistake can nullify all the efforts.

Some funds will be required to implement a repair. It must be decided which of the technologies are the best suited to carry out the work. You must also know the state of the market of products and services. Such knowledge should provide the opportunity to purchase the high quality materials without being overpaid. The proper selections of materials, ensuring their uninterrupted supply of required quantity are also important.

The cost of "roughing" materials (plaster, fillers, primers, adhesives, etc.) taking into account their delivery and recovery in the room is about 50% of the work cost. The lower price of "cleaning" finishing materials (parquet, tiles, wallpaper, etc.) and electrical and sanitary equipment, doors, windows, etc. can be also about 50% of the work cost. The financial opportunities determine what type of repair will be chosen. Reducing of the requirements for class quality will reduce costs. (С чего начать ремонт?.)

There are three classes of quality in Finland, indicated in the RYL, Code of Building Practice:

- High (1)
- Normal (2)
- Low (3)

The different quality categories are used for internal works. The category P_s1/ P_s2/ P_s3 indicates internal painting works; the category K_s1/ K_s2/ K_s3 indicates finishing works by special paints (iridescent, external, opaque and others); the category V1/ V2/ V3 means painting on the texture or on the wallpapers; the category T1/ T2/ T3 means inside texture and wallpaper pasting works. The quality class 1, marked P_s1/ K_s1/V1/T1, is the most expensive and the long time

finishing, since the most careful surface preparation and the high quality materials as well as the highly skilled workers are required. The quality class 3, marked P_s3/ K_s3/V3/T3, is the cheapest and a quick variant of finishing, the surfaces should not be so smooth as for the first class. (RT 14-10754 2001, pp. 339-340.)

In Finland the quality class 2 is the most common used, the price and the work time are less than in the first class, the finished surface is more smooth and good looking than in the third class. The differentiated approach can save up to 35% on the work cost and up to 20% on the cost of materials (С чего начать ремонт?.).

The main thing is: not to economize of the materials quality and the level of employees' skills. The modifications will be cost considerably more expensive than the initially spent money. The technology of finishing work, the technical requirements and the quality control procedures are outlined in Maalaus RYL 2001 General specifications and finishing systems for painting work. MaalausRYL is the fourth part of The RYL Code of Building Practice normalized in the qualitative construction works in Finland. MaalausRYL consists of a menu and 214 finishing-system specifications and 5 work-section chapters, divided by nomenclature of Talo 90. MaalausRYL is a manual of planning and performing finishing work of building surfaces such as painting, applying transparent finishes and wallpapering (RT 14-10754 2001, p. 4.).

In MaalusRYL there are special painting combinations (encoding numberings) for the new painting (new building) and the repair painting (repair). In the repair painting the main aspect is the base under the painting of the old surface. Maalaus RYL is updated every year, so the characteristics of the new surface will differ from the characteristics of the old surface. It makes the adjustments to the technology of execution of repair works and the selection of finishing materials. The materials and smoothness of the bases are the main problems in the renovations. It is difficult to define the quality of painting according to the RYL. Often a painting contractor has to prepare a model room or a model layer

(according to painting combination code) to show the quality for employer or user. This model room will confirm the quality of painting.

4 THE COMPARATIVE CHARACTERISTIC OF MATERIAL GROUPS

On the websites of the largest producers of paints and varnishes it is possible to make the selection of paint by MaalausRYL 2001, depending on the purpose of the premises and the internal conditions, the required quality class of surface finish and the desires of consumers.

By the level of technical and economic performance concrete and reinforced concrete are the main structural materials, taking priority on the global production of construction products. After receiving the title "material of the XX century" concrete, thanks to its unique properties, found its niche in the construction market and is used for the construction of durable and comfortable homes (Звездов.). Among the three classes of surface finish quality the most commonly used class is the second class, because the surface is a more smooth and resistant to external influences than in the third class, and less expensive than in the first class. Therefore, Table 1 represents the comparison of paints for domestic use, made for the second class of surface finish quality to concrete surface. The comparison of paint materials is made by price, environmental friendliness, drying time, resistance to impacts and reagents, etc, because only these characteristics are really important for repair and cost evaluation.

The wallpapers are one of the best options for walls and ceilings in the apartments. This material is relatively inexpensive, easy to use and is a good decoration. The wide choice of textures, colors and patterns allows you to choose a suitable option from the variety of possibilities. Table 2 shows the comparison of wallpapers made by Finnish producers by cost, environmental safety, usability, etc.

Table 1 The comparison of paints from different producers for Superior class of surface finish quality to concrete surface.

Company	Product Name	Price	Weight/volume	Coverage	Application	Gloss	Emission classification	Drying time	Resistance
Tikkurila	Joker (one of the most famous brands of company)	31,9 € per 2,7 l	0,225 l; 0,9 l; 2,7 l; 9 l; 18 l	10 - 12 m ² /l for absorbing surfaces. 7 - 9 m ² /l for non-absorbing surfaces	Solvent free co-polymer emulsion that resists cleaning and dries to a superfine matt finish with a slight sheen. Joker is suitable for interior painting of plaster, concrete, filler treated, brick, cardboard, wallpaper and wooden surfaces, also for cardboard-finished gypsum board, chipboard and wood fibre board surfaces. Suitable for new and previously painted surfaces as well as for surfaces previously treated with alkyd paint according to instructions. For painting ceilings and walls in living rooms, bedrooms and children's rooms, as well as halls and kitchens and other similar dry premises.	Matt	Group M1 in Emission Classification of building materials (complete absence of solvents and other hazardous substances).	Drying time at 23°C and 50% relative air humidity Dust dry after 1/2 hour, recoatable after 1-2 hours.	Resists over 5000 brushings. Resists cleaning detergents and weak solvents e.g. White Spirit. Heat resistance - 85°C ISO 4211-3
Teknos	BIORA 7 himmeä seinämaali	25,8 € per 2,7 l	2,7 l; 9 l; 18 l	Previously painted surface - 10 - 12 m ² /l Stopper and wood fibre	Water-soluble acrylic paint for walls and ceilings, without solvents and smell. According to instructions BIORA 7 is suitable for wood,	Matte	Group M1 in Emission Classification of building materials (complete absence of	Drying time at +23°C and 50% RH Dust dry after 1/2	Washability is very good. Lasts over 5 000 brushings. Method SFS

				board - 7 - 10 m ² /l Concrete and plastered surface - 4 - 7 m ² /l	concrete, plaster, putted and brick surfaces, the surfaces of particleboard and fiberboard, as well as steel surfaces and surfaces of other construction materials. The paint can be used for repair painting of surfaces previously painted with alkyd and waterborne paints. BIORA 7 is used in children's bedrooms and living rooms and other similar dry premises.		solvents and other hazardous substances).	hour, recoatable after 2 hours.	3755.
Fintex-Tetrakem	Fintex 7	21,11 € per 2,7 l	2,7 l; 9 l; 18 l	Previously painted surface - 10 – 12 m ² /l Particle board and fibreboard - 8 – 10 m ² /l Concrete and plastered surface - 5 - 7 m ² /l Fiberglass wallpaper – 8-10 m ² /l	Water-soluble acrylic-latex paint for interior applications. Fintex 7 is used for painting walls and ceilings of dry premises, has good hiding power and high degree of whiteness. The paint is lightfastness and does not turn yellow over time. Fintex 7 is suitable for concrete surfaces, cement-based, plaster and plasterboard, particle board and fibreboard, glass-wallpaper. Suitable for new and previously painted surfaces.	Matt	Group M1 in Emission Classification of building materials (complete absence of solvents and other hazardous substances).	Drying time at +23°C and 50% RH Dust dry after 1/2 hour, recoatable after 2 hours.	Storage: 2 years in original packaging, not below + 5°C. Resists over 5000 brushings. Resists cleaning detergents and weak solvents.

(Data sheets for retail and architectural paints; Joker; Водно-дисперсионные краски; the price information have been obtained by a telephone call to Starkki - the store of building materials and tools in Helsinki)

Table 2 The comparison of wallpapers from different producers for Superior class of surface finish quality

Company	Product Name	Price	Base material	Size	Emission classification	Description
Sandudd Oy	Nikkari	12,9 €/roll	Paper	11,2 or 10,05 m in length 0,53 m wide	Group M1 in Emission Classification of building materials (complete absence of solvents and other hazardous substances).	Wallpapers Sandudd perfectly fit to the category of people who want to buy wallpaper with a simple and unobtrusive print made of non-polluting materials, and thus save money without compromising quality.
Pihlgren & Ritola Oy	Menaros 818	15,0 €/roll	Paper	11,2 or 10,05 m in length 0,53 m wide	Group M1 in Emission Classification of building materials (complete absence of solvents and other hazardous substances).	The wallpapers are really made of paper, not plastic, although there is very slight plastic covering on models. Therefore it breathes well and is a healthy choice. They do not block houses ability to breath like fully plastic wallcoverings do. The wallpapers are easy to hang, because: <ul style="list-style-type: none"> • Pasting is done with normal paste that does not have toxic substances • Do not have to be removed before hanging new wallpapers • Can be removed by moisturing

(Menaros 818; Sandudd Oy - Suomen johtava tapetinvalmistaja; the price information have been obtained by a telephone call to Starkki - the store of building materials and tools in Helsinki)

The paints, similar in composition, were compared to identify the differences are not in the type of paints, but in typical characteristics. The paint of the three firms are almost identical in all ways: they are packed in containers of various sizes, costs and drying times are almost equal, resistant to external influences and cleaning by brushes and detergents. They are environmentally friendly because their composition does not include solvents. They are included in the Group M1 in Emission Classification of building materials, and are equally applicable to all dry areas and on different surfaces. The paints are suitable for new surfaces and for renovation. The paints Joker and Biora 7 are in the same price category, the paint Fintex 7 is cheaper on 22-29%. Thus, for the same characteristics the paint of company Fintex-Tetrakem fits better to reduce the cost of repair.

The paper-based wallpapers of two manufacturers were compared. The options of wallpapers are identical, only the costs are different. The difference between the prices can be explained by the fact that the wallpaper Pihlgren & Ritola is made only from natural ingredients, using old traditional techniques. The wallpapers are designed by the famous Finnish designers, so the production of company Pihlgren & Ritola can be attributed to the high price category. The main type of wallpaper, produced by Sandudd, is non-woven wallpaper. The modern technology, mechanized labor and cheap raw materials make the wallpapers of Sandudd affordable for most consumers. Hence, low price, environmental friendliness and resistance to mechanical damage make these wallpapers the most suitable for repair work.

5 THE QUALITY CONTROL GUIDANCE FOR REPAIR WORKS

The clients want to get a quality repair, an attractive and stylish finishing. But even if the work is carried out by professionals, the careful monitoring is still required at each stage of work, to operate strictly on a fixed schedule and the project plan. The RYL Code of Building Practice describes a standard of good construction practice generally accepted in the building trade. It is prepared at

The Building Information Foundation RTS in co-operation with experts, organizations and enterprises in the building trade. The quality of construction in Finland is in the RYL. (RT 14-10754, p. 4.)

The designer gives the painting codes in the painting specifications of room cards. A tender is conducted, when the finishing contractors give their prices for works. One of the tenderers is selected by the main contractor, which will monitor progress of the works. After the completion of the painting works the clients' supervisor will check the quality of finished surfaces. If there are any defects or problems, the elimination actions have to be made by the finishing contractor.

The quality control begins with a careful selection of companies producing building materials. Nowadays there are many of these companies, but not all of them can answer the charges to construction companies' requirements. Therefore, the choice of such companies is among of the largest and most well-known producers working on the building materials market long time. The production process of finishing and building materials, consumer reviews, and other factors are analyzed that determine the high level of company work. In addition, the costs of finishing materials are taken into consideration, because the financial opportunities and needs of each customer are different. So they must have different proposals of the finishing materials.

The monitoring of the employees is carried out. Firstly, a foreman is responsible for the work of dressers, he is obliged to organize the work and monitor its timely execution, so that each stage of the work is carried out as planned and phased manner. Secondly, the finishing work must be carried out on the basis of regulations on quality control. (Контроль качества отделочных работ.)

5.1 The most common defects in the finishing works and their causes

The finishing works defects are set out on the Internet sources: Виды дефектов и причины их возникновения, при производстве строительного-монтажных

работ. Наиболее часто встречающиеся дефекты отделочных работ и причины их появления.

Defects in the construction of floors

- delamination, swelling and bumps linoleum coverings, causes of which are ill-prepared surface under the coating (the irregularities on the ties, unacceptable deviations);
- swelling of the laminate flooring. Causes swelling of the laminate is high humidity in the premises, insufficient clearance between the laminate, walls and partitions, laminate rigid attachment to the floor;
- swelling of the individual parts of the parquet, loss of parquet, the gap between the planks of the parquet. Causes of defects in parquet flooring are: high humidity in the rooms or high humidity of the substrate, insufficient clearance between the flooring, walls and partitions, the violation of temperature and humidity operating room (lack of ventilation, wet cleaning or low humidity in the room, etc.).

Defects in finishing of kitchens and bathrooms

Separation of a tile from the wall surfaces in kitchens and bathrooms because of the use of adhesives, mastics' poor quality and temperature violations on the tile work, when tiles are laid by unskilled workers.

Defects in finishing wallpapers

The peeling of wallpaper wall and ceiling is the result of leaks, condensation, high relative humidity in the rooms, the use of low quality wallpaper paste, poor preparation of surfaces for pasting, violations of rules governing the production of upholstery work, violations of temperature and humidity conditions and the regime in place after wall covering.

5.2 The quality control of decorating works

The decorating works are performed to protect a building from premature deterioration caused by the weather, to improve sanitary conditions, as well as architectural decoration. The guideline for the decorating works was written

based on Контроль качества строительных материалов и работ. Отделочные работы; Как избежать дефектов штукатурки.

Depending on the purpose of building and requirements for quality finishes, paint colors are divided into simple, advanced and high quality. Because of higher requirements for the quality of the color, a greater the number of technological operations must be performed for preparing surfaces and painting works. The quality of surface finish, operation of machinery and tools are depended of the proper selection and careful preparation of paint mixes. Currently, a variety of paints and varnishes is used in painting works.

Before the painting works a way of paint and a set of colors are maintained. The quality of used materials should satisfy the requirements of standards and specifications. If there are doubts about the materials (due to their long-term storage, destroying the integrity of the package, unclear labeling), the master selects the average sample of the material and sends it for testing in a construction laboratory.

The quality of painting works depends on the condition of surfaces intended to painting, so the master must monitor the thoroughness of preparation and surface treatment. Newly plastered surfaces are painted glue, silicate and casein only after the drying plaster to moisture content 8%. The plaster humidity is determined by testing the samples taken in the construction laboratory. In addition, the laboratory can verify whether the plaster dries out in the room and whether it has free lime, wetting a small area of plaster tested with 1% alcoholic solution of phenolphthalein. If the surface immediately appears crimson-red stain, this plaster cannot be painted. If a spot does not appear or is a light pink color, the plaster can be prepared for the paint.

The surface with high humidity is allowed to be painted with lime and cement paints and water-based paints. In case of the presence of surface liquid water drip paint is not allowed.

The preparation for painting of new plaster surfaces is in smoothing them, as a result the surface roughness is eliminated and the surfaces are cleared from the spray solution. Then all the little cracks are embroidered and closed up with a solution to a depth of 2 mm. If some oil and rust spots are found on the surfaces, they are cleaned off by steel brushes or scrapers, these places are covered with oil paint or nitrocellulose varnish.

The surface treatment is to perform all processes preceding color: bedding some places, grinding grease places, priming, filling. The master must ensure the correctness of implementation of all required manufacturing operations. The master controls the quality of used materials together with the workers of construction laboratory, which give the advice for storage, obtaining materials of necessary consistency and replacing them with some other materials.

After the bedding of defect places and their grinding the priming begins. The type of priming depends of the paint, which will be used. A primer should be uniform, without lumps of chalk, sand, clots and flakes. The quality control over the primer is performed by a foreman. The soap and aluminous compositions are usually primed with any surface and painted with the water-cretaceous paints. These operations are performed in a mechanized way. The copper vitriolic composition in order to avoid deterioration mechanisms and in accordance with the safety requirements are applied only to primaries' manual brushes.

Depending on the requirements for the painted surface and the thoroughness of execution of work the primer is applied in one or several layers on dry and prepared surfaces. The foreman should monitor the quality of performance primers, as carelessly applied, without careful shading, it leaves the rough strips on the surface, and any good paint cannot improve that.

The high quality finished surface is subjected to continuous filling. It is produced only by primary coated surfaces, in this case, the connection from the filler penetrates into the thickness of the plaster, and as a result the layer of putty, adjacent to the plaster, almost completely loses its adhesive. After the painting

it causes the beats of the paint layer with the filler, in addition, the filler cannot be inflicted without a primer as a flat, smooth layer. The type and the composition of the used fillers should be appointed in relation to paints.

The filler is applied to the pre-cleaned from dust and other contamination surfaces by pneumatic or manual spraying guns made of wood, steel or rubber spatulas. The filling can be applied by special spatula to which the composition is applied under pressure. In this way a filling is inflicted and flatten at the same time. The filling for application by pneumatic spraying guns should be more liquid than for the application manually. The dried putty must be grinded. To improve the quality of painting works the sanders or pneumatic and electric machinery are used.

After the preparation and the drying the paints are inflicted on the surface. When choosing the colorful compositions firstly the type of material and operational conditions of painting should be considered. The primaries' brushes, rollers, the spray guns and the paint sprayers are used for covering by water and non-aqueous paints.

Any colorful compositions should be applied thinly. If at one time the painted surface cannot be hided completely, then it is better to paint again, as two or three thin coats are always stronger than one thick layer. The color quality dependents largely on the serviceability of tools and the quality of brushes and rollers. Therefore, the duty of the foreman is to monitor the correct operation of the instruments. The pneumatic cylinders are used for paint works. The roller painting of surface is called the non-brushes way. The universal pneumatic rollers are designed for putty, paint and glue stains. In the production of paint works and in acceptance of the painted surfaces a foreman must timely detect defects in paint, establish their causes and find the ways to eliminate the defects.

5.3 The painting with the water compositions

The manual for the water-based painting works adhere the advices and tips from Talbert 2008; Контроль качества строительных материалов и работ. Отделочные работы; Основные дефекты малярных работ и способы их устранения; The basic defects of painting works and ways of their elimination; Water Based Paint. The water-based paints form non-water-resistant, half-water-resistant and water-resistant coatings. The master must monitor the quality of water-based paints, which should be a homogeneous mass without lumps and have an approved color. In addition, the water-based paints must be carefully mixed before using and their strength must be tested. The paint works should be started only after primer drying. The paints are applied in two or three times by brushes, paint rollers, spray guns, sprayers, etc.

The glue paints. The ceilings in residential buildings are often painted by glue paints, as an example Fintex KM. A rubbed chalk paste is usually delivered on construction site, and the colored pastes are added on site, which are made from pigments and chalk, diluted with water to a dense state. The colored pastes are prepared in a quantity required for the painting of all rooms. Until using the pastes are stored in sealed containers. Before use, a synthetic glue is added in a required amount of color paste. The glue paints are applied twice on painted surfaces by brushes, rollers and spraying guns. The master must ensure that only after the full drying of the first paint layer a second layer will be applied. The master, controlling the quality of glue paints, has to promptly identify defects, to establish their causes and recommend ways to eliminate them. When stained by water compositions, including glue, many defects can be detected, their causes and elimination ways are given in Table 3.

Table 3 The defects in glue painting, their causes and elimination.

Defects	Causes	Elimination ways
Grease stains	stains from non-drying mineral and animal oils	To cut plaster in stain place, close up the place with lime mortar, priming and painting the entire surface
white crystal thin coating	soluble salts or alkali are	Dry and clean the white

	dropped out of plaster or concrete as a result of high humidity of the base	coating by brushes. Paint these places
Rough texture	The presence of coarse sand in the plaster, non-strained color or primer were applied	Washing, priming and painting by strained compositions
Splashes, drips	Application of liquid composition, slow motion during staining	Scrape and paint the entire surface again
Brush marks	Excessive density of paint	Wash the surface with a brush with water and carefully shade
Blanks	Negligence in work	Tint the surface and shade
Strips	Insufficient mixing of pigments in the paint	Wash with water and then paint the surface again with liquid paint
Change of the color tone	The using of non-resistant pigments	Wash the surface and apply the appropriate pigments in the paint

The lime paints are used for walls and ceilings on smooth plastered surfaces and precast concrete slabs, as an example Finngard Kalkkimaali and Holvi Tikkurila and Silikatfärg Teknos. The priming and painting lime compositions are prepared on construction sites. The surfaces are pre-saturated with water, lime water is better. In case of painting non-wetted surface on hot days or a large draft a colorful layer does not have the necessary strength due to the rapid evaporation of water. The lime compositions are applied to the painted surface by brushes or spray guns. The breaks while painting are allowed only after painting the entire room or bring color to the corner. Within a week after applying the lime colorful layer acquires the required strength.

The silicate paints are used for ceilings, plastered walls, leaf dry plaster, the walls are made of ceramic and silica bricks, as an example Kivitex Tikkurila. These paints form a long-lived layer that is durable, hygienic, washed with water and does not fade under the action of sunlight. The silicate paints are a suspension of alkali-resistant mineral pigments and fillers in a potassium silicate. To prevent premature interaction of potassium silicate with pigments and fillers, which makes the paints unfit, the paints are issued in separate package. The potassium silicate of density about 1,4 g/cm³ is in an iron container and the mixture of pigments and fillers is in paper bags. The silicate

paints on site are prepared in two stages: first potassium silicate is diluted in the water to a density of 1,15-1,2 g / cm³, then the pigments are mixed with diluted potassium silicate. The master must ensure that the made silicate paints are entirely used within 10-12 hours after preparing, since then they thicken. During the painting the following steps are performed: priming, the first painting, a second painting, or knurling of pattern. A surface is primed of vitriol or soap-adhesive composition with a brush or a spray gun, and then after 10-12 h the primed surface is painted with a paint roller or a brush. The silicate paints are applied in two layers or one if the pattern knurls. The second layer should be done in 10-12 hours after the first, and the pattern - 2 h after the staining. When painting with silicate composition the glass surfaces and the surfaces painted with oil paints must be protected from getting the paint. The tools and the utensils are thoroughly washed after using the silicate paints. The most common defects are formed on the surface, colored by silicate paint, their causes and remedies are given in Table 4.

Table 4 The defects in silicate painting, their causes and elimination.

Defects	Causes	Elimination ways
Spots on the painted surface	Uneven absorption capacity of the prepared surface	Before applying the second painting layer to prime the
Surface stains by chalk	Thick paint is heavily diluted with water	Prepare the paint of the required thickness

The casein paints are used for dry solid basis - the concrete and plastered surfaces; the formed layer is stronger than the layer of glue paints. Before the painting the surface is primed by copper vitriol or alumen primer. The casein paint formulations are prepared on site. They are applied to the surface by spray guns or brushes in two times. When painting ceilings and walls the paint is applied by transverse to the direction of the light movements of the brush, and shade by the longitudinal. The most common and characteristic defects formed on the surface, painted casein paints, their causes and elimination are given in Table 5.

Table 5 The defects in casein painting, their causes and elimination.

Defects	Causes	Elimination ways
The composition gives streaks or wrinkles	The composition are too diluted or there is a lot casein glue	To prepare a new painting composition with the right amount of glue
The coating surface has pockmarks	The paint composition is too thick, weak pressure, the sprayer is too removed from the painted surface	To prepare the paint composition of the right thickness, to adjust the pressure on the compressor, to bring a spray gun closer to the required distance
The paint surface is granular	The paint composition is filtered badly, the dust is remained on the surface	To skip the painting through a strainer, to clean the surface with compressed air or to remove the dust by a rag

The synthetic water-based paints are used for the concrete and primed surfaces, as an example Siloksan Teknos. These paints are diluted with water, they dry quickly, a formed layer is difficult inflammable, has a smooth matt, porous (breathable for air and water vapor). The master should make sure that before using the water-based paints are thoroughly mixed until a homogeneous composition. In winter time the frozen paint must thaw a few days in a room with a positive temperature. The steam, hot water and heaters have not to be used for accelerating thaw of paint. The master should check the thawed paint on the stability: a presence in it thickened particles and delamination. If the paint is not uniform in mass, it is experienced in the laboratory to determine its applicability. To make the work consistency of paint water is added in small portions, mixed thoroughly and its strength is tested. The surfaces are preliminary filled and then primed. The synthetic water-based paints are applied to clean dry surfaces in one or two times, the second layer is applied after the complete drying of the first one. The paint is applied first vertically and then horizontally.

5.4 The painting with the non-aqueous compositions

The manual for the non-aqueous painting works adhere the advices and recommendations from Talbert 2008; Контроль качества строительных материалов и работ. Отделочные работы; Основные дефекты малярных работ и способы их устранения; The basic defects of painting works and ways

of their elimination; Oil Based Paint. The non-aqueous compositions (oil, varnish and enamel) are painted in the plastered rooms: kitchens, bathrooms, and the solid color of the walls is unacceptable, since the natural ventilation of the premises is disturbed due to airtightness of paint layer.

The non-aqueous compositions are used only for the dry surfaces, covering them with a thin layer. The thickness of the paint layer should not be increased as the top of the thick layer dries out and forms a first membrane, and then the rest of the mass of the paint dries out. The uneven drying of the paint layer leads to the roughness, wrinkles and cracks. Therefore, the surfaces are painted over twice, allowing each layer to dry.

The oil paints are used to create the decorative surfaces and to protect the structures from moisture and corrosion, as an example Pinjasol Pro Tikkurila and Wintol Teknos. In the oil paints the binders are organic, compacted or modified linseed oil. The oil paints are diluted to a working density by linseed oil and are mixed thoroughly. The surfaces must be cleaned of dirt and dust and then coated with linseed oil. The oil paints are usually applied in two coats with an interval of a day, which is required for complete the drying of the first layer. During the last painting the walls should be shaded in a vertical direction, and ceilings - towards the window. The most common surface defects, painted with oil paints, their causes and elimination ways are given in Table 6.

Table 6 The defects in oil painting, their causes and elimination.

Defects	Causes	Elimination ways
Bubbles	painting on wet surfaces and contaminated surfaces	Scrape the paint bubbles, dry, prepare the surface for painting again
The paint layer does not dry for a long time	Applied retarding drying pigment, admixture of mineral oils	Shade with an addition of a drier
Drips	Liquid paint, insufficient shading	Clean with pumice or sandpaper and paint again
Brush marks	Applied too thick paint	Clean with pumice or sandpaper and paint again
Grid of cracks on painted surfaces	The painting made on the not dried layer of primer	Clean with pumice or sandpaper, coat with linseed oil and paint again
Spots of different colors	The emergence of various	Dry the surface of plaster

	oil and tar stains, not removed from the surface, painting on fresh plaster	or concrete, rinse, dry, prepare for painting and again paint
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Varnishes and enamels are used not only to increase the decorative of surfaces, but also to create the atmospheric and corrosion-resistant coatings, as an example Petsilakka Tikkurila is a varnish and Miranol alkydimaali Tikkurila is an enamel, Helo Teknnos is a varnish, Fintex Doortex 3 is an enamel . In the construction there are alkyd, pentaphthalic, glyptal, nitro glyptal enamels and nitro enamels. The covering of these enamels has a good appearance, durability and weather resistance. The drying time of enamel is not more than 1 day. The master controls the correctness and the execution sequence of all operations, the paint compositions as well as the condition of tools and equipment.

The protective paint coatings are applied in the following sequence: applying of primers, drying of primer layers, applying of fillers (if necessary), drying of filler layers, applying of paint, drying of paint layers, aging or thermal treatment of the coating. The acceptance of painting works is implement only after the complete drying of water-base paints and not early the formation of durable membrane on the surfaces, painted by non-aqueous compositions, when it is easy to detect all defects. The surfaces, painted by water compositions, should be shadeless, they should not have spots, stripes, splashes, bubbles, cracks, gaps, hairs from the brush or visible local corrections.

The surfaces, painted with the oil, enamel and varnish compositions, should have shadeless texture (glossy or matte); the translucence of the underlying layers of paint, stains, wrinkles, streaks, missings, visible pellet of paint, uneven due to poor polishing, and brush traces are not allowed. The found defects of the paining are removed.

5.5 The wall pasting by the rolled materials

One of the final finishing processes is the paperhanging. The guideline for the wallpaping was written based on On a roll... measuring, cutting and hanging

wallpaper and borders; How to Wallpaper; Контроль качества строительных материалов и работ. Отделочные работы. The wallpapers are the rolled materials most often on paper base, the front surface of which has a monochrome or color pattern. At present, there are a wide range of wallpapers. According to its purpose and operational characteristics wallpapers can be ordinary, washable (water resistant) and fleecy (sound absorbing). The wallpaper should fulfill the following requirements:

- have a strong base and a smooth uniform surface without any extraneous inclusions and blemishes;
- one-color primer on base must be smooth and tight and multi-color primer must have uniform color placement of color stains, have a strong paint layer;
- damages should not be on the basis;
- the wallpaper humidity should not exceed 6-8%

The thorough preparation of the wall surfaces precedes the paperhanging. A surface for wallpapering is well dried, aligned and cleaned from dust and other contaminants. The rough surfaces are carefully smoothed. The uneven surfaces of plaster or concrete are filled. The various pastes, synthetic adhesives, adhesive mastics, adhesive compositions based on the dry mixes are used for the wallpapering. The wallpapers are well glued when they are fairly soaked with paste. Before the pasting the soaked pieces of wallpaper are secondary plastered by paste. In order for the wallpaper to be pasted vertically on the prepared surface the control vertical lines are marked by plumb. The first vertical line is applied, measuring from a corner at the top of the wall a distance equal to the width of the wallpaper. The first piece is glued right on the marked vertical line and in the direction away from a window deep into a room. During the pasting the piece of wallpaper is applied to the top to the wall and then smoothed with a brush from the middle to the edges, squeezing out air under the wallpaper.

Well smoothed wallpapers should not have wrinkles, inflations, folds or raised edges. It is recommended to roll the edges by rubber roller. The following piece is glued in the same way, making sure that the patterns are coincided in the

junctions. The wallpaper surplus at the eaves, baseboards, doorways, the slopes of windows and at other places are cut immediately after the pasting until it is not dry. After the pasting the walls become a little dry, and then the borders and friezes are glued. The ceiling surfaces should be smooth and even, without grease and rust stains. Before the papering of the ceilings the hidden wiring should be made. The surface preparation is as follows: the surface is cleaned of dirt, the bumps are eliminated, the joints of the ceiling to the walls are filled and polished. For the papering of the ceilings the wallpapers with light colors and with patterns that do not require a fitting are chosen. The wallpaper background should be uniform, without spots or stripes. The paint layer must be strong, and the wallpaper edges must be straight. The ceilings are pasted before pasting the walls. Before the paperhanging the ceilings and the tops of the walls are primed.

First the glue composition is applied evenly without gaps and streaks to the ceiling. Then the glue is applied to the perimeter of walls at 10 cm. The wallpapers are daubed, kept for soaking and pasted to the ceiling, covering a corner and the upper part of the walls. The paperhanging on the ceilings is begun from window to door, parallel to the short side with the overlap. The overlap should be facing toward the light. The glued sheets are smoothed by brush from the middle to the edges. The wallpapered ceilings till the complete drying are protected from the direct sunlight and the drafts. During the drying of wallpapers the room temperature should be constant and no higher than 23 ° C, and the windows in the rooms should be closed. In this mode of drying the wallpapers, glued to the ceiling, are dried for 1-2 days and the high quality of work will be provided.

The quality of the wallpapering works must satisfy the following requirements:

- pieces of the roll finishing materials and the wallpapers must have the same color and shade;
- the wallpaper pieces should be vertical;
- the fitting of the wallpaper edges should be accurate, without the gaps between the sheets and without the distorting of the picture;
- the wallpaper joints should be performed in overlap, the top edge of the

wallpaper in the junction should be converted to the light (toward the window);

- the junction of the wallpaper sheets should not be noticeable in the end-to-end pasting ;
- not allowed spots, paste pollute, changes of color and shade of the wallpapers, folds, wrinkles, inflations, uneven cut edges of the wallpapers near the boards, non-pasted places.

All the wallpapering works have to be performed by professionals with high quality materials and in accordance with the production technology as well as the painting works.

6 SUMMARY

In this thesis I have made several comparisons for the paints and varnishes and wallpapers produced by the biggest manufacturers in Finland. These finishing materials were compared by cost, environmental safety, usability, resistance, etc, by the most important for repair works characteristics. The different quality classes were taken into account. The quality class influences on the implementation time, the appearance of the surfaces and the most important on the cost of repair. The less time is spent on work, the faster the money will be refunded. Since all compared materials have almost equal characteristics, the clients and the contractors should make a choice based on price.

The Finnish quality organization, controlled by The RYL Code of Building Practice, is not understandable for the clients, even the coding system is too complicated. The quality manuals for finishing works were made in the second part of the diploma. There are several ways to reduce the cost of repairs, but the quality of materials and the skills of the workers absolutely cannot be reduced. In both cases, the proverb is actual "A miser pays twice", and a nice savings could result in the need to redo repairs. The competent repair ultimately leads to savings. The using of the quality materials and modern technology reduces the work time, allowing to dispense several years with intermediate cosmetic repairs. So the contractors should just lead the quality control guidelines and the clients should monitor the result.

For small contractors, who are forced to survive in the market among the larger competitors, each customer is important. What can attract customers better than reducing the cost of repairs? The small contractors need to find a reasonable compromise between the price and the performance of building materials, as well as the repair time. My diploma may be useful for the beginning small repair companies in the selection of the finishing materials and carrying out repairs. But, in my opinion, each contractor must have the professionals who know the market of construction materials and skilled production technology of repair works, or access to the specialist-consultants on such matters.

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