CONDITIONS AND INTERNAL QUALITY CONTROLS

FOR THE INDUSTRIAL APPLICATION

OF JOINERY WITH WATER-BASED PAINTS
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1 STATE OF AFFAIRS

For the certification of paints on wooden façade elements that are provided with a KOMO® quality declaration, the AD (Assessment Directive) 0814 ‘Film forming coatings for application on timber’ and AD 0817 ‘Film-forming midcoat and topcoat systems on timber’ apply.

With these ADs, the quality of a paint system is tested under minimum application circumstances prescribed by the paint supplier. These instructions apply to the following assessment directives:

- AD 0801 ‘Wooden façade elements’;
- AD 0803 ‘Wooden exterior doors’;
- AD 0806 ‘Paint application on timber and sheet material for the building industry’;
- AD 0812 ‘Profiled components for joinery’.

This publication is an instrument to assess whether a factory has been equipped to apply water-diluted paints on soft- and hardwoods. This publication also determines which minimum internal controls have to be executed to make sure that water-based paints are applied well in the joinery industry (see appendix 4).

2 REQUIREMENTS AND CRITERIONS FOR THE USE OF WATER-DILUTED PAINTS

The publication consists of criteria, requirements and an accompanying questionnaire, which can be used to establish whether a company, given its specific circumstances, is suitable to apply water-diluted products.
### 3 REQUIREMENTS FOR JOINERY MANUFACTURERS / DOOR MANUFACTURERS / PAINTAPPLICATORS

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Moisture content</strong></td>
<td>Guaranteed at % laid down in SKH-Publication 99-05, meaning in practice the presence of a humidifier (RH ≥ 50%), as long as the timber is not treated.</td>
</tr>
<tr>
<td><strong>Application apparatus</strong></td>
<td>Shall be suitable for water-based paint; documentation shall be available.</td>
</tr>
<tr>
<td><strong>Paint</strong></td>
<td>According to AD 0814 and/or 0817. The KOMO® certificate of the paint supplier must be present. Any deviations of the process parameters according to the AD 0817 should be substantiated in accordance with the SKH-Publication 06-03.</td>
</tr>
<tr>
<td><strong>Storage of paint stock</strong></td>
<td>Free of frost</td>
</tr>
<tr>
<td><strong>Work stock of paint</strong></td>
<td>≥ 15 °C</td>
</tr>
<tr>
<td><strong>Re-use of paint</strong></td>
<td>In case paint is re-used, the conditions under which this takes place shall be recorded (see also appendix 3).</td>
</tr>
<tr>
<td><strong>Processing instructions of paint</strong></td>
<td>The processing instructions shall be present for all coatings applied.</td>
</tr>
<tr>
<td><strong>Control of expiration date paint</strong></td>
<td>See appendix 5 TIFA-E 12.014 (VVVF) version 2</td>
</tr>
<tr>
<td><strong>Registration</strong></td>
<td>Continuous registration of above-mentioned temperature and RH. Remark: put data loggers in a representative place (height midway element height)</td>
</tr>
<tr>
<td><strong>Measuring equipment</strong></td>
<td>Measuring- and registration equipment must be regularly calibrated.</td>
</tr>
<tr>
<td><strong>Heating</strong></td>
<td>Should the heating fail, one should be able to intervene timely. This means that an alarm shall be present. In case this alarm is not present, a written procedure should be present in which it has been arranged how to deal with failing heating. When required part of the production needs additional drying at the correct temperature.</td>
</tr>
<tr>
<td><strong>Control of layer thickness</strong></td>
<td>See appendix 4</td>
</tr>
<tr>
<td><strong>Cross-branding</strong></td>
<td>The application of combined paint systems made up from certified paint systems or subsystems from different manufacturers, see Appendix 6</td>
</tr>
<tr>
<td><strong>Storage</strong></td>
<td>In accordance with AD 0801, 0803 and 0806</td>
</tr>
<tr>
<td><strong>Packing</strong></td>
<td>In consultation with client</td>
</tr>
<tr>
<td><strong>Personnel</strong></td>
<td>Executive and supervising personnel shall be acquainted with the requirements as well as the measurements and controls to be executed</td>
</tr>
</tbody>
</table>
Compatibility

The paints shall be demonstrably compatible with other products such as:
- sealers;
- fillers and repair kits;
- lubricants;
- glue;
- connectors.
See appendix 2 for the proving of the compatibility.

<table>
<thead>
<tr>
<th>Compatibility</th>
<th>The paints shall be demonstrably compatible with other products such as:</th>
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</thead>
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<td>- lubricants;</td>
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<td></td>
<td>- glue;</td>
</tr>
<tr>
<td></td>
<td>- connectors.</td>
</tr>
<tr>
<td></td>
<td>Determine a.d.w. supplier frame work seals</td>
</tr>
</tbody>
</table>

Repaint ability

The supplier of the joinery shall indicate on delivery which brand and type of paint has been applied, and in what way the joinery can be maintained, defined in a paint technical instruction and maintenance recommendation.

<table>
<thead>
<tr>
<th>Repaint ability</th>
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Requirement for paint-suppliers

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<th>Paint</th>
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4 ADDITIONAL REQUIREMENTS FOR PAINT SUPPLIERS

1. The paint system for the primer systems or pre- and/or final lacquer system offered shall have to be tested and approved in accordance with AD 0814 ‘Film forming coatings for application on timber’ or AD 0817 ‘Film-forming midcoat and topcoat systems on timber’.

2. The supplier shall indicate at least for each separate paint system per layer:
   - minimum and maximum temperature during application;
   - minimum and maximum RH during application;
   - minimum and maximum wet layer thickness;
   - minimum temperature and maximum RH during drying;
   - minimum drying time between two layers;
   - minimum air velocity to be kept between the treated pieces of work;
   - time during which the minimum drying temperature shall be at least maintained; this time can vary depending on the actual temperature, RH and air circulation during drying and the colour of the finish*;
   - minimum temperature and maximum RH in case of through and through drying;
   - time during which the minimum through and through temperature shall be at least maintained; this time can vary depending on the actual temperature and RH during the drying and the colour of the finish*;
   - suitability for bleeding timber species;
   - operating information storage (work) stock paint;
   - the timber species for which the product is supposed to be suitable.

3. The paint supplier shall indicate by which paint products the primer or midcoat can finally be painted by means of a technical data sheet.

* For the specific minimum drying conditions, reference is made to the paint supplier’s certificate.
APPENDIX 1 FOUNDATION FOR DEVIATING PROCESSES

By applying SKH Publication 06-03 ‘Finishing wooden façade elements and wooden exterior doors on the basis of performance requirements’ it is possible to deviate for the following ADs from this publication:

- AD 0801 ‘Wooden façade elements’;
- AD 0803 ‘Wooden exterior doors’;
- AD 0806 ‘Paint application on timber and sheet material for the building industry’;
- AD 0812 ‘Profiled components for joinery’.
APPENDIX 2 COMPATIBILITY OF WATER-BASED PAINT WITH OTHER MATERIALS

When the information about the compatibility of water-based paint with other materials such as sealants, filling and repair kits, adhesives, sealers and lubricants is not available, an indication can be obtained in the following way.

Only the material combinations that could occur in the production process of the joinery factory shall be inspected. During the inspection process the conditions (drying times, temperatures, method of application etc.) used in practice must be followed.

Principle
Timber samples shall be transported through the production process. The materials to be tested shall be installed and dried at the usual place in the production process. Before or after the installation of the materials the paint shall be applied. The adhesion of the paint on the material to be examined shall be tested. Should the adhesion be class 0 or 1 then the compatibility has been, in principle, demonstrated. All tests are carried out singularly.

Adhesion test
The adhesion test shall be carried out in accordance with SKH-Publication 05-01 'Determination of the dry adhesion of paint on wood' for the following products:

- lubricants;
- filling and repair kits;
- adhesives;
- sealers;
- sealants (paint on sealant);
- products which are provided with a primer system at another location according to AD 0814;
- products which are provided with a mid- or topcoat system at another location according to AD 0817.

The samples shall be, as is usual in the factory, provided with a layer of paint. After critical drying the adhesion test is carried out.
APPENDIX 3 ASSISTANCE IQC DIRECTIVE FOR RECYCLING PAINT

Methods for recycling paint

Flow coater
A buffer of paint in a flow coater is continuously filled up with fresh paint and fresh water. It is important to check the viscosity regularly to ensure good flow. Attention: the surplus of paint applied runs off the window frames/windows/doors and falls into a drip tray. It is important to dampen or clean the drip tray day a few times a day in order to stop the paint from drying up before entering the flow coater. **Attention: do not** use any rinsing water from the sprayer in this process – dirty rinsing water is disastrous for the quality of the flow coat.

Condensation wall
The dew point temperature at the condensation wall is of importance for the condensation of the moisture on the wall. The paint does not dry due to this layer of water and runs to the catchment gully. Good housekeeping of the temperature and RH in the spraying hall is of importance. The spraying hall shall preferably be closed from the rest of the production in connection with dust pollution and climate control.
The viscosity of the reclaimed product can be lower by condensation water absorbed, by which the mixing ratio between fresh product and reclaimed product is critical.

Recycling column
The recycling column is used in combination with the automatic electro-static spraying in a closed cabin. By doing this the temperature and the RH can easily be regulated. The column will have to be humidified. However, too much water gives a low viscosity of the reclaimed product. The column may not continuously be scraped in order to prevent drying of the paint. **NOTE!** This differs from the recycling belt that does need to be stripped off continuously to prevent the paint from drying.

Recycling belt
The recycling band also stands in a cabin together with the automatic electrostatic spray. The temperature and RH can be regulated well. The band is always moving and is always raked in order to prevent the paint from drying and to prevent the viscosity from becoming too low to use the reclaimed product.

General conditions concerning the recycling of spray paint
The paint collected shall always be mixed with fresh paint in a mixing ratio agreed on with the paint supplier. This mixing ratio is important to prevent an excessive quantity of repeatedly collected paint in recycled paint. In order to prevent blocked up nozzles it might be necessary to filter the paint. The recycled paint shall be used as soon as possible in order to prevent contamination. It is recommended that colours are not mixed. When required such mixed paint can be used on e.g. cavity wall laths.

Recycled paint may never be used as a final coat.
By the paint supplier and the joinery manufacturer together the following matters shall be recorded and maintained:

- protocol for recycling of paint, in which is included in any event: the maximum ratio of collected and fresh paint to be mixed, the prescribed wet coat thickness of the recycled paint (bandwidth) and the settings of the equipment/system;
- control of the climate (temperature and RH) and data logging;
- registration of the recycled paint (composition and mixing date);
- annual check of the recycled paint for the water absorption and adhesion after application in accordance with the process parameters as these apply in the factory concerned. This inspection must be conducted by an independent and appropriately accredited laboratory, according to SKH Publication 06-03.

Checklist recycling

**Flow coater**
- Manage the viscosity several times a day;
- Cleaning procedure;
- Procedure drainage rinsing water;
- Daily empty the paint from the draining zone and add it to the basis paint shall be a part of the IQC.

**Spraying application**
- Does the recycling take place per colour?
- How long is the caught paint left to stand?
- What are the arrangements with the paint supplier in relation to the mixing ratio of the caught and the fresh product?
- Keeping a record of the quantity of product caught mixed with fresh paint;
- Control of the climate in and around the spraying cabin;
- Is the quality of the recycled product regularly tested (water absorption and adhesion)?
APPENDIX 4 MINIMUM QUALITY CONTROLS TO BE EXECUTED IN THE (JOINERY) FACTORY WITH REGARD TO PAINT

Below-mentioned IQC instructions apply to companies that are certified in accordance with one of the following ADs:
- AD 0801 ‘Wooden façade elements’;
- AD 0803 ‘Wooden exterior doors’;
- AD 0806 ‘Paint application on timber and sheet material for the building industry’;
- AD 0812 ‘Profiled components for joinery’.

Remark: for the specific requirements concerning layer thicknesses, number of paint layers and paints to be applied reference is made to the relevant AD.

**Control of wet layer thickness**

**Method:**
determination by means of measuring comb (stainless steel finish).

**Control apparatus:**
wheel or comb layer thickness meter.

**Location of control:**
in axial direction of the timber at random on 5 places, however 1 measurement on the outer face and 1 measurement of the (glass) rebate of both stile and sub-threshold. The measurement shall take place between 1 and 4 minutes after applying the layer of paint.

**Number of controls:**
5 times distributed over per day and at each change of paint.

**Control of dry layer thickness**

**Method:**
determination by means of dry layer thickness meter.

**Control of apparatus:**
Apparatus to measure the dry layer thickness (destructive or non-destructive) with an accuracy of 10 microns.

**Location of control**
At random at 5 places, however 1 measurement on the outer face and 1 measurement of the (glass) rebate of both stile and threshold. The measurement shall take place after the critical drying time. The layer thickness is measured from the timber surface (without the paint penetrated into the timber).

**Number of controls:**
onece a week on 5 random places on the element.
Control of closed paint layer

Method:
see SKH Publication 06-02 ‘Assessment of the closedness of a paint film on timber’.

Control of apparatus:
magnifying glass (10x) with illumination (preferably 50 x).

Location of control:
at random at 5 different places of the wooden façade element.

Number of controls:
at least 5 times per week. Attention, special attention for coarse-grained wood species

Control of paint adhesion after critical drying

Method:
see SKH Publication 05-01 ‘Determination of the dry adhesion of paint on wood’.

Control of apparatus:
- a template for making the x/section;
- tape;
- knife.

Location of the control:
at random on a separate sample.

Number of controls:

<table>
<thead>
<tr>
<th>Number of frames/doors produced per year</th>
<th>Number of tests per year</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤ 500 items</td>
<td>2 x (every 6 months)</td>
</tr>
<tr>
<td>501 to 2500 items</td>
<td>4 x (every 3 months)</td>
</tr>
<tr>
<td>2501 to 5000 items</td>
<td>8 x (every 6 or 7 weeks)</td>
</tr>
<tr>
<td>≥ 5001 items</td>
<td>12 x (every month)</td>
</tr>
</tbody>
</table>

The joinery factory shall record here the project number of the job for which the separate sample went through the sprayer. The batch number of the paint used is also to be recorded.

Coated panel material per day

<table>
<thead>
<tr>
<th>Coated panel material per day</th>
<th>Number of tests per year</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤ 50 m²</td>
<td>2 x (every 6 months)</td>
</tr>
<tr>
<td>51 to 250 m²</td>
<td>4 x (every 3 months)</td>
</tr>
<tr>
<td>250 to 500 m²</td>
<td>8 x (every 6 or 7 weeks)</td>
</tr>
<tr>
<td>≥ 501 m²</td>
<td>12 x (every month)</td>
</tr>
</tbody>
</table>

The factory shall record here the project number of the job for which the separate sample went through the sprayer. The batch number of the paint used is also to be recorded.
APPENDIX 5 SHELF-LIFE OF PAINT

With regard to the shelf-life of paint there is a difference between not previously opened containers and those that have already been opened.

**Unopened containers**
For unopened containers the following applies:
The shelf life date as stated on the label and/or the shelf life period given in the Technical Data Sheet from the paint supplier. This period refers to the number of months after production date (more specifically, the date at which the paint was given its colour). The shelf-life may vary per supplier.

**Previously opened containers**
The shelf-life of paint in opened containers depends on several factors.
For previously opened containers the following applies: if the undermentioned conditions regarding quality and storage of the paints are met, the shelf-life may be considered equal to the shelf-life of un-opened containers. Whenever one of the conditions is not met, the product warranty is void.

**Conditions regarding the quality and storage of paints**
The conditions are:
- storage of residues under conditions as prescribed by the paint supplier These conditions are part of the technical documentation of the producer concerned;
- storage of residues in well-closed original containers. Residues may not contain impurities like paint skin, wood dust, abrasive dust etc. (visually noticeable);
- residues may not contain rinsing water from the cleaning of the spraying equipment (discernible from the consistency of the paint);
- residues may not originate from the rinsing out of the spray equipment (discernible from the consistency and foam forming of the paint);
- residues may not show signs of bacterial contamination (discernible from the specific putrid odour).
APPENDIX 6 CROSS-BRANDING

By cross-branding should be understood the combination (crossing) of KOMO-certified paint systems from different paint manufacturers (brands). Various different situations are possible here. Below is explained for each situation what additional measures must be taken by the joinery factory and in what case a system may be called upgraded.

Situation I:
A joinery factory buys in parts that are provided with a certified undercoat or primer system and brings them up to colour by having them go through the last application stage of their own application process. Concept I remains Concept I and Concept II remains Concept II.

In the case of situation I, the joinery manufacturer must test the adhesion after the joinery factory’s critical drying period has elapsed, according to the usual frequency and as indicated in Appendix 4. The adhesion must be Class 1 or better.

Situation II:
A joinery factory buys in parts that are provided with a certified primer system and wishes to upgrade these to Concept II or Concept III. The primer system used and the undercoat or top coat are from the same paint supplier and appear as a system on the paint supplier’s AD 0817 certificate. Concept I becomes Concept II or Concept III.

In the case of situation II, the joinery manufacturer must test the adhesion after the joinery factory’s critical drying period has elapsed, according to the usual frequency and as indicated in Appendix 4. The adhesion must be Class 1 or better.

Situation III:
A joinery factory buys in parts that are provided with a certified primer system and wishes to upgrade these to Concept II or Concept III. The primer system present and the undercoat or top coat used are from different paint manufacturers and as such are not tested against the requirements of AD 0817. Concept I becomes Concept II or Concept III.

In the case of situation III, the joinery manufacturer must demonstrate that the primer system from paint manufacturer X applied in location A in combination with the coat/coats from paint manufacturer Y applied in location B fulfil the requirements as included in AD 0817 and for this must follow the protocol as included in SKH publication 06-03. The tests must be conducted by an independent and appropriately competent laboratory. Also, the joinery manufacturer must test the adhesion after the joinery factory’s critical drying period has elapsed, according to the usual frequency and as indicated in Appendix 4. The adhesion must be Class 1 or better.
Situation IV:
A joinery factory buys in parts that are provided with a certified undercoat system and wishes to upgrade these to a top coat system. Concept II becomes Concept III.

Situation IV applies when the joinery manufacturer uses a top coat paint from the same paint manufacturer as the bought-in undercoat system and the entirety appears as a system on the paint supplier’s AD 0817 certificate. The joinery manufacturer must test the adhesion after the joinery factory’s critical drying period has elapsed, according to the usual frequency and as indicated in Appendix 4. The adhesion must be Class 1 or better.

When, in situation IV, the joinery factory makes use of a top coat paint from a different paint supplier from that used to spray the undercoat system, the paint adhesion must be tested weekly according to Appendix 4. The adhesion must be determined after the joinery factory’s critical drying period has elapsed and must be Class 1 or better.
APPENDIX 7

After a paint system has dried there might be a chance you see very small dots/holes in the paint film. These dots/holes are not bigger as a pinprick and are caused by air which was trapped in the wet paint film. This air is called ‘micro foam’.

Possible issues which might occur because of micro foam are:
1. Esthetic failure (metallic appearance);
2. Dirt and fungi pick up;
3. Increased water uptake of the paint system.

Possible causes of micro foam
Overall there are two possible causes for the presence of micro foam:
1. The paint / application process
2. The equipment being used

To prevent micro foam from occurring it’s recommended to discuss the issue with your paint and equipment supplier. Besides that the provided guidelines must be followed at all time.

Paint

More likely to occur in a topcoat system In general micro foam occurs more often in topcoat systems (Concept III), because of the raw materials (additives) used in these products.

High film thickness When a high wet layer of paint is applied, the air in the paint slowly moves to the surface and can be trapped on its way.

Flash off Shortly after application of the paint, the system needs sufficient time in a ‘flash off’ zone, according the KOMO certificate of the paint supplier.

Quick drying When paint is dried to quickly, air can be trapped in the process.

Stirring of the paint When paint is colour matched or stirred before use, air can be trapped in the paint. Therefore colour matched paint or paint which has just been stirred needs to ‘rest’ before use. The time defers between the type of paint and paint supplier, but in general this should be at least 30 minutes.

Mixing of paint is preferably done with a thumbler-system (eccentric rotating mixer), but never with a vertical shaker or cement mixer. There are specific mixing systems available for water based paints.
Application equipment

Spray cap/ nozzle
The use of old, worn out spray caps or nozzles or the use of the incorrect one can cause micro foam.

Spray pump/ spray gun
Micro foam occurs more often when airless systems are being used compared to air-mix systems.

Spray pressure
The higher the pressure, the more air is used and the more can be trapped in the paint. In this case the pressure on the paint needs to be checked and if necessary the air assist in the case of air-mix application.

Distance to the substrate
When the distance to the substrate is too little (< 25 cm) this can cause air to be trapped in the paint.

Hoses
In the hoses over time very small holes and/or cracks can appear. Because of this additional air is being sucked in to the paint while running through the hoses, causing micro foam.

The damage to the hoses is often caused by bending of hoses which are covered with paint. The paint can make the hoses more brittle and while covered with paint cracks are not visible. Good housekeeping is essential.

Recycling
When paint is recycled defoamers (present in paint formulations) can over time lose their efficiency.

Return hose
When a return hose is being used the paint is pumped back in to the can with the same speed as being sprayed, therefore a lot of air continuously is being pumped in the paint.

The next page shows a checklist of actions to be taken when micro foam occurs. If the first action does not result in a positive outcome move on to the next.
Micro foam checklist

1. Is there microfoam present in the can?
   a. is the method of mixing and mixing time used as described?
   b. in case a return hose is being used, check pressure possibly too high;
   c. wait time between mixing and spraying respected? (min. 30 minutes)

2. Is a recycling installation being used, see also Appendix 3
   a. is the correct recycling ratio respected?
   b. is the viscosity of the paint still within specifications?

3. Is the correct layer thickness applied?
   a. a higher wet layer thickness might result in poor air release.

4. Are the flash-off conditions (certificate paint supplier) respected?
   a. increase flash-off time

5. Are the application conditions (certificate paint supplier) respected?
   a. a higher temperature results in quicker drying, which might cause micro foam; increase flash off or slow down drying;
   b. an increase in air flow also causes the paint to dry quicker, which again might cause micro foam; increase flash off or slow down drying.

6. Check spray cap/nozzle for:
   a. wear-out (is the spray pattern still okay)
   b. time in use

7. Check pressure:
   a. correct pressure and re-check 6, do NOT just increase pressure!!!
   b. set correct pressure

8. Is the distance to the substrate correct?
   a. distance between spray gun and substrate should be 25 – 30 cm

9. Check equipment for: (Good Housekeeping)
   a. kinks in hoses;
   b. dried paint on the hoses;
   c. brittle hoses (old hoses);
   d. condition of seal rings and clamps;
   e. testing with a spare hose is a good way of checking the condition of the hoses in use.

Contact your paint- and/or equipment supplier if one of the above actions doesn’t solve the issue.
LIST OF DOCUMENTS REFERRED TO

AD 0801 ‘Wooden façade elements’;
AD 0803 ‘Wooden exterior doors’;
AD 0806 ‘Paint application on timber and sheet material for the building industry’;
AD 0812 ‘Profiled components for joinery’.
AD 0814 ‘Film forming coatings for application on timber’
AD 0817 ‘Film-forming midcoat and topcoat systems on timber’

SKH Publication 99-05: Approved timber to be used in wooden façade elements (window frames, windows and doors)
SKH Publication 02-03: Basis for the assessment of fillers
SKH Publication 04-01: Assessment of sealants for the timber industry
SKH Publication 05-01: Determination of the dry adhesion of paint on timber
SKH Publication 06-02: Assessment of the closedness of a paint film on timber
SKH Publication 06-03: Finishing wooden façade elements and wooden exterior doors on the basis of performance requirements
SKH Publication 07-01: Overview of sealers allowed for the joinery industry
SKH Publication 08-06: Fire-resistance