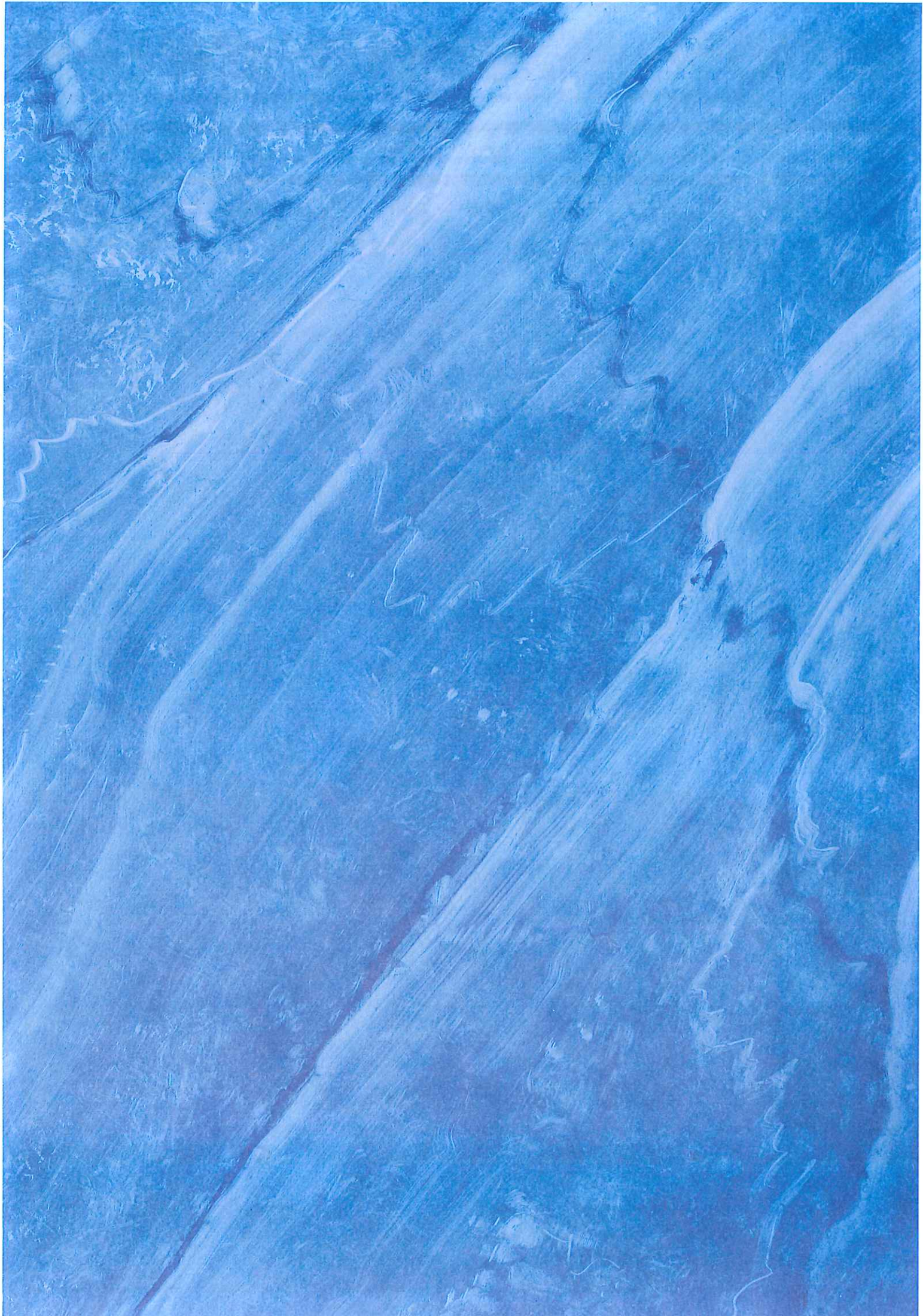




Technical instructions

# Painting buildings



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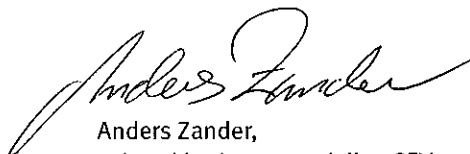
## Foreword

*Technical instructions for painting buildings* is a compilation of texts put together based on experience of painting work, planning and management within the National Property Board (SFV). When working on buildings of high cultural and historical value, it is of the utmost importance that these are approached individually as befits their specific circumstances. It therefore goes without saying that those planning and carrying out the work must have in-depth knowledge of paints, their composition and their use – both in terms of the situation today and the historical perspective.

It has long been felt that there is a need for an updated repository of knowledge and experience in the field of interior and exterior painting. As the client, it is SFV's ambition to help build up expertise and set clearer criteria for consultants and contractors. This publication is a key element of that work. *Technical instructions for painting buildings* replaces the previous publication *Beskrivningsnytt* (New Descriptions), last issued in 1992 by the Swedish National Board of Public Buildings.

This publication is aimed at SFV's staff and those who work in planning, procurement, production and management on behalf of SFV. The aim is to ensure a high level of quality in the painting work carried out under the auspices of SFV. The ambition is also to improve knowledge of interior and exterior painting and make it simpler for managers and orderers to submit clear instructions to consultants and contractors with regard to all painting work carried out on the portfolio of buildings that SFV manages.

The text includes information on new painting and repainting, on the interior and exterior. The specialist knowledge underpinning the text was drawn up by painting consultants Michael Brant-sjö and Börje Larsson. The material was then reviewed by building conservator Vicki Wenander, who also added more detail to the section on traditional Swedish painting. The undersigned acted as project manager, while the reference group comprised palace architects Andreas Heymowski and Björn Norman, property manager Lars-Göran Löfström (SFV), architect to the Royal Palace Berit Edling, painter Björn Höglund and painting consultant Per Karneke of industry body Färgindustrierna. Valuable contributions have also been made by cultural heritage specialist Hélène Hanes (SFV), environmental specialists Maria Koskull and Anna Åström (SFV), and procurement officer Bengt Nilsson (SFV).



Anders Zander,  
cultural heritage specialist, SFV

Painting buildings of high cultural value demands knowledge and sensitivity from all those involved in the conservation and maintenance process – from orderers and managers to officials and workers. The photo is an interior view from Tullgarn Palace.

## Paints and painting in the Swedish building tradition

Painting has always had two functions: to decorate a building or a room and to prolong its life by creating durable and lasting surfaces. The balance between the aesthetic intentions – the desire for decoration – and the practical benefit – protecting and preserving – has varied from case to case,

moving along a sliding scale that takes account of several different factors.

One of the most significant factors is the use that the building and the specific room will be put to. In many public buildings, and indeed private reception rooms, the aesthetic has generally taken centre stage, while the focus in service buildings and wetrooms has been on the practical and the functional. However, only occasionally have the practical considerations entirely taken a back seat in the reception rooms or the aesthetic ambitions been set aside in the wetrooms.

When it comes to exterior painting, the effects of the climate have also had a major impact on the choice of paint treatment and the kind of paint, but there are buildings where the aesthetic vision has trumped the practical needs. In such cases, property owners generally accept that regular maintenance will be required in order to uphold their aesthetic vision.

Of course, the taste and preferences of the owner, and their finances, have also governed the choice of paint finish and look. Sometimes, the choice of paint treatment and the desire to convey the importance and dignity of a façade or a room have weighed so heavily that all other factors have been ignored.

Exterior painted surfaces are generally subject to relatively hard wear. Some materials and architectural features age gracefully, while others need to be kept in tip-top condition to live up to the intentions of the architect and the owner.

Rooms that have not been repainted for a long time are invaluable historical spaces. They show, for instance, the aesthetic ideals and painting crafts of old, as well as the financial status of the owner.







There are other factors that have had a crucial impact on the finished result. These include the materials and pigments that were available at the time, as well as the dexterity and experience of the person doing the painting.

All the factors mentioned above have a historical significance and must therefore be considered when choosing methods and techniques for restoring and maintaining painted surfaces in buildings managed by the National Property Board.

### **The history of paints**

For a long time, Sweden had access to just a few types of paint and a limited number of pigments for painting work. Up until the 16th century, limewash, whitewash, distemper and, in rare cases, linseed paint were practically the only options. Sometimes, these types of paint were mixed with each other, creating emulsion paint for example. These are the paints that we find in the earliest church buildings across Sweden, and in our oldest secular buildings.

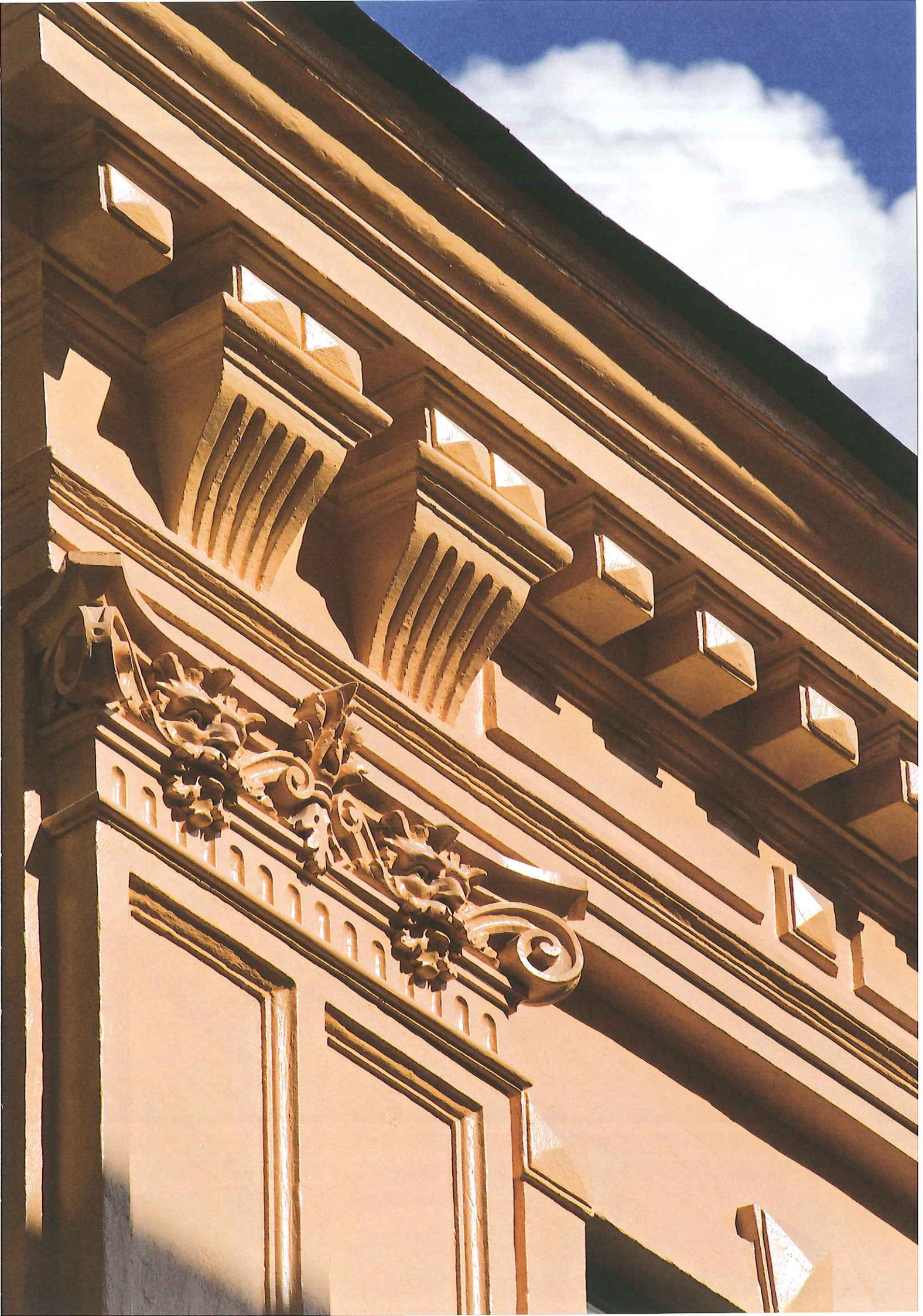
Red distemper was used in the 17th century in Swedish towns to give the buildings the look of German and Dutch Renaissance architecture in brick, which was the height of fashion at the time. Later, towards the end of the 19th century, red distemper also became increasingly common on the rural houses of country folk.

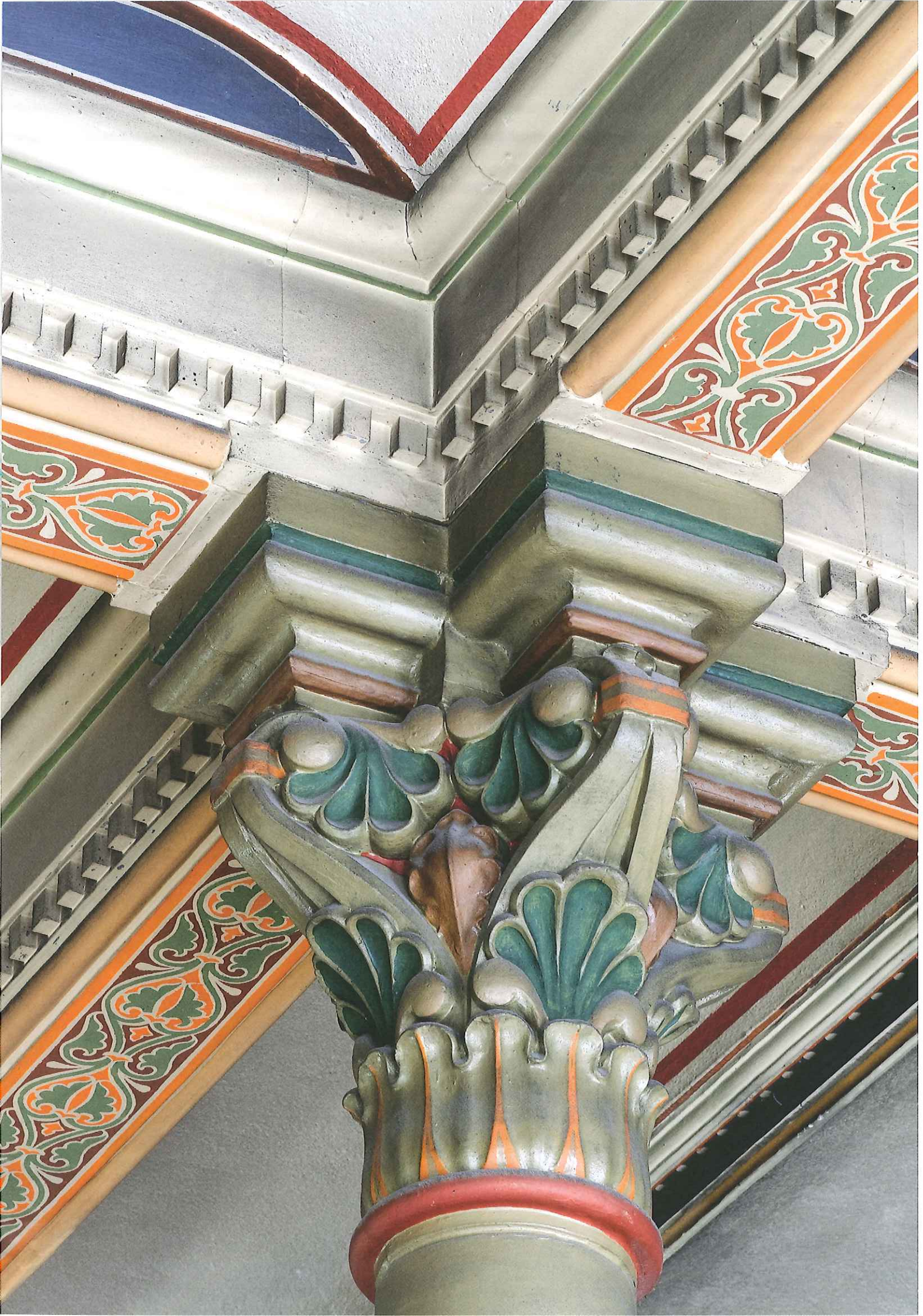
Externally, the most common paints for a long time were limewash on render and distemper on wood, but gradually linseed paint also came into use on high-status buildings. Linseed paint became increasingly common as a façade paint on town houses and later, in fact around the turn of the 20th century, also on detached villas and other houses.

Linseed paint also became more and more common indoors. In the 19th century, the general approach was to use limewash and whitewash on plastered surfaces and linseed paint on woodwork, although deviations from this principle were relatively frequent.

When the owner's finances limited the choice of building materials, paint was often used to create the illusion of the material that was actually wanted. In this case, plasterwork painted with linseed paints creates the feel of natural stone.







On surfaces that suffered most wear the preference was for linseed paint on all types of substrate, but in areas of low wear or where there was a limited budget, whitewash was chosen, even on wood. In the case of really severe wear or a desire for a high gloss finish, enamel paint was used for the final coat. The enamel paint was produced by adding resins such as copal to the oil paint.

With the advent of industrialisation in the 19th century, the number of pigments rose dramatically, and new binders were also developed into the 20th century. This initially affected interior painting, but gradually exterior painting also started changing. The interwar period saw the introduction of synthetic enamels, based on alkyds. These gradually replaced the resin-based enamels. The chemicals industry now presented a whole host of new products and the shortage of linseed oil during both World Wars hastened the development of paints based on other binders. Several of the new binders came from the defence or petroleum industries. These included cellulose, which was introduced after the First World War, styrene-butadiene latex (SBL), acrylate and polyvinyl acetate, all of which appeared after the Second World War. The new binders brought about a large number of new paints, which producers gave new product names such as Ripolin, Rivalin, Credolin, Kåbecit, Bindol, Spred, Faxol, Torcomatt, Betonit, Bell and Solofärg. Many of the products and some of the binders were only used for a short period, while others are still made and sold today. Note, however, that the content and properties of a paint product that has been on sale for a long time may have changed, even though the product name is the same.

Interest in older paint types such as linseed paint, limewash and whitewash, and in emulsion

The large number of new pigments developed in the 19th century were reflected in contemporary architecture. Thanks to the new pigments, colour schemes became bolder and more playful, like here in the Old National Archives in Stockholm.



Interest in older painting materials and techniques grew in the late 20th century. To bridge the knowledge gap, painters with long experience have been encouraged to pass on their expertise to their younger colleagues. Now, once more, there are a number of skilled painters around who are familiar with materials such as limewash and linseed paint. Here we see painter Björn Höglund at work.

paints based on these binders, saw a resurgence in the late 20th century, after they had all but disappeared from use. Initially, building conservators had to blend these paints themselves, but now they can once again be bought ready-made from paint producers and suppliers.



In the mid-20th century, painters used a large number of tools to produce the variety of finishes required. Traditional tools such as the flat brush, the round paint brush and the flogger were used alongside new inventions like the spray gun and the roller.

#### **Tools and equipment**

In order to produce the required finishes, the painter had a large number of brushes of various shapes and with various bristles at his disposal. Up until the mid-20th century, practically all paint was applied using different kinds of brushes. Tools such as sponges, combs and specialist brushes were also used.

The paint spray gun was introduced in the 1920s. Paint could now be sprayed on walls and ceilings, but since the process of cleaning the spray gun was extremely laborious, spraying came to be used quite sparingly, particularly indoors. It took until the mid-1950s for spray painting to be commonplace on interiors, and then it was mainly for the application of screeds and multipurpose lacquers, which could only be applied using a spray gun.

It was during the Second World War that the concept of the roller was first introduced to Swedish painters and decorators, in the trade magazine *Målaren*, but a Swedish patent for this 'new device for painting' was actually taken out in 1939. To start with, painting with a roller was seen as a kind of cheating, but by the 1960s the

roller had become widely accepted. The reason for this was that when Alfort & Cronholm (now Alcro) launched its latex paint Bell (for interior use) in 1954, it recommended that the paint be applied by roller.

The roller has since taken on an increasingly prominent role in the painting profession and the number of different brushes has been cut down to just a few. However, as interest in older paints revived in the late 20th century, so did interest in traditional application techniques, and demand for a wider range of brushes returned.

#### **The financial factor**

Up until the late 19th century, paint was an extremely expensive product, in contrast to labour costs, and therefore acted as a mark of status. For a long time, interior paintwork was reserved for the most well-heeled in society and in many buildings only specially selected surfaces or rooms were painted.

The choice of application tool has a major impact on the end result. Getting a glazed finish like this requires a steady hand, the right tools and the expertise to use them.





It was common for less important areas to be left wholly unpainted. In the 19th century, more and more people were able to afford paint, but even into the 20th century, the price of paints influenced where and how we painted.

With exterior painting too, the finances of the owner and the price of the components that make up the paint determined how much of the exterior was painted and what type of paint was used. Larger surfaces were generally painted using low-cost paints, coloured with cheap pigments, while smaller areas were painted with more expensive products. For a long time, wooden façades were therefore painted using distemper, while windows, doors and architecturally prominent features were painted using linseed paint, sometimes coloured with extremely expensive pigments. For financial reasons, it was also not unusual only to paint the façade or façades that faced the street or the road, and that a more expensive paint was used on the street-side, with a cheaper paint applied to the other sides of the building.

Oil-based paints have always been more expensive than paints based on other binders. For a long time pigments also varied in price, in part depending on what raw material they were made from. Earth pigments such as umbers and ochres were relatively cheap, while malachite green and ultramarine blue, produced by grinding semiprecious stones, were exceedingly expensive. During the 19th century, a large number of new and cheaper pigments were invented in increasingly bold colours. Many of them, such as chrome green and cadmium yellow, were based on heavy metals. The 20th century saw the development of new ways to pigment paint, which is why the price of paint is much less affected by the choice of colour nowadays.

The selection of dry pigments expanded dramatically in the 19th century due to the growth of the chemicals industry. The colours concerned were mainly blues and greens, but bold reds and yellows also appeared.



The different pigments have their own properties, which is why two pigments of a similar colour can produce very different results. A pigment that works really well in linseed paint may, for example, be entirely unsuitable for a limewash. The dry pigments pictured are stored at Stockholm's Måleriyrkets Museum, a museum of the painting profession.



A surface painted with the best products by the most skilled painters can last for several hundred years. Pictured is an exquisite example of paint craftsmanship from the 1760s that still looks magnificent.

Another financial factor that had an enduring effect on the choice of paint was the local availability of raw materials. Property owners of limited means tended to choose paints based on local materials. One example of this is the way that in regions with local lime kilns, interior plaster was painted with limewash, while in other regions the same surfaces would be whitewashed.

### **Attitudes to the painted surface**

The desire to decorate and change the look of a building or room has probably existed for as long as mankind has been building houses. Paint has been one way to achieve this desire, but fashions have changed over time.

Since at least the 16th century, paint has been used to make surfaces and materials look rather more exclusive than they actually are. Examples of this include pine woodwork being painted to look like oak, walnut or mahogany, and plaster being painted to look like marble, granite or limestone. Façades have been painted in colours reminiscent of marble, travertine or sandstone and interior walls and ceilings have been decorated with paint to give the effect of wallpaper, tapestries or drapery. There are also examples of entire landscapes and other scenery being painted directly onto walls and ceilings.

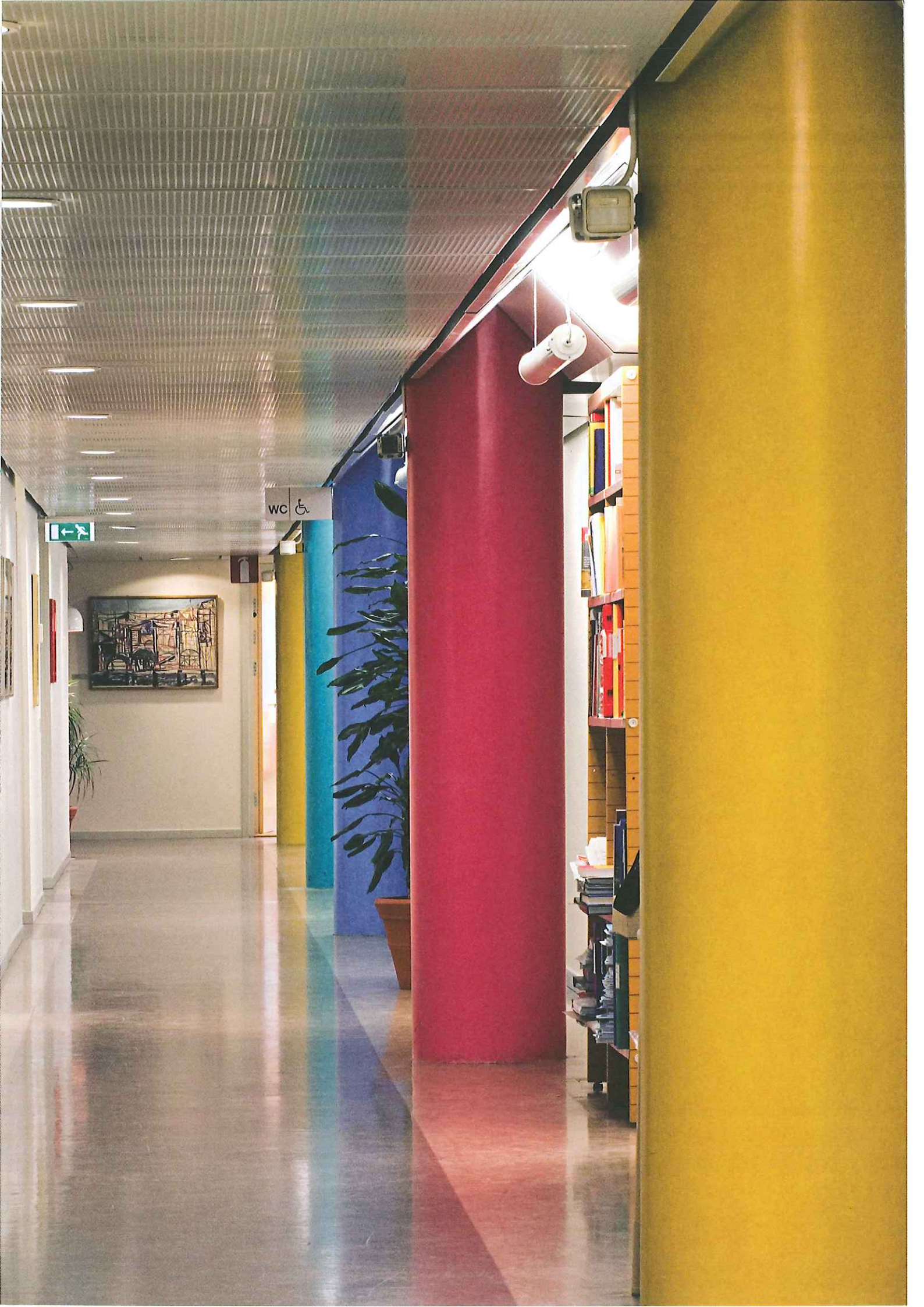
During the explosion of palace building during Sweden's Age of Greatness and the construction of the Royal Palace in Stockholm during the first half of the 18th century, foreign craftsmen and artists were drafted in – specialists whose expertise in decorative painting was disseminated more widely through local craftsmen working on the major palace projects. Through their involvement in other construction projects, this expertise was gradually passed on to more and more of their professional colleagues across the country.

The woodgrain and marbling effects of the 17th and 18th centuries had the character of *trompe l'œil* painting, which gave great artistic licence to design small details and whole decors.

During the 18th century, both wood and lime plaster could be transformed into exclusive Carrara marble with the help of a skilled painter.







wc ♿

EXIT



The second half of the 19th century marked the arrival of new synthetic pigments, offering colours that had previously been too expensive for most people. Synthetic ultramarine allowed relatively large areas to be painted blue without breaking the bank.

By the mid-19th century, woodgrain and marbling techniques were able to exactly mimic different kinds of wood and stone. To achieve this, craftsmen used a number of different painting techniques, including glazing, woodgraining, combing, sponging, flicking, stencilling and marbling. If the newly painted surface was required to look old, the painting process ended with a patination or antiquing effect.

Up until the end of the 19th century, paint was often applied directly onto the substrate, so that it could be made out under the finished layer of paint. However, with the beginning of industrial-

sation, attitudes to the painted surface changed. Now it had to be completely smooth. To achieve this, the substrate was first filled with linseed putty, also known as painter's putty, before the surface was painted. Painting from the late 19th century, particularly on interiors, is often considered to be more 'perfect' than painting based on 18th century ideals regarding the craft.

With the advent of Functionalism in the 1930s, attitudes to the painted surface changed once again. The painted surface was no longer required to mimic more exclusive materials, but instead was given value in its own right. Paint was now seen as a material that made its own architectural statement. This way of looking at paint has informed the use of the painted surface since the second half of the 20th century. However, during the last decades of that century, interest in traditional painting techniques increased, prompting a renaissance for stencilling, sponging, marbling, glazing and woodgraining.

Since the second half of the 20th century, paints have been used to add colour to a surface, rather than to create an illusion of some other, more exclusive material, as was often done in the past. The pillars in this photo were painted in glazed latex paint in the 1980s.

### History of the paint industry

Up until the end of the 19th century, Swedish master painters had all the paints they needed made up in their workshop, with the help of their apprentices. There were no factories making paints at the time, but the dawning of industrialisation would change all that.

In the 1860s, Carl Wilhelm Becker started manufacturing paint to sell and in 1874 he opened his

first paint factory. Around the same time, ready-mixed paint started being imported, primarily from Germany. Initially the factory-made paints were only enamels, but gradually more and more paints came to be made at factories and the paint industry gained an ever firmer grip on paint production. However, painters continued to blend many of their own paints long into the 20th century. The more paint types that were developed and the more widely advertised they were, the more paints professional painters started buying from factories. The changing production techniques also made it no longer financially viable for the master painter to produce his own paints.

The early 1960s saw the introduction to Sweden of paint mixing machines using the Tintorama system, which meant that paint shops could easily mix up the required colour, although only within a limited colour palette.

The increased interest in traditional painting that started in the late 20th century has also prompted painters to re-examine the art of blending your own paints. Although practically all paints are now purchased via paint manufacturers and suppliers, many painters involved in the restoration sector still possess the expertise to mix and modify their own paints.

A couple of decades into the 20th century, the range of new painting products and factory-made paints rose dramatically. Previously, painters had made up practically all the paints themselves, but now industry started taking over that task. The paint tins pictured are held by Stockholm's Måleriyrkets Museum, a museum of the painting profession.

Latex paints were introduced to the Swedish market in the early 1950s. The first latex paints (SBL) came from the USA and were manufactured under licence by Swedish companies such as Beckers and Alfort & Cronholm.



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### The role of the painter

Even into the 20th century, the master painter held complete control over the painting process – from being involved in designing the architecture of the buildings or rooms and producing the paints required to being responsible for the actual application work. All these elements were therefore included in the training of a master painter.

However, with the arrival of industrialisation, these tasks were gradually divided up, with the architect taking on increasing responsibility for the design of the rooms, and the paint industry taking over production of the paints. The task that remained for the painter was to apply the specified paint to the specified surface.

Today, most painting projects are subject to the principles of industrialisation, with the planning carried out separately to the actual application, but in certain specific restoration projects, the work follows a pre-industrial format. In this case, the planning and application are generally carried out in parallel, with decisions on material choices and finishes decided by a team of people, usually comprising the painter, a paint consultant, a restorer, an architect, a conservation expert and a manager/orderer.

### Descriptive tools

As a result of the craft of painting being divided up between designers, paint manufacturers and the actual painters, the need arose to describe and standardise both colours and paint treatments.

During restoration and maintenance of historically valuable buildings, the painter has a critical role in the end result. The person carrying out the work must, of course, be able to master the necessary painting techniques, but they must also know which architectural look is required and which painting materials are suitable for the particular project. Master painter Lennart Tjernberg has been in the business since the late 1950s, and is pictured here carrying out some 18th-century marbling.



Around the turn of the 20th century, the master painter and his colleagues bore considerable responsibility for the final appearance of the buildings. Practically all surfaces were painted and it was common for the master painter to be the person who suggested the colour scheme, and what kind of decoration should be applied.

1938 saw the presentation of colour samples under the name *Hesselgren-Sjögrens Färgprover*. Architect Sven Hesselgren then continued to refine the colour system and 1952 saw the publication of *Hesselgrens Färgatlas*, a 'colour atlas' based on the natural colour system. Since many of the colours in the colour atlas were difficult to mix, the trade and employers' association for Swedish painting contractors, *Målaremästarnas Riksförning* (*Målaremästarna*), drew up its own colour charts that better met their needs. Three different versions of the colour charts were printed in the 1960s and 1970s. The late 1970s marked the introduction of the NCS system, which was made the Swedish standard for colour designation in 1979.

In the early 1920s, Målaremästarna drew up its 'Standard provisions for different paint treatments'. This came out of a realisation that the specifications of requirements submitted to its own members were too unclear, which made it impossible to compare quotations. The aim of the standard provisions was to make the quotations easier to weigh up against each other.

The standard provisions contained the most common paint treatments, described in simple text and given a unique numerical designation. The idea was that the client could use the numbers and the tenderer could check these off against the descriptions.

The standard provisions were the precursor to the current system of paint treatments currently outlined in HusAMA, a compendium of technical task descriptions that was first published in the early 1950s. In this, paint treatments have been divided up into different jobs, which in turn have been given a numerical designation. Describing

a complete paint treatment in line with HusAMA requires a specifically composed combination of numbers, where each number represents a particular task. This makes HusAMA's description system more flexible than the standard provisions, but also more difficult to work out if you are not familiar with the way the system works.

Today, the NCS system and HusAMA are used for most projects, but their older predecessor may sometimes be useful as a knowledge base in conjunction with restoration and maintenance, if its description tools were used for earlier work.

As paints increasingly became manufactured by paint producers during the 20th century, instead of by the master painters, the need arose for sample cards to show the products' standard colours. Here is a sample card for the enamel paint Ripolin, one of the very best but also most expensive paint products of the early 20th century.





### The NCS colour system

NCS, The Natural Color System®©, arose out of Sven Hesselgren and Tryggve Johansson's paint theory, which itself was based on German physiologist Ewald Hering's theories from the late 19th century. Today's NCS system was developed by colour researcher Anders Hård, who completed Hesselgren and Johansson's pioneering work.

NCS describes colours as we really see them. The system is therefore easy to understand and easy to use in gauging and describing the colour of a surface.

NCS is based on the six elementary colours black, white, yellow, red, blue and green, and how they relate to each other. The NCS system has a broad spectrum, and all the colours that the human eye can normally make out, which is around 10 million variations, can be placed within the system.

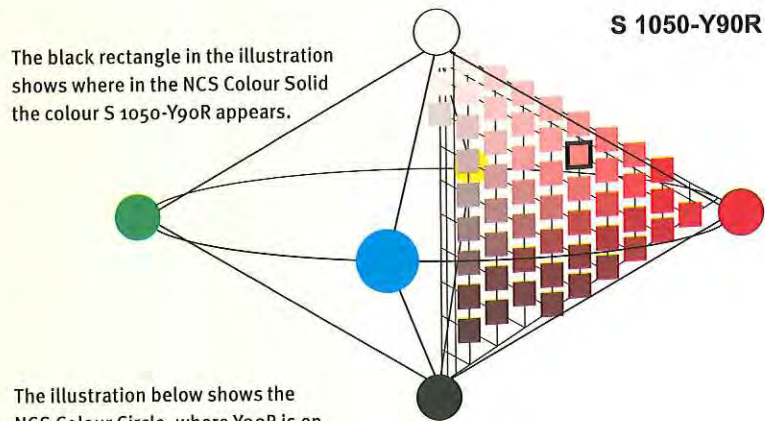
The colour designations in NCS describe both the nuance and the hue of the colour. The colour's nuance comprises three factors: darkness, colour intensity and whiteness. In a designation such as NCS S 3555-R60B, the first pair of digits (35) states the amount of black in the colour, in this case 35%. The next pair of digits (55) gives the colour intensity, in this case 55%. The remaining 10% is the proportion of white in the colour, but this is not included in the designation since whiteness is always the remaining percentage that makes up 100%. (100% minus 35% and 55% = 10%). The final section of the NCS code gives the hue. R60B means that the colour described is

40% red (R) and 60% blue (B). The letter Y is used for yellow and G for green. Pure grey colours have no hue and so the nuance designation is followed by an N for neutral, e.g. NCS S 2000-N.

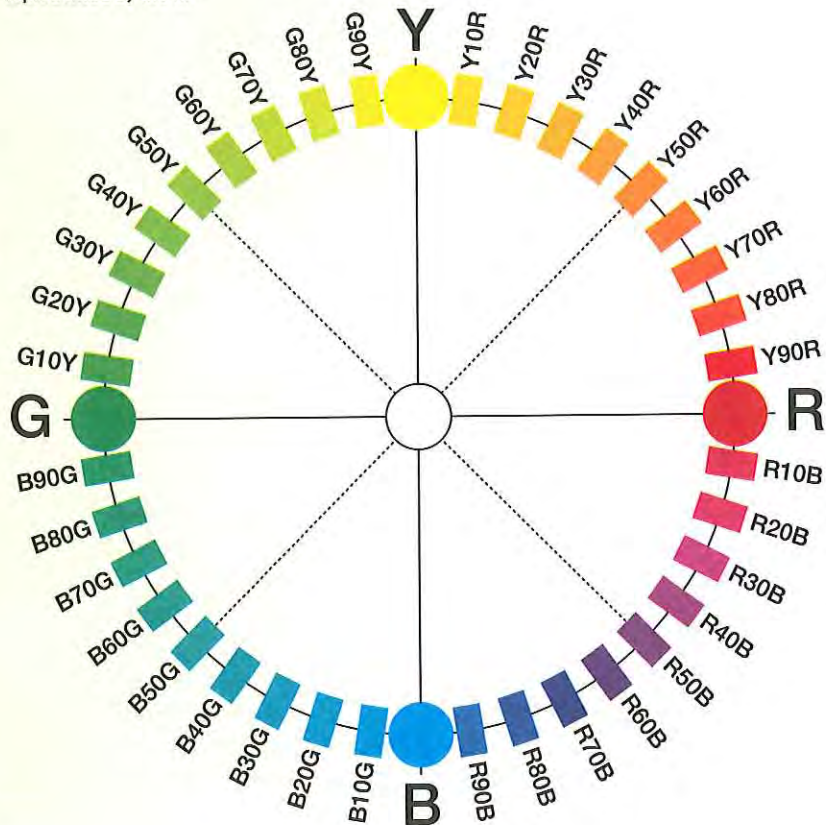
A common colour when painting white walls and woodwork is S 0502-Y, which is 5% black and 2% colour intensity with yellow. Another way of describing a colour that is not absolute white is to use

a colour name, such as Stockholm white, China white, off-white and so on. However, these names do not describe an exact and standardised colour, in contrast to the designation NCS S 0502-Y.

The NCS system is illustrated on printed sheets, but also in the form of an electronic measurement instrument called the NCS Colour Scan. Both these tools can be used to measure the colours of existing painted surfaces.

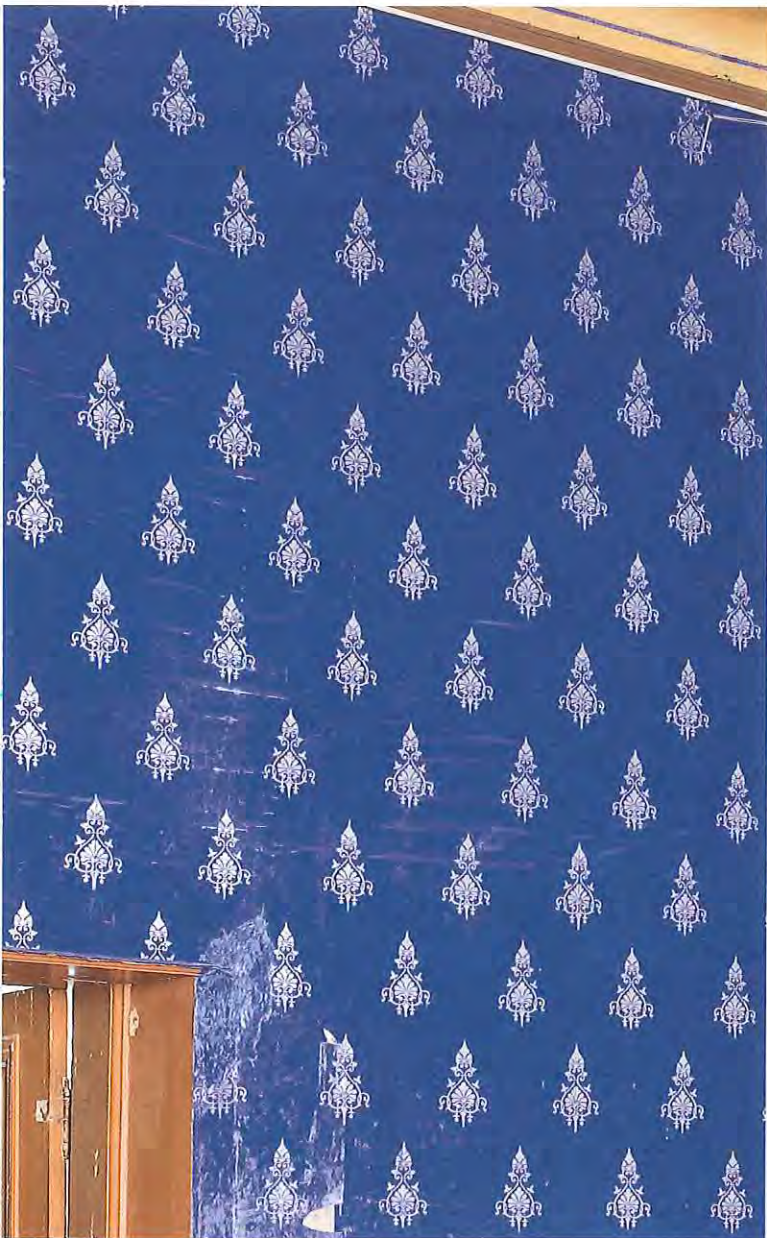


The illustration below shows the NCS Colour Circle, where Y90R is on the far right, just above the pure red represented by the R.



NCS – Natural Color System®© is the property of Skandinaviska Färginstitutet AB, Stockholm 2010.

References to NCS®© in this publication have been approved by Skandinaviska Färginstitutet AB.



### Health and the environment

Over the years, several paint ingredients have been used that pose varying degrees of danger to health and the environment. Often these ingredients have subsequently been banned and replaced with other substances.

During the 19th century, the pigments Scheele's green and Schweinfurt green were extremely popular for painting walls, and also for producing wallpapers. However, the pigments contained arsenic and were banned in 1876. Several other pigments have also proven to be toxic to humans and the environment. Common to them all is the use of heavy metals such as lead, chromium, cadmium and mercury. The pigments include white

lead, litharge, red lead, chrome green, chrome yellow, cadmium red, cadmium yellow, aniline and vermilion.

The use of white lead for interior painting was banned during the second half of the 19th century, while a ban on the use of lead pigments for exterior painting came much later, when more general environmental issues started being raised. The ban, implemented in an EU directive, only came into force in the 1990s. However, under Regulation (EC) No 1907/2006 (REACH), EU Member States may allow the use of white lead for the restoration and maintenance of artworks and historical buildings and their interiors. Exemption from the ban on the use of white lead must be applied for from the Swedish Chemicals Agency. Any application involves verification of the historical value of the object to be painted. A permit is not, however, required when using red lead for professional purposes.

Oil paints such as linseed paint and alkyd oil paints have traditionally been diluted with turpentine or white spirit. The raw material for turpentine comes from the plant kingdom, while white spirit is a petroleum-based product. Both are hazardous to health. Long-term use of white spirit can cause brain damage, while turpentine provokes allergic reactions and can cause eczema.

Balsam turpentine and other terpenes were the most common solvent in linseed paints long into the 20th century, but when alkyd oil paints were widely introduced in the mid-20th century, white spirit started being used instead. Gradually, the turpentine in linseed paints was therefore also replaced by white spirit.

Old wallpapers and layers of paint that contain arsenic are generally green in colour, but there are also paint products in other colours that contain arsenic. The blue wallpaper on the left and the green wallpaper on the right are both from the 19th century and both contain arsenic.





Using a fresh air respirator protects the painter against dangerous solvents in the paint. Here Stefan Johansson is painting the ceiling in the Hall of State at the Royal Palace with linseed paint containing volatile organic compounds.

The allergy-causing properties of turpentine have long been known by professional painters, which is why they were quick to protect themselves against direct contact. The hazards of white spirit were less well known, but it was realised in the 1960s that the solvent had a devastating effect on health, giving many painters serious problems with memory and balance.

To tackle the major problems that white spirit causes in the working environment, painters' unions and employers have pushed for the production of solvent-based paints to be phased out. 1987 saw the introduction of a ban on the use of organic solvents when painting interior walls and ceilings. In order to continue using linseed paint for interior painting in historically important buildings, a three-party agreement was struck between trade association Målaremästarna, the Swedish Painters' Union and the National Heritage

Board. Under the agreement, which was revised in the late 1990s when alkyd-based wood paints were also banned for interior use, linseed paints are permitted in buildings of particular cultural and historical value. However, the particular value and the importance of using such a material have to be documented.

To cut the use of volatile organic compounds (VOCs), Sweden has set legal limits for such substances in paints and other products. VOC-containing products must therefore be labelled with the product category and the amount of VOCs in grams/litre. The following limits for solvent-based paints were introduced in 2010: matt interior wall and ceiling paints – 30 grams per litre; gloss interior wall and ceiling paints – 100 grams per litre; rendered exterior surfaces – 430 grams per litre; paint on interior and exterior wood, metal and plastic – 300 grams per litre; varnishes and glazes on interior and exterior wood, metal and plastic – 400 grams per litre; thin layers of glaze, oil and stain, interior and exterior – 700 grams per litre; sealing primers, interior and exterior – 350 grams

per litre. For water-based paints, the limits are the same or even lower.

This means that it can be difficult to use certain types of paint, such as solvent-based linseed or alkyd paints, particularly when painting interiors. However, according to section 13 of Swedish Chemicals Agency Regulation KIFS 2005:9, it is possible, in individual cases, for the agency to give special dispensation from the rules on limits when restoring and maintaining buildings that are judged to have special historical and cultural value.

The types of paint currently used in conventional painting work also have negative impacts on both the working environment and the wider environment, but the effects and scope are not yet fully understood.

When making an environmental impact assessment of paint products, it can also be difficult to

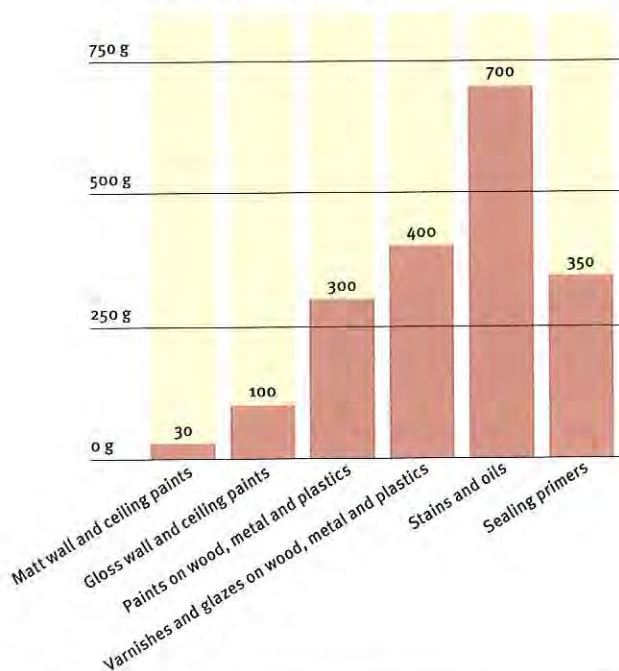
gain a complete picture, since not all the components need to be listed in the material safety data sheet. According to an EU regulation, products classified as hazardous must have any extremely hazardous ingredients listed, if they exceed 0.1% of the product's content, while hazardous ingredients must be stated only if they account for at least 1.0%. A paint product may therefore contain considerably more components than those listed in its material safety data sheet.

One known negative effect is that water-soluble paints, in contrast to oil-based paints, must have preservatives added in order to allow their storage. Some of these preservatives cause allergic reactions.

Another group of environmental toxins that used to be used in several of our modern paints is perfluorooctane sulphonates (PFOS). These belong to a group of organic compounds that affect reproduction in mammals. PFOS chemicals are not broken down in nature, either chemically or biologically, which is why they were banned in 2008.

Another chemical that affects reproduction is nonylphenol, which also used to be used in water-soluble paints. However, following pressure from the environmental lobby, the paint industry has now removed nonylphenol from paints.

**Limits for volatile organic compounds (VOCs) in solvent-based paints (grams per litre of paint)**



# Properties and use of the paints

Paints are made up of binders, pigments and solvents plus any other additives, such as driers (siccatives), preservatives, fillers, thickeners and mould inhibitors.

## Basic paint chemistry

The binder is the component that holds together the paint and fixes it to the substrate. As such, the binder has an extremely important function and most types of paint are named according to the binder used. The pigment gives the paint its colour and opacity, while the solvent keeps the binder fluid and/or thins paints to the required consistency. Solvents include balsam turpentine, white spirit and aliphatic naphtha, but ordinary water also acts as a solvent in many types of paint.

Different types of paint dry differently, depending on the binder. Oil-based paints such as linseed and alkyd oil paints dry by the oil oxidising, i.e. taking up oxygen atoms from the surrounding air. Solvent-based and water-soluble paints such as limewash and latex paint dry by the solvent/water in the paint evaporating. In paints that contain both oil and solvent, the drying process involves both oxidation and evaporation. Two-component paints such as polyurethane and epoxy dry through a chemical reaction between the two components.

In traditional paints, the pigments comprise coloured material that is ground into an extremely fine powder, known as dry pigment, that is mixed with the binder. In modern paints, the pigment now comprises synthetically produced dyes in liquid form, coloured using micropigments.

Historically, the most common components of linseed paint were: balsam turpentine, boiled coldpressed linseed oil and pigment. The pigments pictured are yellow ochre, green umber, ultramarine blue, English red and bone black.

Historically, the most common components of whitewash were: bone glue dried to a cake, water, chalk and coloured pigment. The coloured pigments are yellow ochre and English red. The glue could also be pearl, antler or sturgeon glue, or glue made from carrageen moss.









Filler, which is needed in some types of paint, comprises finely powdered substances with low opacity, since they are required not to compete with the intended colour. Examples of fillers include baryte, chalk and talc. Driers are used in oil paints to speed up the oxidation process, while preservatives, thickeners and mould inhibitors tend to occur in water-soluble paints.

Some ingredients have several functions in a paint. One example is lime, which acts both as a binder and a pigment in limewash. Another is dry pigment, which gives both colour and bulk to linseed paint and whitewash. A third example is the pigment zinc, which also inhibits the growth of mould. The components can also have different functions in different types of paint. Chalk, which gives full opacity in whitewash, is actually transparent in linseed paint, where it acts instead as a filler.

#### **Common types of paint**

Below is a description of just some different paints that have been used over the years. Although some of these are no longer in production, particularly the paints used in the mid 20th century, they can still be extremely useful in restoration work. The older paint types that were made in the master painter's workshop are relatively easy to have mixed today, as long as the recipe is still available, but having industrially produced paints such as styrene-butadiene latex recreated is more complicated.

**Distemper**, in this case traditional red, is both easy to apply and simple to maintain. The Falu red pigment is a by-product from the Falun copper mine. The pigment is extracted from low-copper ore that has been left to crumble into 'red earth'. This is then washed, burnt and ground into the fine Falu red pigment.

**Whitewash** comprises glue, chalk and water, plus additional pigment for a colour other than the white provided by the chalk. In strongly coloured whitewash, the chalk is replaced entirely with the coloured pigment. The binder may be either animal-based (e.g. bone glue or antler glue) or vegetable-based (e.g. carrageen moss or cellulose). Whitewash has a short shelf life and should be treated as fresh goods. It is therefore usually mixed up just before it will be used and does not contain any preservatives. There are paint manufacturers who supply ready-made whitewash, but this should also be treated as fresh goods.

Whitewash has been used for several hundred years. Since it is water-soluble and thus sensitive to moisture, it has only been used on interiors. Whitewash was cheap and was therefore used in all types of building, and on most types of substrate, including wood, plaster and board.

Whitewash is one of the most environmentally friendly paints in use. It has no toxic solvents or additives and the binder is renewable. The paint only becomes environmentally hazardous if it contains a toxic pigment.

**Distemper** is actually a subset of emulsion paints. (Read more about emulsion on page 39.) As a category, distemper comprises a number of different recipes, with the paint type often referred to as Falu red most common in Sweden. Over the centuries, however, until the majority of all paints were made in factories, each master painter had his own, more or less secret, distemper recipe.

Distempers such as Falu red are made by boiling up water and iron sulphate (copper sulphate in light colours) along with rye or wheat flour, stirring vigorously. Then a dry pigment is added, usually Falu red but there are also other light-fast pigments, so distemper can also be white, yellow, green, black, etc. To ensure a non-smearing paint, a small amount of linseed oil can be added during preparation. This gives the finished paint a slight-

ly deeper and darker colour. Distemper has been in use for a very long time, mainly for painting wood. Since distemper has a tendency to transfer colour, it has mostly been used outdoors. A major advantage of distemper is that it is entirely breathable, so any penetrating moisture can easily get out again.

Mould attacks on Falu red façades increased sharply during the 2000s, which is why several studies are underway (as of 2010) to develop distemper that is more resistant to mould.

Generally speaking, distemper has a low environmental impact, since it does not contain any hazardous solvents and will probably not contain toxic pigments. However, this is not the case if the paint contains copper or iron sulphate, since copper in particular is damaging to aquatic organisms. The Falu red pigment also contains lead, although only in very small quantities (about 0.2 percent by weight). However, the sheer quantity used in Sweden generates a discharge of several tonnes of lead every year. From the perspective of resource management, and from a historical point of view, it is also problematic that the Falu red pigment is a finite resource, since it is a by-product from the Falun copper mine, where mining operations have ceased.

**Limewash** comprises lime and water, plus additional pigment for a colour other than the white provided by the lime. Since the lime cannot be replaced (like the chalk in whitewash), limewash can only be pigmented to a certain degree and will therefore never be strongly coloured. The pigments used in the paint must be earth pigments and, particularly when painting exteriors, they must also be light-fast. Limewash can either be mixed on site, as part of a painting project, or mixed up in advance. Pre-mixed limewash does not require any preservatives or other special additives.

Limewash has been used for several hundred years, both indoors and out. Internally, limewash has primarily been applied to plastered surfaces such as walls, ceilings and fireplaces.

Limewash is an environmentally friendly paint, but the binder is a finite resource, at least in the very long term. The paint has no toxic solvents or additives, as long as it does not contain toxic pigment.

**Silicate paint** comprises liquid potassium silicate, water and pigment. Genuine silicate paint is a two-component paint delivered in two separate packs. The paint must be used immediately after it is mixed, which is why it is generally prepared on site. The paint is also available as a single-component paint with the addition of acrylate.

Silicate paint is a relative newcomer to Sweden. It was patented in Germany in the 1870s, but its manufacture only started at the very end of the 19th century. Due to its proximity to Germany, southern Sweden was the first to embrace silicate paint. It adheres excellently to concrete, stone, plaster and fibre cement, but also works on wood. The paint has mainly been used for exterior painting, but at the Stockholm Exhibition of 1930, silicate paint was used both internally and externally on the exhibition halls' fibre cement cladding. Silicate paint is also used in rooms with high air humidity, where organic paints could be exposed to the growth of fungus and mould. During the 20th century, specially produced silicate paints were also used to fireproof internal roof trusses.

Limewash has an excellent capacity to chemically bond with the underlying lime render, making it an extremely durable paint treatment. The photograph shows the façade of Skokloster Castle. Read more about limewash in SFV's Technical Instructions – Plasterwork.





Silicate paint is strongly alkaline and thus corrosive, which has an impact on the working environment and work tools, as well as surrounding building materials during the actual painting work.

**Linseed paint** comprises linseed oil that is mixed to a paste with dry pigment. To get a consistency that is suitable for painting, the paste is thinned with more linseed oil and often also a solvent such as balsam turpentine or low aromatic petroleum-based solvents such as aliphatic naphtha. Some linseed paints contain a drier, but otherwise it is rare for other additives to be used. The solid content by volume of linseed paint is therefore very high. If the paint is not thinned with a solvent at the time of painting, the solid content can be up to 99 percent.

Linseed paint does not dry through evaporation, but by the oil oxidising, a process that involves oxygen atoms being bound to the oil. Under suitable climatic conditions, room temperature and good ventilation, the paint can be overpainted after about a day, but it will take a month or so to dry completely.

The characteristic of pure linseed paint is that, in contrast to alkyd and enamel paints, the brushstrokes remain and can be seen in the finished layer of paint. If linseed paint is used in rooms that lack daylight, the linseed oil tends to yellow, which is particularly noticeable in white paint.

A long way into the 20th century, linseed paint was practically the only type of paint used on both interior and exterior woodwork. Other paints such as whitewash and limewash were used when the property owner could not afford the expense of linseed paint. The woodwork pictured is from the 1770s and can be found in Strömsholm Palace. When it was renovated in the 1990s, it was discovered that the woodwork had originally been painted with whitewash, which is why it has once again been painted with this type of paint.

Yellowing can also occur behind furniture and open doors, but the yellowing will disappear again after a couple of months if the surface is exposed to daylight. Outdoors, the paint fades after just a few years, making the colour look as if it has completely changed. As in all exterior painting, it is important for the pigment to be light-safe.

Linseed paint was used to paint Swedish churches back in medieval times, but it took until the 18th century for the use of linseed paint to spread beyond churches, palaces and country houses. Linseed paint used to be used both indoors and out, and on all types of substrate such as wood, plaster, metal and board, but since linseed oil was so expensive, the paint was used sparingly and only in specially chosen areas. It is most common for linseed paint to be gloss or semi-gloss, but there is also matt linseed paint.

From the end of the 19th century until the mid-20th century, linseed-based painter's putty was used to give a smooth finish. Linseed putty tends to come away from the substrate and crack after 75–100 years, no matter how well it was applied. This type of damage is therefore relatively common in buildings from this time.

Oil paint can also be made using oils other than linseed oil – e.g. tall oil, soya oil or fish oil – but linseed oil has traditionally been seen as the best oil for regular oil paint. Other types of oil such as Chinese wood oil and poppy oil are sometimes added to linseed paint to give it certain properties. However, some of these oils have a negative impact on the end result, for example making the paint crackle.

During the 19th century, before enamel paint started being manufactured on an industrial scale, the master painters made their own enamel paint. It was based on linseed oil, but with the addition of resins that were melted down into the paint. These paints were called enamel paints or lacquers because of their hard, high gloss finish.

Linseed is mainly made up of renewable ingredients, particularly if the paint is thinned with balsam turpentine rather than aliphatic naphtha. In terms of the working environment, the solvent is problematic, but there are solvent-free linseed paints on the market, as it is possible to avoid the use of solvents. The paint can instead be thinned using high quality linseed oil. Certain dry pigments that have traditionally been used are a danger to the environment and paint residues can contain heavy metals, which is why they have to be handled as environmentally hazardous waste. During the oxidation process, as the paint dries, carbon dioxide and aldehydes are released, but the emissions are relatively low and tail off after just a couple of days.

**Alkyd oil paint** is an umbrella term for a large number of paints, all of which use a binder made up of an ester produced by combining an alcohol with an acid. The oil may come from the plant kingdom, like linseed oil, but it may also be a petroleum-based mineral oil. The first alkyd paints, which were called 'synthetic enamel' paints, were made from modified linseed oil, but the use of mineral oils has gradually become more common. Alkyd oil paint gives a harder and more durable surface that smooths out better than linseed paint. In order to make the boiled alkyd usable as a paint, it has been necessary, from the time that the first alkyd paint was produced, to add white spirit, and later aliphatic naphtha, to the otherwise far too viscous binder.

Alkyd oil paint was used during the first half of the 20th century primarily as a final coat on surfaces that were required to have a high gloss finish. It was very common to use an alkyd-based top coat, mixed with linseed paint, on woodwork as well as glossy areas of walls and ceilings. The durable alkyd paint was the preferred choice in rooms that demanded high levels of hygiene, e.g. in healthcare and the food industry, but also in

domestic kitchens and bathrooms. During the second half of the 20th century, alkyd paint grew in popularity and almost entirely replaced linseed paint for use on interior and exterior woodwork. Due to the high level of unhealthy solvent in alkyd paint, it has gradually been phased out from the market since the 1980s.

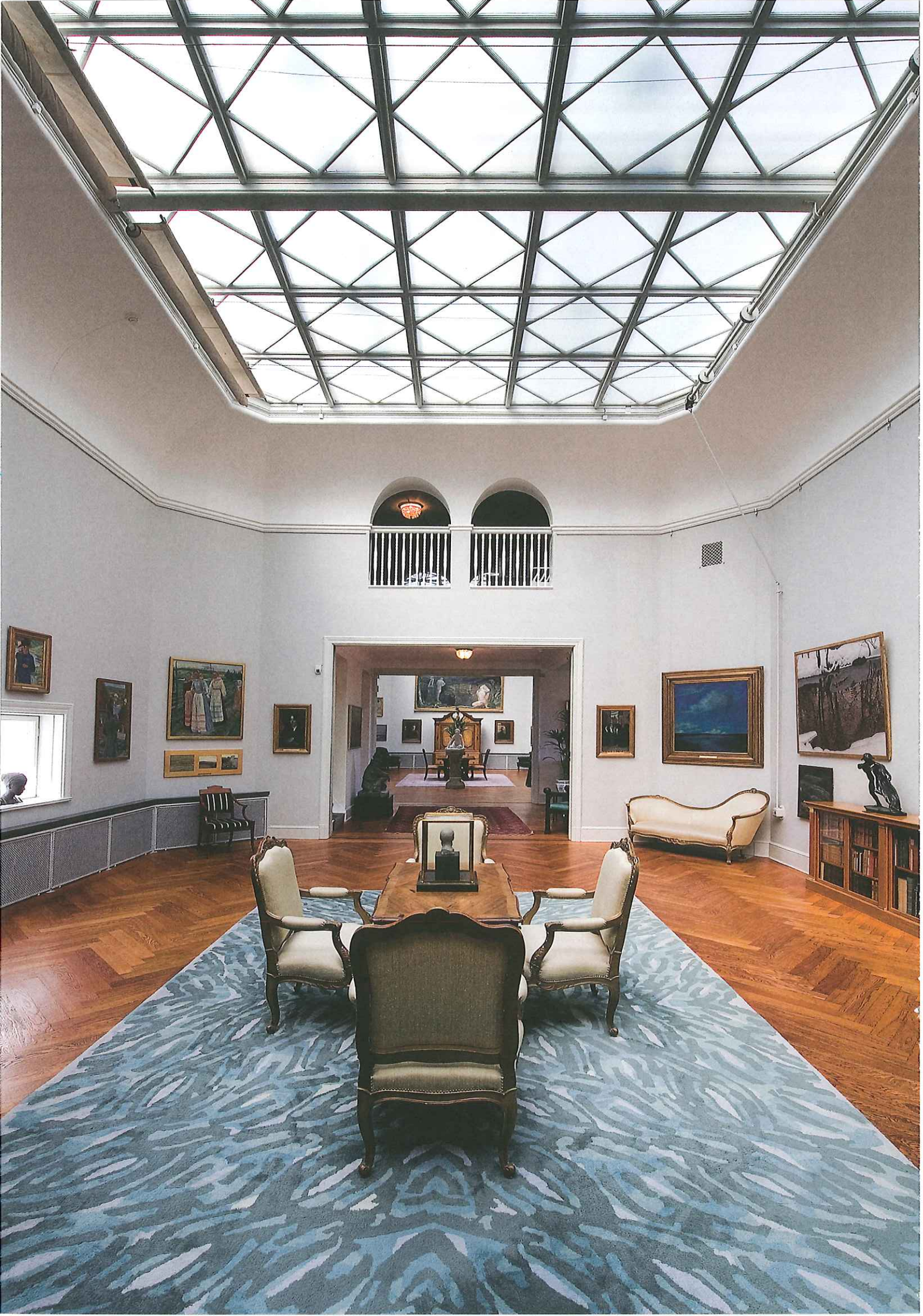
Solvent-based alkyd paint has a negative impact both on health and the environment, in part because the solvent derives from the finite resources of the petroleum industry, and in part because the solvent affects the working environment for the people on site during painting work. However, the water-based alkyd emulsions that are available for interior use have a lower environmental impact.

**Latex paint** is an umbrella term for various kinds of water-based dispersion paints, which means that the binder is freely suspended in the solvent. The binder, comprising one or a mixture of such substances as polyvinyl acetate, acrylate and styrene acrylate, is produced from petroleum products. The paint also contains fillers, thickeners, preservatives, film forming agents, mould inhibitors and other chemicals not specified by the manufacturers. Latex paint dries through the water in the paint evaporating.

The latex beads then stick together and form a film that adheres to the substrate. The solid content by volume in latex paint is around 40 percent, which means that the remaining content is the

During the mid-20th century, it became increasingly common to use alkyd oil paints on interior woodwork. There were many reasons: alkyd paint smooths out better than linseed paint, the finish is more hard-wearing and alkyd-based paint stays glossy longer than linseed oil-based paint. The woodwork pictured still has its original alkyd paint finish from the late 1950s.







water that evaporates. The paint is touch dry and can be overpainted after just a few hours, but it actually takes several weeks for the drying process to be completed. In the case of exterior painting, latex paint generally retains its shine and colour for much longer than linseed paint. These two paints thus age in different ways.

The first latex paint to be introduced in Sweden, initially called 'plastic paint', was the American paint Spred, which was made under licence by Beckers from 1951. A couple of years later, in 1954, Alcro responded by launching the product Bell. The binder in these two paints was styrene-butadiene latex (SBL). The adherence of this type of paint was very poor and the paint yellowed significantly. It was therefore quickly replaced by acrylate and polyvinyl acetate, PVA latex.

Initially the latex paints were used chiefly for interiors, but they gradually also came to be used for exterior painting.

Latex paint is also available as enamel paint, and is thus called latex enamel paint. It is mainly used for woodwork, but also for glossy finishes on ceilings and walls. Since today's latex paint is based on petroleum products, the raw material is not renewable. Most latex paints contain preservatives and several other additives, some of which are classified as allergenic or as carcinogenic, mutagenic and reprotoxic (CMR) chemicals. However, the paint industry is working to phase out CMR chemicals, with the aim of removing them entirely from paint. Despite these chemicals, latex paint is considered less hazardous to painters as long as it is applied using a roller or brush. If the paint is

being sprayed, however, the painter must wear a protective mask. Latex paint must not be flushed into the sewerage system since treatment plants have difficulty processing paint residues.

**Emulsion paint** is an umbrella term for paints made up of an oil-based binder mixed with water. In order to mix these two thoroughly unblendable substances, emulsion paints always contain an emulgator such as cellulose, egg, casein or soap. Types of emulsion include tempera paint, casein paint and linseed emulsion.

Emulsion paint is generally relatively sensitive to moisture and should not be used on surfaces that will require wiping with a damp cloth. It can also be difficult to touch up a surface painted in emulsion, as the touching up often remains visible. Since the ingredients of different emulsions vary, their properties also differ, so it is important to choose the right emulsion paint for each situation.

Emulsion paint dries in two ways – through water evaporation and oil oxidation. The paint is non-tacky and overpaintable in just a few hours, but takes a few weeks to dry out fully.

Emulsion paints have been around for many hundreds of years, probably for as long as mankind has been using paints. When master painters blended their own paints, they often made emulsion, but it was usually called distemper. The linseed oil shortage of the First World War drove the paint industry to develop several types of emulsion paint during the interwar years, both for painting interiors and exteriors. During the Second World War, these paints were crucial in keeping the painting sector going. After the war and until the ascendancy of latex paint, emulsions were common for painting interior walls and ceilings, but also used for painting exterior rendered and wood façades. In Sweden at least these paints came to be referred as OW or WO paints, depending on whether the oil or the water content

During a refurbishment in the 2000s, the walls of the Thietska Gallery were painted with linseed oil-based emulsion paint. Most emulsions give a characteristic matt finish that is similar to whitewash. However, emulsion is more hard-wearing than whitewash.

### SFV's guidelines on choice of painting material

For SFV's property portfolio, the following applies:

Decisions on painting materials are to be based on a long-term approach that weighs up all considerations regarding the object in question. The investment cost is to be balanced against the qualitative results and the long-term maintenance cost. This may mean that a more expensive option will be more cost-effective in the long term. One particular thing to bear in mind is that paints applied in thin layers adhere better than paints that are applied thickly. Thin paint layers also fill and distort profiled woodwork and other details to a lesser extent.

For environmental reasons, it is required that all ingredients in the painting products to be used are reported in their entirety. It also provides extra quality assurance regarding the cultural and historical aspects.

When choosing painting products, the precautionary principle is to be applied, in regard to both the historical considerations and the environment. This means that SFV will, in the first instance, choose products whose aesthetic look and ageing process, as well as their environmental impact, have been known for a long time. Before any new painting products are used in buildings of high cultural value,

they must therefore have been thoroughly tested and evaluated.

When painting in one of SFV's buildings, the following paint types are thus to be prioritised (in no particular order):

- whitewash (p. 31)
- distemper (p. 31)
- limewash (p. 32)
- silicate paint (p. 32)
- linseed paint (p. 35)
- certain alkyd oil paints (p. 36)
- certain emulsion paints (p. 39)

If new, eco-friendly paints suitable for use in historically valuable buildings are developed in the future, this priority list may be revised.

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- For SFV's views on and the conditions for the use of red lead and other pigments based on heavy metals when painting historically valuable buildings, see pages 24 and 46.
  - For the use of paints containing solvents that are hazardous to health, see pages 24, 27 and 46.6.

dominated. The higher the oil content, the more the paint acted like an oil paint and vice versa.

As part of a rising environmental awareness, emulsion paints gained ground once more in the 1990s, with egg tempera and linseed oil-based emulsions being put into production. Water-based alkyd paints, which are a kind of emulsion, have also been available since the early 2000s.

Two types of emulsion paint that became popular in the late 20th century are egg tempera and beeswax glaze. Both paints are based on renewable resources and they are non-toxic, as long as they are pigmented with non-toxic pigments and do not contain any toxic additives. However, factory-produced egg tempera has sometimes caused skin irritation in painters and users. Beeswax glaze has the disadvantage that surfaces with this finish cannot be overpainted with other types of paint. Instead, the beeswax glaze has to be removed entirely. On woodwork, for example, this means all paint being stripped away beforehand.

The ingredients of emulsion paint are generally

renewable, but latex paints, which are based on petroleum products, are sometimes erroneously included in the category of emulsions. Factory-produced emulsions often contain preservatives, which is why such paint cannot be flushed into the sewerage system. Like all other paints, residues of emulsion must be treated as environmentally hazardous waste if the paint contains heavy metal-based pigments.

During the 2000s, new types of paint have been developed and launched on the market. Some of them are known as hybrid and nano paints. Hybrid paints are water-based paints with a blend of several different binders, such as alkyd, acrylic and silicate. Nano paints comprise extremely small particles that increase the strength of the paint, but these paints may have a negative environmental impact and pose a risk to health. However,

as of 2010, there is a lack of knowledge about how the nano material spreads, disperses and degrades in the environment, and a lack of adequate information about the health risks.

### Paints of the future

Over the 150 or so years that paint has been manufactured industrially, a large number of new paints and many variations on established paints have been developed. Even when the master painters were making their own paints, new variants appeared, although the recipes were often kept secret and the reach of these products was therefore limited.

There is nothing to suggest that this rich seam of invention is going to end, either within the paint industry or among those who mix their own paints. It is in fact likely that an increased environmental awareness, combined with tougher green legislation, will speed up the development of new paint types. This may, for example, mean that new and progressive variants of emulsion enter the market, alongside a renaissance for the really old, tried and tested paints. It may also be that paints with a high environmental impact will be banned completely and so will disappear from the range from paint manufacturers. The content of some of today's paints might also change. It is, for example, already (as of 2010) possible to manufacture latex paints made from renewable resources such as maize and biomass, although no such paints have yet been brought to market. If such

Ever since we started painting our buildings, mankind has constantly invented new paints and paint treatments. One of the challenges that we face is to develop less environmentally hazardous materials and methods. Washing and cleaning dirty paint surfaces using deionised water may be a way to reduce the environmental impact.

latex paints are commercialised, their environmental impact should be investigated to check that they do not contain environmentally hazardous preservatives.

Of course, it is hard to predict what this will mean for the conservation of cultural environments. How new and changed paints will work in a historical context must therefore be analysed and evaluated in each individual case.





## Wear, ageing and damage

### The way that paints age

All paint treatments age – whatever the type of paint, application technique and skill of the painter. This may mean, for instance, that the paint layer crackles and lifts away from the substrate, that the paint layer splits from the underlying layer, that the paint slowly erodes on the surface or that the colour and finish change.

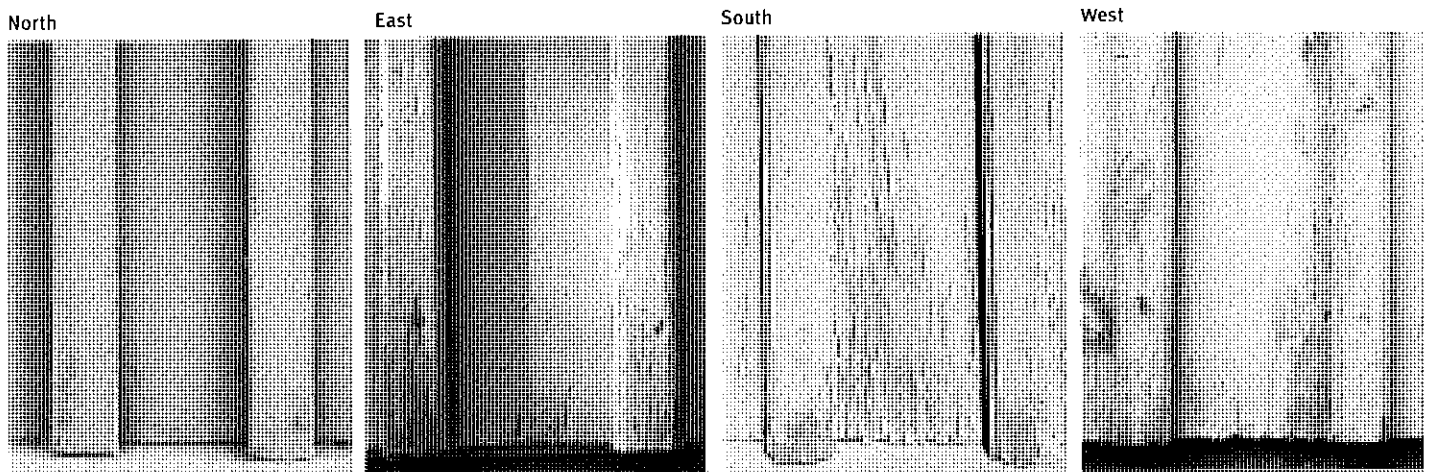
Different paints age in different ways, which is important to bear in mind when choosing the type of paint, since it can affect both the cultural value of the object and its maintenance needs. Examples of different properties include the fact that linseed-based paint has a tendency to yellow in dark rooms with no daylight and that it loses its sheen relatively quickly outdoors, while the finish of latex paints generally remains relatively stable both indoors and out. Interestingly enough, an ageing property that in one context is seen as positive, may have a negative effect in another situation.

### The way that the substrate ages

The building material that the paint sits on also ages and changes, which in turn can affect the paint layer. Organic materials such as board, wood and fibreboard expand and contract as the air humidity changes, and when the underlying material moves, however minutely, the paint may eventually come away from the substrate. Wood can be damaged by rot and insects, which also leads to the paint layer being damaged and even partially disappearing. Inorganic material, such as lime render, can split or start to crumble, and if the render fails or comes away, the paint covering is naturally also lost.

### Wind and weather

Of course, outdoors wind and weather has an immense impact on the ageing of paint. The way and degree to which a paint ages depends partly on the properties of the paint, and partly on how exposed to the weather the painted surface is.



There are painted surfaces where wear is synonymous with patina and thus part of the object's cultural value. One of the kitchens at Tullgarn Palace has a prime example of this (left). The wear on the woodwork relates how the kitchen was used, and which drawers were used most.

Exposure to wind and weather affects how the building wears and ages. The photographs above show the different façades on one building. The pictures, all taken at the same time, show how the same paint layer ages differently, depending on the direction that it faces.



High quality façade material can generally cope without paint. On the façade above, much of the linseed paint has long eroded

away, but thanks to the high quality of the woodwork, it will be possible to reinstate the façade through repainting.

Due to sunlight, paint ages more quickly on south-facing façades than on north-facing ones. On the other hand, façades facing north are more prone to algae and mould growth. However, buildings in particularly exposed locations, for example by the sea, will see very different ageing processes.

Since the ageing of paint treatments can vary considerably between different façades on the same building, and between different elements of a building, SFV recommends that all façades are inspected to check their status before any planned maintenance interventions. It is very often the case that maintenance intervals can be varied. Where cleaning and touching up can suffice for one façade, another might need to be completely repainted. Adapting maintenance intervals to the conditions of each façade can preserve the cultural heritage, while at the same time reducing the impact on the environment.

#### **Everyday wear and other factors**

Most painted surfaces are exposed to everyday wear and minor damage, for example from dirt, water stains, mechanical damage, drill holes and tape. Surfaces and paint layers can also be

damaged by incorrect cleaning methods, mould attacks, insect damage, water damage, fire, vandalism and graffiti. Substandard or incorrect painting can also have a negative impact on the look and durability of the surface layer.

This type of wear and damage can, to a certain extent, be avoided by taking preventive measures such as placing furniture so that it controls how people move around a room or through information and cleaning procedures. Risk factors should be identified for buildings whose paint treatments possess extremely high cultural values, so that preventive measures and object-specific procedures can be drawn up.

The limit of where patina becomes poor maintenance is not always obvious. It can sometimes be difficult to decide whether to remedy wear or to keep surfaces as they are. Each object and decision has its own context. In certain situations it may be of value to retain minor wear around a doorknob, while in another case it may be extremely important to put it right.



## Environmental considerations

### **Paint, the environment and cultural value**

All types of paint are chemical products and thus have an environmental impact. Paint affects the surrounding environment and the buildings where it is used, as well as the painters, the tenants and other users.

Common sense should therefore be applied when choosing and using paint. The choice of paint and paint treatment shall, in each individual case, be made based on a reasonable balance between the cultural value of the object in question and the environment impact that the preferred paint type will cause.

However, SFV stresses the fact that, in cases where linseed paint, alkyd paint and other paints containing solvents that are hazardous to health are important for the cultural value of a building or a feature of a building, these paints are to be used. In the first instance, however, linseed paint should be solvent-free and in other cases the quantity of hazardous solvent is to be kept to a bare minimum. In addition, all available measures

are to be taken to reduce the risks to the working environment. The same applies to the use of pigments containing heavy metals such as lead, cadmium, chromium or cobalt, where these are important to the cultural and historical value of a building or a feature of a building.

### **Environmental management of painting contractors**

According to SFV's environmental objectives, clear environmental criteria are to be set when purchasing both goods and services, hazardous emissions and pollutants are to be reduced and effective, environmentally aware waste management is to be encouraged. SFV is committed to following all environmental legislation, as well as taking a lead in further improving environmental work.

As support in choosing building materials, SFV uses the web-based tool Byggsvarubedömningen (BVB). BVB sorts the environmentally assessed building materials into the categories 'recommended', 'acceptable' and 'avoid'. If the paint falls into the latter category, alternative products are to be investigated.

In order to achieve environmental objectives, environmental inventories are to take place at an early stage before any painting project and environmental programmes are to be drawn up and incorporated into building documents. Environmental considerations are to play a part in the procurement process and during execution of the contract, the set environmental criteria are to be followed up. Any deviations from the environmental programme are to be documented and reported to the project manager.

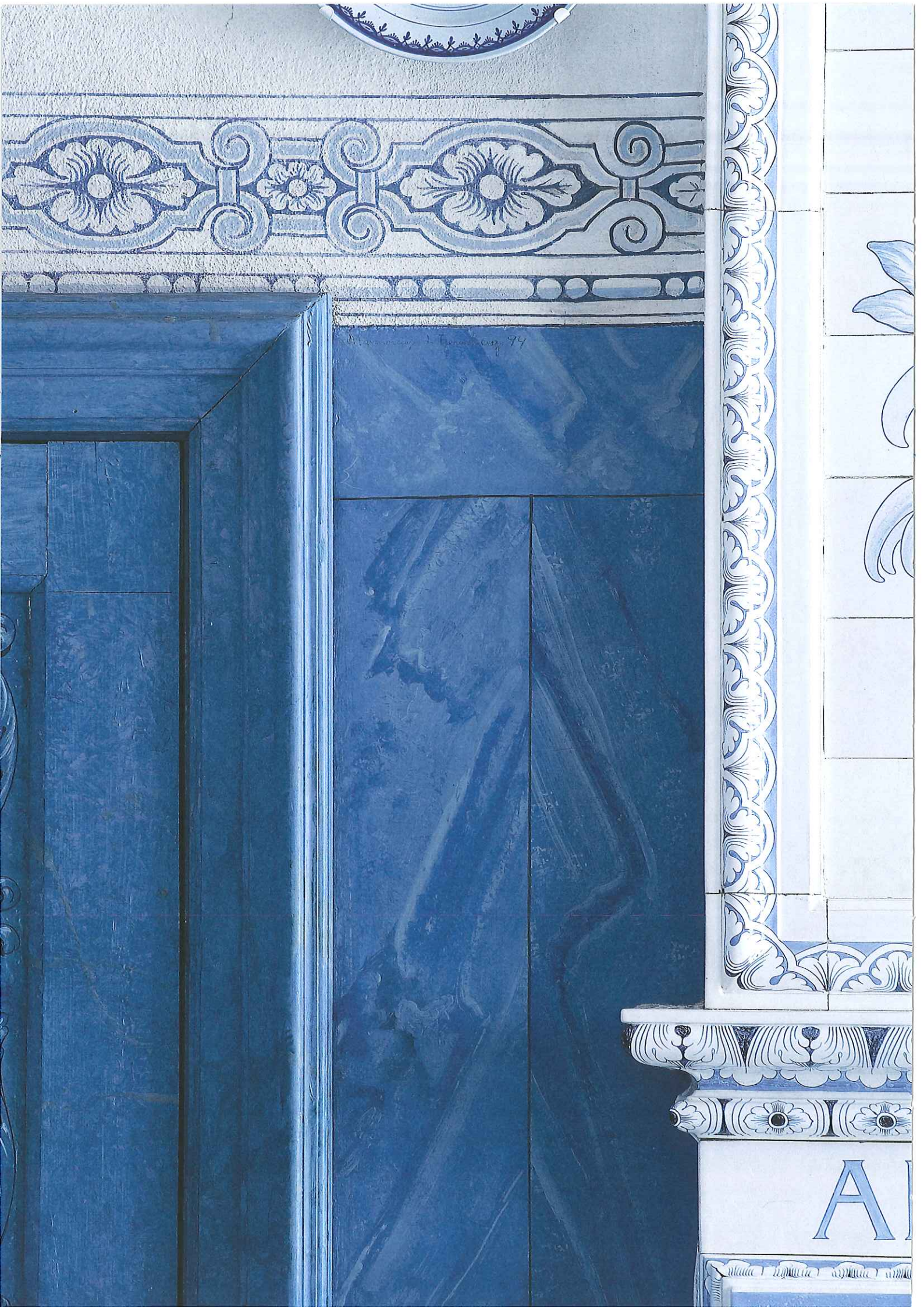
Interior from Rosenbad in Stockholm, where in the early 2000s some rooms were painted using a specially developed, odourless linseed paint. This allowed the room to remain in use during the painting work. Due to technical difficulties in the manufacture, this paint is no longer on the market. The current appearance does not reflect the original, which used a slightly off-white paint, with a large amount of gilded decoration.



Red lead metal detail that will later be painted with linseed paint and gilded. No special permit is required when using red lead for professional purposes.







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## Quality and execution criteria

### Respect for cultural value

Painting work in SFV's buildings is to be executed with respect for the object's cultural value and history, from the start of the project until its completion. The object's cultural value is to be outlined in a specific description. If no value description has been drawn up, the project will run more smoothly if the cultural values are investigated and established at the start of the project. Such a project-specific value description may cover the whole building or built environment, or simply the part that the contract is intended to cover.

### Functionality requirement

SFV demands a high degree of functionality, taking account of practical, aesthetic and historical factors. The treatment of the painted surface must therefore meet the demands of its use, while at the same time conveying the appropriate design ideal and the story of our cultural heritage.

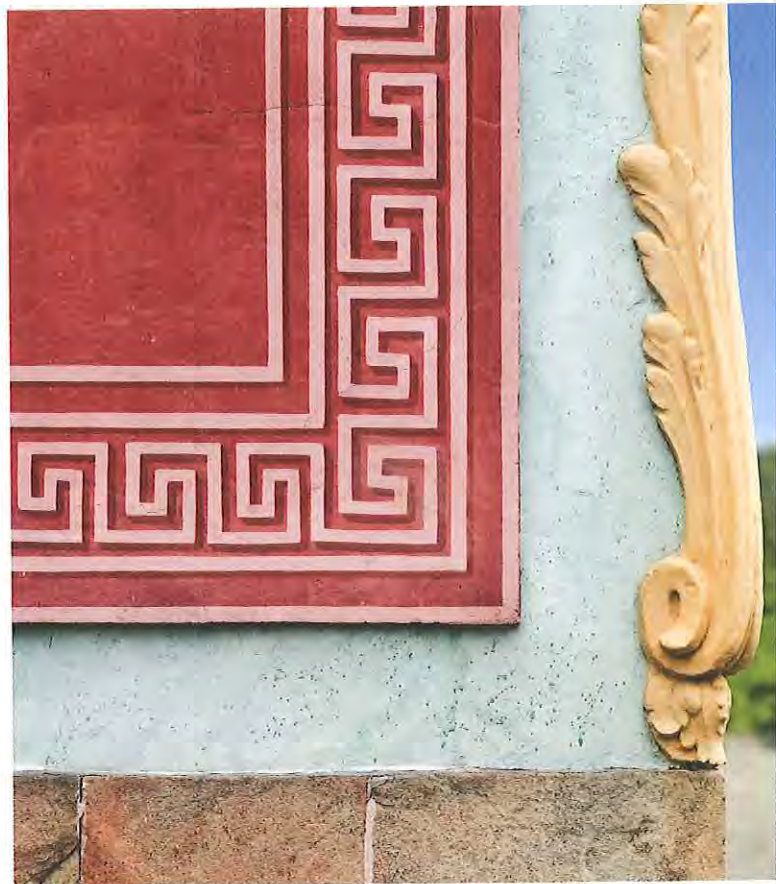
Determining the factor or factors that must be prioritised varies from object to object and from case to case. In some cases practical criteria will trump other functional requirements, while in other cases aesthetic considerations will take precedence and in yet further cases the cultural and historical value may be so high that other criteria have to take a backseat. These issues are to be tackled at an early stage, before a painting contract starts.

Expert decorative painting, such as here in the Porcelain Room at Drottningholm Palace, will last for a very long time. The painting was originally executed in 1897 and restored a hundred years later.

During the 1990s restoration of the Chinese Pavilion at Drottningholm, exacting standards of quality and execution were demanded. The results of the restoration have stood up well, both in technical and conservationist terms. The detail shows the rendered façade protected with linseed paint and the meander border skilfully hand-painted.

### High level of craftsmanship

The end result of the painting work carried out on behalf of SFV must always at least meet the quality level established in advance and represent sound craftsmanship. Each type of paint has its own specific properties and the different application techniques often require a particular approach to achieve a good result. It is therefore required that the people specifying the task and executing the work are familiar with the properties and conditions of the different paint types, and with the execution of the necessary painting techniques.



## Project planning

### Two types of object – two approaches

SFV's property portfolio contains two categories of construction: buildings of high cultural value and administrative buildings. The first category includes Royal palaces, while the second category comprises the more ordinary buildings. These two types may also occur within the same property or even within the same building. This means that

rooms of high cultural value may be next door to more ordinary rooms.

These two types of object or room must generally be approached differently right from the planning stage. Buildings and rooms of high cultural value require customised paint treatments and conservation measures, while ordinary buildings and rooms can generally be painted in line with common practices in the painting trade.

### Good advance planning

In the case of painting contracts in historically valuable buildings, good planning well in advance is crucial to the execution of the contract and to the end result. It is common for the planning time to be longer than normal, and it may be that the start date of the contract is brought forward or postponed in relation to what is actually desirable. Sometimes the needs of the users and tenants impact on the planning conditions, and on the time of the contract's execution. In addition, consultation with the approving authorities for heritage conservation and waiting for the results of sample analyses may extend the planning time. It is also a good idea right from the planning stage to bear in mind that the choice of paint may affect the length of the project, since longer drying times also cause longer production times.

### Conservator involvement

In cases where the building concerned is of high cultural value, and perhaps even a listed historical monument, a conservation expert must take part in the planning in line with the Swedish National Heritage Board's *Guidelines regarding conservator involvement*. The earlier in the process the conser-

Even in the properties that fall within the category of administrative buildings, the paintwork has a significant role in the overall design. It is likely that paint treatments in some of these buildings will be classed as culturally and historically valuable in the future.



The majority of the buildings of high cultural value in SFV's portfolio contain high quality paintwork that has to be treated with particular care and consideration. Interior from Tullgarn Palace.





Before contractors start painting in existing buildings, in most cases site surveys must be carried out as part of the planning process. Here painting consultant Michael Brantsjö surveys the paint treatment at the Old National Archives in Stockholm.

vation expert is brought in, the better it is for the planning, the contract and the end result.

#### **Inventory and survey**

In the case of painting contracts concerning existing buildings, particularly with high cultural value, several issues have to be surveyed and investigated during the planning phase. Sometimes, the surveys have to be carried out independent of each other, but they can often be combined into a joint undertaking.

A status inventory is required before each painting contract, with the condition of and damage to the painted surfaces described and gathered together. The format and scope of the inventory

is to be adapted to the nature and situation of the object.

In buildings of cultural and historical value, a careful preliminary conservation study is to be conducted. The preliminary study is to be limited to the façade or interior affected, although this must be set in its context.

When it comes to culturally and historically valuable buildings, and sometimes also administrative buildings, it is appropriate to carry out a survey of existing paint layers during the planning phase. A paint survey generally involves a visual study on site, but in certain cases may be supplemented with a laboratory analysis to establish which binder and pigment the existing paint layer contains. The scope of the paint analysis is to be adapted to the issue concerned and intended measures.

An environmental inventory must also be carried out during the planning phase. If there is a suspicion that the existing paint contains environmentally hazardous or disruptive substances, the paint is to be subjected to a laboratory analysis. It is relatively uncommon for lead to be found in existing paint indoors, but it can happen in older buildings. Other heavy metals or unhealthy substances may also be found in existing paintwork. Even modern paints may contain ingredients that can cause a severe reaction, for example when removing paint with a hot air gun.

#### **Exemptions and certification**

In cases where prescribed painting materials are classed as environmentally hazardous or have a negative impact on the painter's working environment, it is recommended that exemptions and certification are obtained from the authorities and experts during the planning phase. These documents are to be included with the tender documentation.

### **Tender documentation**

The clearer the tender documentation, the better the contract and the end result. The results from the completed inventories and surveys must therefore be incorporated into the tender documentation. The form that the tender documentation takes must also be adapted to the specific circumstances of the building and the contract. This means that unconventional solutions and formulations sometimes have to be used.

To make procurement easier, SFV has drawn up a simplified set of administrative rules that can be applied to most painting contracts.

### **Description system**

When drawing up descriptions, the intended paint treatments can either be described using codes from established and accepted systems such as HusAMA, or written out in clear and simple text.

Where painting codes are used, the paint treatment is also to be written out in clear text. This applies in particular for culturally and historically valuable buildings. The text fulfils two functions: it ensures that all the parties in the project can easily see what treatments are required, and that the actions can be interpreted in the event of a future renovation, even if the necessary code key is no longer available.

### **Reference surfaces and reference rooms**

Painted up reference surfaces are a good method of establishing and visualising the job and the levels in the planning phase. Depending on the nature of the planned contract, a reference surface may either be an existing painted surface or a surface newly painted for the purpose. Before major contracts that include several similar rooms, a reference surface may comprise a whole room, making it a reference room.

Together with the tender documentation, the reference surfaces form the basis for the procurement. In the majority of cases, the reference



A paint survey on site enables previous paint treatments to be uncovered and determined. In most cases, a paint survey plus an archive search provides sufficient information to reconstruct a previous paint treatment.

surface must be backed up by clear treatment instructions, but their content may vary, depending on the object and the intended work.

### **Standard treatments for administrative buildings**

When planning painting work, only a limited number of continually recurring paint treatments are generally used. This is particularly true for maintenance and renovation work in the property category of administrative buildings. Ahead of these contracts, the planning work can be simplified and made more efficient by choosing from a number of pre-coded treatments, drawn up in line with HusAMA.



These painting codes can be compiled in advance on an inventory form, where the paint treatments are divided up into five categories. The first four categories are divided according to the condition of the existing painted surfaces, and are described using the precoded treatments, while the fifth category is reserved for surfaces that require specialist treatment and therefore cannot be treated using any of the precoded paint treatments.

To make the inventory easier, the first four categories can be described with capital letters, where A signifies the best condition and D the worst. Level A means that the paint surface is in good condition and only needs cleaning or simple repainting. Level B means that the paint surface is in need of more normal repainting, level C indicates that the paint surface has minor cracking and/or flaking that requires more careful treatment, where the loose paint layer will have to be removed first, and level D means that the paint surface is in poor condition with considerable cracking and flaking, and in certain cases also water damage and mechanical damage. Surfaces classed as level D require thorough interventions, which means that existing paint layers need to be removed entirely before repainting. The levels of action required are linked to the cleaning levels in HusAMA, with levels A and B corresponding to cleaning level 3, while levels C and D correspond to cleaning levels 2 and 1.

When putting together the inventory results, the paint condition for each room/surface can be marked using four colours on a plan. This provides a clear and easy-to-read picture of the status of the existing paintwork, and which measures need to be carried out.

The previous colour scheme of the Old House at Waldemarsudde was reinstated in the 1990s. To make the planning easier and more efficient, a pre-produced inventory form was used for the status inventory of the existing paint treatment.

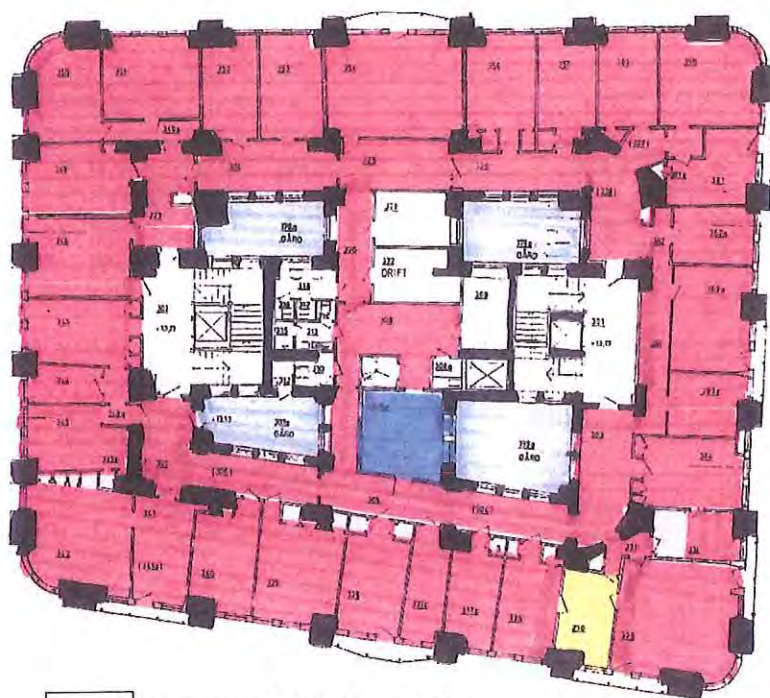


## Statusinventering av befintlig målning – Utomhus

	A	B	C	D	spec.
	Nymålning	Ca 10 år gammalt, normal ommålning	Delvis sprickor, delvis flagor, 10 år	Dåligt skick flagor, blåsor och skador	
Kod enligt Hus AMA o8					
LCS.21	<b>UTVÄNDIG MÅLNING</b> (Målningsmaterial se kap LCS)				
LCS.211	<b>Fasader, fasaddetaljer</b>				
	Fasadsocklar, asfaltmålade	15-04508	955-24508	955-14508	955-14508
	Trä linoljefärg	65-04712	955-35312	955-24712	955-14712
	Trä alkydfärg	65-04710	955-35310	955-24710	955-14710
	Trä akrylatfärg	66-04710	966-34510	966-24710	966-14710
	Trä slamfärg	62-04508	922-14508	922-14508	922-14508
	Trä lasyrfärg	67-06542	677-26542	677-26542	677-16542
	Trä fönsterluckor oljefärg	65-04712	955-35312	955-24712	955-14712
	Plåt stuprör hängrännor v/z	75-49210	955-29110	955-29210	955-19210
	Plåt, list- fönsterbleck rost	75-49210	955-29110	955-29210	955-19210
	Plåt, plastisol rör rännor bleck	955-39210	955-39210	955-29210	955-19210
	Metall smide gångjärn krokar bleck mm	75-29210	955-29110	955-29210	955-19464
LCS.212	<b>Trappor stegar lejdare räcken ledstänger o dyl utomhus</b>				
	Trätrappor målade	Rengöres	955-30010	955-24710	955-14710
	Stegar metallräcken	75-29210	955-29210	955-29210	955-19210
	Träräcken m m	65-	955-29210	955-29210	955-19210

With a pre-produced inventory form containing the most common and most expected paint treatments, the majority of paint treatments can easily be determined at the time of the

inventory. Then the selected paint treatments can be transferred directly to the painting description.



	No measures / alternative awaited
	A – New painting
	B – Approx. 10 years old, normal repainting
	C – Some cracking and flaking, 10 years
	D – Poor condition, flakes, blisters and damage

A plan makes it quick and easy to visualise the intended painting work at the time of the inventory. The use of different colours for the treatment levels clarifies the scope in a simple way.

The previous page shows an example of what an inventory form might look like. Under each level there is a suggested painting code for each part of the building. The fifth column is reserved for text or for custom-designed paint treatments, for which there is scope within HusAMA's system. This means that, where there is no code for an existing substrate or for a desired treatment, a unique paint treatment code can be created. However, in these cases it is particularly important that the paint treatment is also detailed in plain text in the painting description.

The kind of paint treatment that most frequently recurs, and that therefore should be included in an inventory form, can vary between objects and administrative areas. The form shown on the previous page is intended to provide inspiration for those who wish to draw their own inventory form.

#### **Planning for buildings with high cultural value**

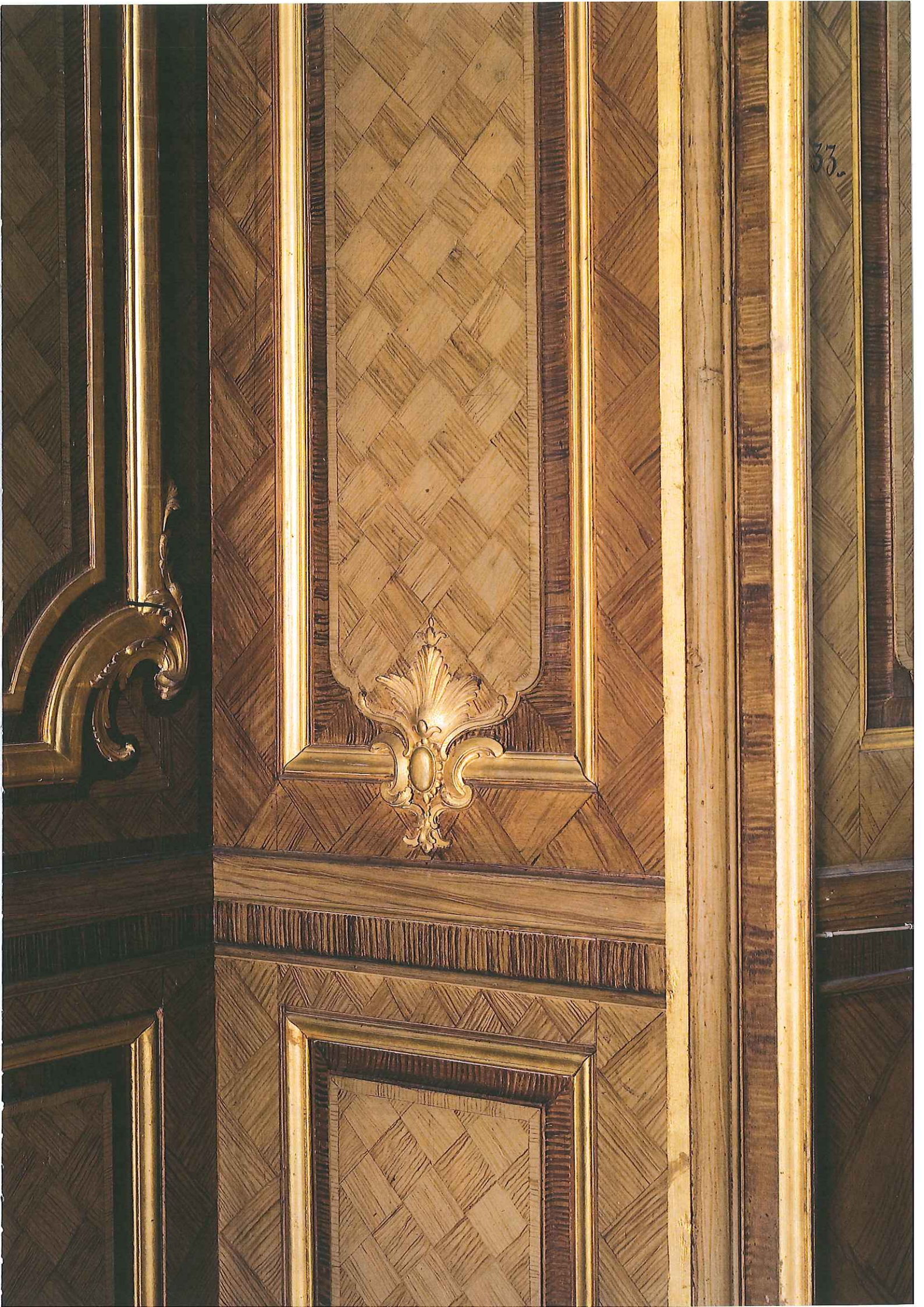
Buildings with high cultural value require an open attitude and customised measures, where every surface must be treated according to its own specific conditions. When planning for these objects, specially designed paint treatments are usually required, but even here the coded paint treatments may be of benefit.

A general principle for these objects is to restrict the interventions to as few as possible, which tends to mean avoiding repainting and instead opting for cleaning and conserving. However, during the second half of the 20th century, several of Sweden's most culturally and historically valuable exteriors and interiors were repainted using paints and methods that did not match the objects' cultural value, and these paint treatments have also, in some cases, proven not to work well. Starting in the 1970s, a gradual change took place, largely thanks to palace architect Ove Hidemark, who advocated the use of older paint types and paint treatments for the high-profile restoration of Skokloster Castle. This approach has come to inform

the management of culturally and historically valuable buildings within SFV's property portfolio.

When restoring and maintaining façades and rooms that have previously been given a historically and/or technically inappropriate treatment, repainting may therefore be necessary, despite the general preference for conservation. The inventory and survey phase is more important in these cases than in normal situations. In other contexts it may, for historical reasons, be justified to retain thick or poorly applied paint layers during maintenance work, despite the risk of a less enduring result. This protects the underlying, and perhaps extremely valuable, paint treatments for the future.

Tailor-made solutions are often required for maintenance of painted surfaces like this one here, comprising trompe l'oeil painting of intarsia woodwork. Right from the planning phase, it is important to find out as much as possible about the prevailing conditions and to be open to using methods other than the usual suspects.



33.



# Procurement

## Procurement procedures

SFV is what is known as a contracting authority and is subject to the *Swedish Public Procurement Act* (LOU), SFS 2007:1091. When procuring the services of consultants and contractors, where the sum of the contract is judged to fall below the threshold value, SFV uses three procurement procedures: *Simplified procedure*, *selective procedure* and *direct procurement*.

In the simplified procedure, everyone is welcome to submit a quotation. The tenders are then examined in two stages, with SFV first checking the tenderers' qualifications to ensure that they meet the set criteria. The tenders of the qualified tenderers are then assessed in the second stage. The winning tender will be chosen because it has the lowest price or is financially most advantageous based on a number of predetermined criteria.

In the selective procedure, suppliers first apply to be able to submit a tender and these applications are checked to determine whether suppliers are qualified. Then the suppliers are invited to submit a tender that meets the set criteria. Here too, the winning tender will be chosen because it has the lowest price or is financially most advantageous based on a number of predetermined criteria.

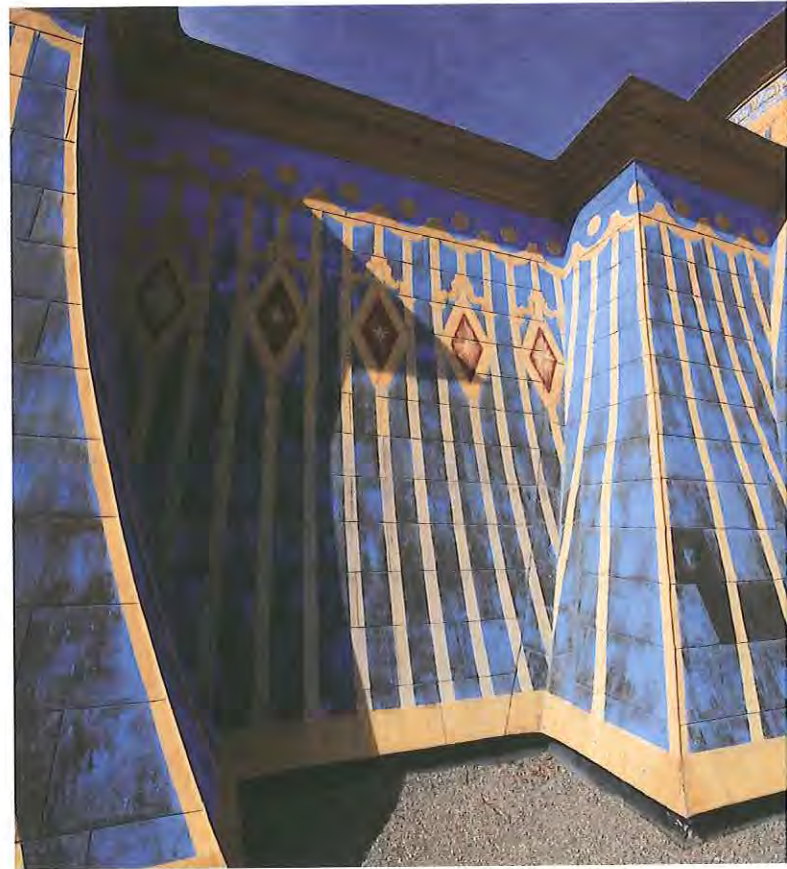
Where the value of the tender is low or if there are particular reasons for doing so, direct procurement may take place. Direct procurement does not need to be advertised, and nor does it have to follow the procedural criteria prescribed in law. However, all procurement must be carried out on a professional footing and make use of the existing competitive situation.

The Copper Tents in Haga Park were repainted in the late 1990s, using linseed paint and completing the decorations by hand. After 10 years, the façades were extremely dirty. During autumn 2009, the tents were washed with deionised water. The results of the washing exceeded expectations, but this revealed just how worn the paint was. SFV therefore chose, in this particular case, to repaint the façades.

## Guarantee period

In the case of contracts for SFV, the practice is for the guarantee period for painting work to be five years, which applies both to materials and workmanship.

For historical reasons there may be cause, in individual cases, to write off the guarantee period for a specific job. This thus frees the workmen from guaranteed liability for that particular job within the contract. An example of this may be where existing paint layers have high cultural value, and at the same time they risk causing poor adhesion if they are retained during repainting.





## Implementation

### Project run-through

All contracts for SFV are to start with a project run-through attended by all the parties involved, including those who took part in the planning. The purpose of the project run-through, which is held at the start of the contract work, is to ensure that everyone is clear about the specific conditions and objectives of the contract. If anything is unclear with regard to the work to be done and its objectives, such issues are to be dealt with at the project run-through.

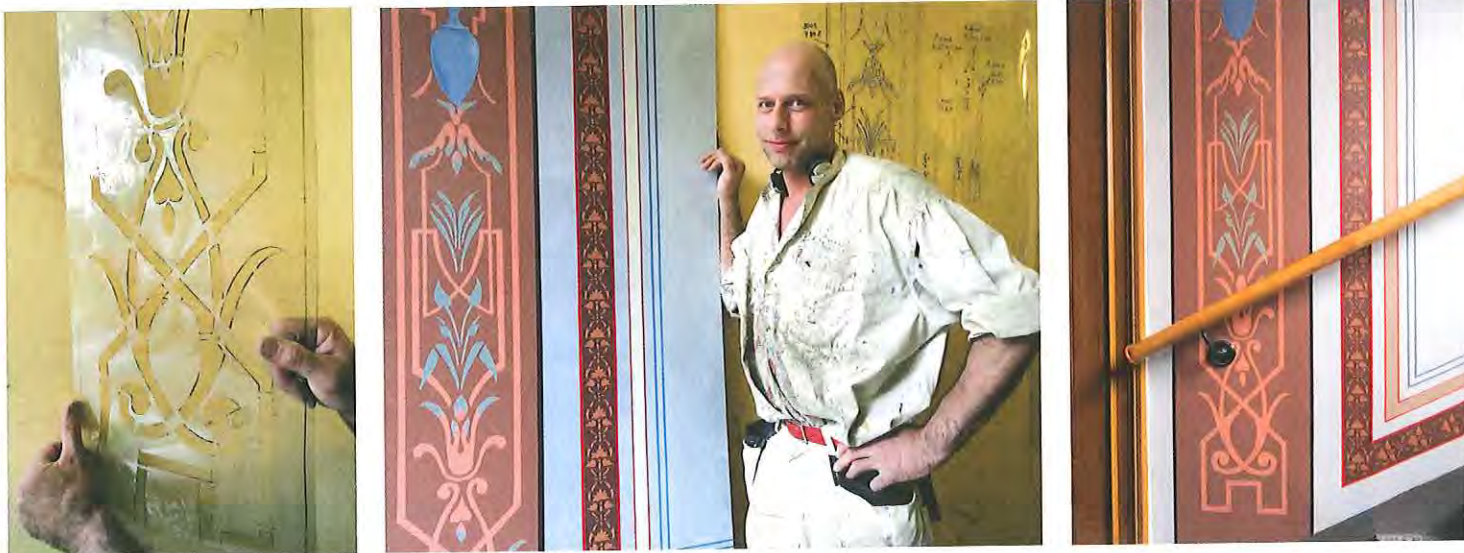
### Conservator involvement

In cases where the building concerned is of high cultural value, and perhaps even a listed historical monument, a conservation expert must take part in the planning in line with the Swedish National Heritage Board's guidelines.

### Sample surfaces and sample rooms

Creating sample surfaces, which may be as much as a whole façade section or room, is an adequate and effective way to ensure that the prescribed standards and execution are achieved during the painting contract. The sample surfaces are to be created at an early stage of the contract, so that they can be inspected and approved by all the parties concerned. The sample surfaces will then act as reference surfaces during the continuation of the contract work. Reference surfaces may already have been established during the planning phase, and they may either comprise older painting work or recently completed surfaces.

Sometimes, there may be reason to save sample surfaces as documentation even after the contract comes to an end. If the sample surfaces were produced on separate sheets, they can be archived if required.



If the paint finish that is to be reconstructed has been preserved under later overpainting, at least parts of the surface have to be removed. This enables materials, colours and

methods to be identified. If necessary, new stencils can then also be made up (left). In the centre picture, artist Karl-Erik Jamtås holds up a sample board ahead of the reconstruction, and the picture to the right shows the finished result.



Existing paint may contain toxic pigment or other environmentally hazardous ingredients. However, red lead is easy to identify by its characteristic red-orange colour, although this fades slightly when exposed to daylight.

#### **Working environment during contract work**

SFV places great emphasis on ensuring a good working environment during painting work at its properties. This applies equally to painters and tenants.

If old paint layers contain lead or other environmentally hazardous pigments, or if there is a suspicion that this is the case, protective measures are to be taken in line with the rules of the Swedish Work Environment Authority. This may mean that the painter will be required to wear personal protective equipment such as a battery-operated fresh air mask and special overalls, and that the surfaces have to be dampened before

scraping and sanding. The workplace must also be well ventilated. If sanding or removal of paint with environmentally hazardous content takes place for a prolonged period, blood samples should be taken from the workers involved before the work in question starts and around two weeks after the work has ended.

The same level of precautionary action applies when painting with paints containing solvents that are hazardous to health. In the case of interior painting with such paints, the workplace must be well ventilated and the painters must have access to carbon filter or fresh air masks.

#### **Fire safety**

Fire at a building site is always undesirable and in a historically valuable building it can be devastating. It is therefore extremely important to ensure that fire safety precautions are in place before contractors start working. No hot work, for example with hot air or infra red heat, may thus be



commenced without first obtaining clearance from the fire safety officer for the site. The person carrying out such work must have undergone training in hot work.

Another common cause of fire is cotton, paper or cloth rags soaked in linseed oil, which risk self-igniting, which is why such items must not be stored on site after the working day has ended. During the working day, linseed oil-soaked rags must be stored in a metal bucket filled with water.

#### **Disposal of paint remnants**

Paint and paint remnants are to be treated as environmentally hazardous waste. Remnants from paint removal are to be collected in a suitable container that is clearly labelled before it is disposed of. Organic solvents such as aliphatic naphtha, white spirit and balsam turpentine, and paints that contain organic solvents are to be handled and disposed of as environmentally hazardous waste, once the contract work has been completed. Other paint remnants are also to be disposed of in line with prevailing legislation. Brushes and other tools are to be cleaned in such a way that paint remnants do not enter the sewerage system.

#### **Documentation**

With all painting projects and contracts for SFV, documentation work is of key importance. The documentation has several functions, including quality assurance of the work and cultural history documentation of the object being worked on. The documentation material also acts as a way of building up knowledge, and may be used in future maintenance work and in research projects, both within and outside SFV's own operations.

Cultural history documentation must generally comprise three parts. The first two parts describe the object before and during the contract work, outlining new and important information that has arisen, as well as what critical decisions have been taken. The third part describes the end re-

sult and how it corresponds to the set objectives. The format and scope of the documentation is to be adapted to each particular object.

Depending on what work has been done and the nature of the contract, the cultural history documentation is to be drawn up by the conservation expert and/or a workmanship quality controller. One of these individuals may also have been involved in the planning. In the case of conservation work, the documentation may also be drawn up by the responsible conservator.

In the final phase of the contract, the contractor must also put together as-built documentation describing the materials, methods and colours that have been used for the contract work. The document may, in some cases, also contain advice on how the treated surfaces should be cared for and maintained. This information is of enormous value for ongoing care and maintenance, and for future painting contracts.

#### **Final inspection and guarantee inspection**

All painting contracts carried out for SFV must end with a final inspection, where the contract work is approved or not. In cases where the area of work is of high cultural value, the inspector must, in addition to knowing about painting, also be familiar with the ins and outs of conserving cultural environments.

Guarantee inspections are to be conducted in line with the stipulations in the procurement. In general, this means that the guarantee inspection will be carried out within five years of the contract work receiving final approval. SFV will also conduct a special inspection to assess the condition of the work within two years of a successful final inspection.

## Management phase



Repainting is not always necessary – or indeed desirable – in culturally and historically valuable environments. This wall panel has not been painted since the mid-1860s. After 150 years or so, the surface was instead cleaned by conservators to bring the paint and gilding back to its original sheen. The line where the finished area meets the area not yet cleaned stands out clearly in the upper part of the picture.

### Ongoing maintenance

Even after recently completed contract work, a painted surface may be in need of care and maintenance, and that need is likely to increase over time.

To avoid unnecessary damage, suitable cleaning routines are to be examined and established at an early stage. In the first instance, the information about care and maintenance work that is handed over on completion of the contract is to inform any decisions.

### Care and maintenance plan

A care and maintenance plan is to be drawn up for painted surfaces and rooms of extremely high cultural value. As well as the cleaning routines, the plan is also to describe any special care needs and suitable measures to facilitate regular attention and ongoing maintenance. Such measures may include carrying out continuous status inspections of the painted surfaces and following up on any changes at suitable intervals.

An object-specific care and maintenance plan may be necessary to maintain cultural and historical values and may also be financially motivated, since incorrect cleaning and unnecessary wear can have a devastating effect.

Regular status inspections and object-specific cleaning routines are good for built cultural heritage. Ongoing professional care can significantly prolong the life of the surface layer. Here, conservator Hanna Edvardsson is cleaning limewashed mouldings using dry methods.



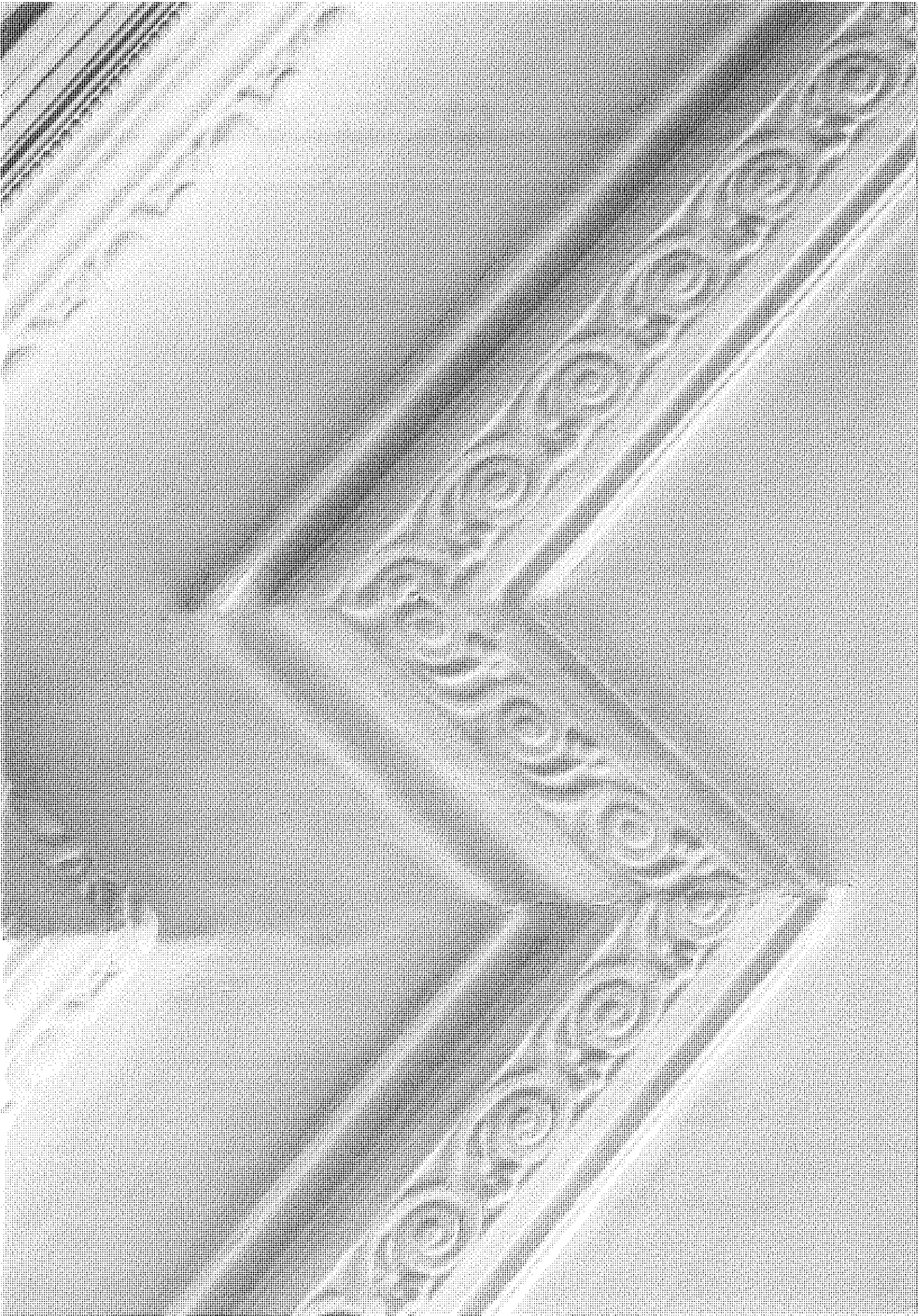
## Further reading on paints and painting

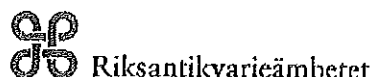
### Bibliography

- BAELING, PETER M. FL., *Linoljefärg utomhus*, 2004
- BROSTRÖM, INGELA och ELISABET STAVENOW  
HIDEMARK, *Tapetboken – papperstapeten i Sverige*, 2004
- FRIDELL ANTER, KARIN och HENRIK WANNFORS, *Så målade man – svenskt byggnadsmåleri från senmedeltid till nutid*, 1989
- FRIDELL ANTER, KARIN, ÅKE SVEDMYR och HENRIK WANNFORS, *Byggnadsmåleriets färger – material och användning*, 2010
- DREIJER, CLAES, CONNY JERKBRANT och CARL-ERIK WIKNER m. fl., *Arkitekter om färg och måleri*, 1992
- HIDEMARK, OVE m. fl., *Så renoveras torp och gårdar*, 2006
- Hantverket i gamla hus*, red. Rebecka Millhagen, 1998
- Hantverkets bok – Färgval*, red. Gregor Paulsson, Carl Olof Sjögren och Sven Hesselgren, 1936
- Hantverkets bok – Måleri*, 2:a uppl., red. Gregor Paulsson, Amandus Gustavsson och Olof Thunström, 1934
- Hantverkets bok – Måleri*, 3:e omarbetade uppl., red. Gregor Paulsson, Amandus Gustavsson och Olof Thunström, 1937
- Hantverkets bok – Måleri*, 5:e omarbetade uppl., red. Paul Nylén, Einar Söderberg och Tryggve Johansson, 1953
- JOHANSSON, ALF, *Med pigment och kopaler. Svensk färgindustri under 200 år. Del 1. Fram till 1920-talets mitt, Sveriges Färgfabrikanters Förening*, 2001
- *Massproduktion och välfärd. Svensk färgindustri under 200 år. Del 2. Tiden 1925 till 1970*, Sveriges Färgfabrikanters förening, 2004
- KJELLANDER, KARL, *Den svenske färghandlaren – Sveriges färghandlares riksförbunds instruktionsbok för medlemmarna*, 1935.
- *Färghandelns varukännedom – För färghandlares riksförbunds räkning sammanställd av K. Kjellander*, Sveriges färghandlares riksförbund, 1940
- *Svensk drogist-handbok – Uppslagsbok för drog- och färghandlare samt tekniska fabrikanter*, Karl Kjellander, 1912
- Kungliga fönster – Om fönstrens renovering på Stockholms slott 1991–2002*, Statens fastighetsverk, 2003
- LENANDER, K.J., *Materiallära för målare*, 1924
- LYCKMAN KARLSDOTTER, KERSTIN, *Historiska oljefärger i arkitektur och restaurering*, 2005
- SILVÉN, EVA, *Bekänna färg – modernitet, maskulinitet, professionalitet*, 2004
- Tekniska anvisningar – Putsarbeten*, Statens fastighetsverk, 2007
- Tekniska anvisningar – Trä som byggnadsmaterial*, Statens fastighetsverk, 2007
- Tekno's måleri, material – teknik – färglära*. 2:a omarbetade upplagan, red. Kjell Johansson och Bertil Ollerstad, 1975
- SVENSSON, LARS-ÅKE och JAN WITTSTRÖM, *MåleriHandbok 09*, 2009
- Särtryck ur AMA Hus08 – Måleriarbeten*. Svensk Byggtjänst, 2009
- TUNANDER, PONTUS, *Förgyllning*, 1997

### Web addresses

- [www.boverket.se](http://www.boverket.se), Boverket – The Swedish National Board of Housing, Building and Planning
- [www.byggtjanst.se](http://www.byggtjanst.se), AB Svensk Byggtjänst
- [www.byggvarubedomningen.se](http://www.byggvarubedomningen.se), Byggvarubedomningen
- [www.kemi.se](http://www.kemi.se), Kemikalieinspektionen – The Swedish Chemicals Agency
- [www.kretsloppsradet.com](http://www.kretsloppsradet.com), Kretsloppsrådet – The Ecocycle Council
- [www.malerimuseum.nu](http://www.malerimuseum.nu), Måleriyrkets Museum – museum of the painting profession
- [www.ncscolor.com](http://www.ncscolor.com), NCS
- [www.raa.se/cms/materialguiden/start.html](http://www.raa.se/cms/materialguiden/start.html), The Swedish National Heritage Board's materials guide (in Swedish)
- [www.raa.se](http://www.raa.se), Riksantikvarieämbetet – The Swedish National Heritage Board
- [www.sveff.se](http://www.sveff.se), Sveriges färgfabrikanters riksförening – The Swedish Paint and Printing Ink Makers Association





## ÖVERENSKOMMELSE OM ANVÄNDNINGEN AV TRADITIONELLA LINOLJEFÄRGER INNEHÅLLANDE ORGANISKA LÖSNINGSMEDEL FÖR INVÄNDIGT MÅLERI VID UNDERHÅLL OCH RESTAURERING AV KULTUR- HISTORISKT VÄRDEFULLA BYGGNADER.

Överenskommelsen har träffats med anledning av bestämmelser i lagen (1988:950) om kulturminnen m.m. (kulturminneslagen), förordningen (1988:1229) om statliga byggnadsminnen m.m., plan- och bygglagen (1987:10), lagen om kemiska produkter (1985:426) samt arbetsmiljölagstiftningen, bl.a. Arbetskyddsstyrelsens kungörelse (AFS 1990:14) med föreskrifter om organiska lösningsmedel jämte allmänna råd om tillämpningen av föreskrifterna.

### Parter

Målaremästarnas Riksförening och Svenska Målareförbundet är avtalslutande parter inom måleribranschen. Riksantikvarieämbetet är central myndighet för kulturmiljövården och har ett övergripande ansvar för att byggnader och anläggningar som är särskilt värdefulla från kulturhistorisk synpunkt får den vård som krävs för att deras kulturhistoriska värde och autenticitet skall vidmakthållas.

Mellan Målaremästarnas Riksförening och Svenska Målareförbundet samt Riksantikvarieämbetet har träffats följande överenskommelse. Den ersätter tidigare överenskommelse daterad 3 juni 1987.

### Överenskommelsens innehåll

Bevarandet av byggnaders kulturhistoriska värde och autenticitet förutsätter att man inte frångår traditionell målningsbehandling, varken vad det gäller materialval eller tekniskt utförande. Det är också nödvändigt att de material och metoder som används är väl beprövade och lämpliga med hänsyn till framtida upprepat underhåll och berörda byggnadsdelars fortbestånd.

Traditionella linoljefärger innehållande organiska lösningsmedel får användas vid underhåll och restaurering av byggnadsinteriörer som är särskilt värdefulla från kulturhistorisk synpunkt. En förutsättning är att interiörens särskilda värde och betydelsen av ett sådant materialval är bestyrkt från kulturhistorisk synpunkt.

Överenskommelsen tillämpas i följande fall:

1. Vid underhåll och restaurering av byggnadsinteriörer i byggnadsminnen och kyrkor som omfattas av skyddsbestämmelser enligt 3 och 4 kap. kulturminneslagen. (Information lämnas av länsstyrelsen.)
2. Vid underhåll och restaurering av byggnadsinteriörer i statliga byggnadsminnen som omfattas av skydd enligt förordningen om statliga byggnadsminnen. (Information lämnas av Riksantikvarieämbetet.)
3. Vid underhåll och restaurering av byggnader som avses i 3 kap. 12§ plan- och bygglagen och som skyddas genom kommunala planbestämmelser. (Information lämnas av kommunens byggnadsnämnd.)
4. Vid underhåll och restaurering av särskilt värdefulla interiörer som utföres med statligt stöd för vård av kulturhistoriskt värdefulla byggnader. (Information lämnas av länsstyrelsen.)
5. Vid underhåll och restaurering av särskilt värdefulla interiörer i andra kulturhistoriskt värdefulla byggnader än enligt punkt 1- 4. Det kulturhistoriska värdet skall då bestyrkas med intyg i varje särskilt fall. Bestyrkandet skall lämnas av Riksantikvarieämbetet, länsstyrelser, läns museer eller kommunala organ med kulturhistorisk kompetens. Intyget skall föreligga vid upphandling av målningsarbetet.

Vid målningsarbete med traditionell linoljefärg skall betryggande åtgärder vidtagas för skydd mot de hälsovådliga lösningsmedlen i enlighet med Arbetarskyddsstyrelsens föreskrifter. Dessa skyddsåtgärder innebär merkostnader, som skall ingå vid upphandling. Vid arbeten som genomförs med statligt stöd kan dessa merkostnader i vissa fall ingå i bidragsunderlaget.

## AGREEMENT ON THE USE OF TRADITIONAL LINSEED PAINTS CONTAINING ORGANIC SOLVENTS FOR INTERIOR PAINTING DURING MAINTENANCE AND RESTORATION OF CULTURALLY AND HISTORICALLY VALUABLE BUILDINGS.

This agreement has been entered into with reference to the provisions of the Swedish Heritage Conservation Act (1988:950), the Ordinance (1988:1229) on Historical Monuments of National Value, the Swedish Planning and Building Act (1987:10), the Swedish Chemical Products Act (1985:426) and work environment legislation, including the Swedish Work Environment Authority's provisions (AFS 1990:14) on organic solvents, and general recommendations on applying those provisions.

### Parties

Målaremästarnas Riksförening and the Swedish Painters' Union are the contracting parties within the painting profession. The Swedish National Heritage Board is the central authority for heritage conservation and has overall responsibility for ensuring that buildings and facilities that are particularly valuable from a cultural and historical perspective receive the care required in order to uphold their cultural and historical value and authenticity.

The following agreement has been signed between Målaremästarnas Riksförening, the Swedish Painters' Union and the Swedish National Heritage Board. It replaces the previous agreement dated 3 June 1987.

### Content of the agreement

Preserving the cultural and historical value and authenticity of buildings requires that there is no deviation from traditional paint treatments, either in terms of material choice or technical execution. It is also necessary that the materials and methods used are tried and tested, and suitable with regard to future repeated maintenance and the continued existence of the parts of the building concerned.

Traditional linseed paints containing organic solvents may be used for maintenance and restoration of building interiors that are particularly valuable in cultural and historical terms. One

condition is that the particular value of the interior and the importance of such a material choice are supported from a cultural and historical perspective.

### The agreement will be applied in the following cases:

1. When maintaining and restoring interiors in historical monuments and churches subject to protection under chapters 3 and 4 of the Swedish Heritage Conservation Act. (Information provided by the County Administrative Board.)

2. When maintaining and restoring interiors in listed historical monuments protected under the Ordinance on Historical Monuments of National Value. (Information provided by the Swedish National Heritage Board.)

3. When maintaining and restoring buildings that are referred to in chapter 3, section 12 of the Swedish Planning and Building Act and that are protected under municipal planning provisions. (Information provided by the municipality's planning office.)

4. When maintaining and restoring particularly valuable interiors using government funding for the care of culturally and historically valuable buildings. (Information provided by the County Administrative Board.)

5. When maintaining and restoring particularly valuable interiors in culturally and historically valuable buildings other than those in points 1–4. In this situation, the cultural and historical value is to be certified in each individual case. The supporting certification is to be submitted to the Swedish National Heritage Board, county administrative boards, county museums or municipal bodies with competence in the heritage sphere. The certification is to be available when procuring painting work.

Where painting work involves traditional linseed paints, safety measures are to be taken to protect against solvents that are hazardous to health, in line with the AFS provisions of the Swedish Work Environment Authority. These protective measures represent an additional cost that is to be included in the procurement. In the case of work carried out using government funding, these additional costs may, in certain circumstances, be included in the costing on which the funding is based.





**Tradition is change.** Sweden has many buildings and environments of great value to its cultural history. Each one is part of the nation's history and its future.

The National Property Board (SFV) aims to make the Swedish people proud of the nation's property: our public buildings and open spaces, palaces and royal parks, theatres, museums, embassies and one seventh of Sweden's total landmass. All are owned by the Swedes collectively. The duty of the Board is to administer them in the best possible way.

We also ensure that the soul and character of the buildings are retained, while at the same time adapting them for use in the modern age – to the benefit and enjoyment of tenants and the public alike. Just as important as passing on the history behind existing buildings is the creation of new buildings worthy of the future. We have therefore been commissioned by the Swedish government to carry out new building projects which are representative for our nation.

SFV also administers state-owned forests and land. We take an approach of long-term sustainability, preserving biodiversity and maintaining reindeer pasture lands for the benefit of future generations.

