“The Importance of Good Sanding Practice”

The surface preparation and sanding in particular, is of paramount importance if both cosmetically acceptable and durable paint schemes are to be achieved.

The durability of the paint system depends on the ability of one coating to stick to another and also the ability of the very first coat of paint applied to adhere thoroughly to the substrate.

Sanding not only improves inter-coat adhesion, but it determines the final aesthetic result, and the best results can only be achieved by using the correct sanding method. Sanding paintwork on a yacht is labour intensive and time consuming but it is essential to execute the operation correctly and efficiently. During the process of sanding, grooves are created and they will be wider or deeper depending on the grade of paper used. By sanding and producing a series of grooves the surface area is increased so that when a coating is applied there is a greater surface area for adhesion. Sanding also progressively refines the surface so that the finished appearance is one of smoothness without underlying defects such as sanding marks being visible.

Sanding step by step

It is very important that sanding is undertaken with the correct grade of paper. The filler or paint applied after a sanding operation must fill up the sanding scratches in such a way that they will be invisible after further application of paint and remain so thereafter. Filling up the scratches will not only depend on the number of coats that will be applied but also on their filling capacity, something that can vary considerably depending on the volume solids of the product.

Substrates are invariably prepared with coarse grades of paper so deep scratches will be obtained.

From this point through the paint scheme the coarseness of the paper is progressively reduced so that scratches in the finishing coat cannot be detected.

This is the basic principle underpinning good sanding practice.

It is a misconception that the marks left by coarse sanding can be refined by using a very fine grade - this is **not** the case. The step down between grades has to be progressive. For that reason it is recommended that the difference between sanding grades never exceeds 100 or better still if the steps are less than 100. In order to follow this guideline it may be necessary to sand the same coat of paint or filler more than once with different grades of sandpaper.

The target in a typical filled topsides paint scheme is to move from a P40 grade for the substrate to a P400 grade for the finish coat in gradual steps throughout the coating system (see tables 1-3 overleaf for grades used on differing substrates).

Typical sanding schedules

Note: *The tables below indicate the number of recommended sanding steps in each type of scheme as specified. They do not necessarily reflect the number of coats of paint applied. During spray applications it may be necessary to apply up to two coats without sanding between. When applying products by brush or roller it is always recommended to sand between coats.*

Table 1 – paint systems with filler, polyurethane primers and undercoats

Substrate **NB substrate may be grit blasted therefore no sanding required**	P40
Epoxy GP Coating or IP 820	Un-sanded
Epoxy LG Filler or IF830	Between layers P40 Finish layers P60
Epoxy Finishing Filler or IF 833	Between layers P120 Finish layers P180
Midcoat Flat HS or IP820	P280
UC Gloss or PU Basecoat	P360
1st Finishing coat or "truth coat"	P400
Finishing coats	Un-sanded

Table 2 – paint system with filler and epoxy undercoat

Substrate **NB substrate may be grit blasted therefore no sanding required**	P40
Epoxy GP Coating or IP 820	Un-sanded
LG Filler or IF830	Between layers P40 Finish layers P60
Finishing Filler or IF 833	Between layers P120 Finish layers P180
Interprime 880	P280
Interprime 880	P360
Perfection "truth coat"	P400
Finishing coats of Perfection	Un-sanded

Table 3 - paint systems without filler on wood or GRP/FRP in good condition.

Substrate (if not painted) **Substrate (if painted and in good condition)**	P180 P320
Primer (if direct to GRP/FRP)	P280
Undercoat	P360
1st Finishing coat or "truth coat"	P400
Finishing coats	Un-sanded

When freshening up finishing coats it may not be necessary to carry out all of these steps. It may be possible simply to sand the previous finish with P400 provided it is in good physical condition.

Sanding Paper Specifications

The grading of papers varies depending in which part of the world the work is being carried out. Two key scales exist:

CAMI (as used in North America) Coated Abrasives Manufacturing Institute who simply number the grade of paper and refer to the "grit size"

FEPA (as used in Europe) Federation of European Producers Association operates the "P" scale

The FEPA grades and their corresponding particle size distributions can be seen in the table below:

FEPA (P-scale)	Mean Diameter (ds 50µm)
1200	15.3 +/- 1.0
1000	18.3 +/- 1.0
800	21.8 +/- 1.0
600	25.8 +/- 1.0
500	30.2 +/- 1.5
400	35.0 +/- 1.5
360	40.5 +/- 1.5
320	46.2 +/- 1.5
280	52.2 +/- 2.0
240	58.5 +/- 2.0
220	68
180	82
150	100
120	125
100	162
80	201
60	269
50	336
40	425
36	538

*The mean diameters of macrogrits (P220 – P36) shown in the table, are estimated and are for information only. The FEPA "P" standard defines them as a range and not a single value.

*Information taken from www.fepa-abrasives.org

General tips when sanding

- If the substrate becomes exposed when sanding, it should be touch primed to maintain the specified primer protection.
- For Health & Safety reasons it is recommended that operators always wear a suitable dust mask. It is recommended they refer to Material and Safety Datasheets (MSDS) as provided by the paint manufacturer.
- Removal of sanding dust from paper during the sanding process is necessary as it makes the sanding process more efficient, prolongs the life of the paper and prevents marking the surface with clogging lumps.
- When sanding out defects such as sags in paintwork it may be appropriate to use wet and dry grades of paper.
- Excessive amounts surface sanding (aiming for smoothness) will reduce the dry film thickness and consequently downgrade the protection that a paint system provides. It is always important to maintain the specified DFT to ensure the substrate is adequately protected.

The advantages of dry-sanding

The advantages of dry-sanding can be summarised as follows:

- It is quicker because of direct contact between the paper and the surface
- It is easier to distinguish between areas that have and have not been sanded
- No time wasted washing away residue and drying the surface
- No risk of applying product onto a damp surface and trapping moisture
- No risk of water getting into seams or window seals where it can be blown out during the spraying process

Mechanical sanding

Types of sanding machinery – there are three basic types of sanding machines

- rotating machines
- vibrating machines
- eccentric machines

These machines may be powered by electricity or compressed air:

Electric machinery: Electrically powered machines are less easily slowed down by counter pressure than equivalent machines driven by compressed air. The ease with which excess pressure can be applied can lead to the removal of excessive amounts of material. Care also needs to be observed to ensure that the electrical installation of such machines is suitable for the work environment and is not a spark hazard.

Compressed air driven equipment: These machines are lighter than electrical machines and do not present an explosion hazard. They are noisy compared to electrically operated equipment and are easily slowed down by excess pressure. This equipment needs to be oiled to prevent excessive wear on parts and therefore care needs to be taken to prevent oil contamination on the substrate.

Rotating machinery: These are machines with round sanding disks that rotate rapidly. There are versions with rigid pads that are really only appropriate to sanding welding seams, de-rusting or roughening metals. They are rarely used on painted surfaces.

Vibrating machinery: In principle any flat-soled sanding machine can be considered as vibrating machinery. Vibration of the sole plate is achieved by means of an eccentric turning mechanism within the machine. To gain maximum effect the sole plate should be held flat against the surface. Vibrating sanding equipment is suitable for most sanding work.

Eccentric rotating vibrating sanding machinery: This type of machine combines all the attributes of rotation and vibration and because of this they have very high sanding efficiency. These types of machines are known to give finer sanding patterns with less heat development compared with rotating machines and are suitable for using on most substrates.

General tips when sanding with machines

- Make long “8” shaped movements to prevent sanding grooves that may be visible at a later stage
- Never put excessive pressure on a sanding machine, it decreases speed making it slower and increases the risk of “blocking” the sanding paper.
- Excessive pressure will cause the machines to generate a lot of heat which in turn may cause paint layers to soften and to damage the sand paper.
- Excessive pressure can cause electrically operated machines to burn out.
- Sanding machines should always be held flat to the surface. If this is not done, grooves may be cut into the surface.

Sanding paintwork is hard work. However, time spent in preparation, using the right grades of paper, following the rule of progressive decrease in sanding particle size and never jumping more than 100 units, is time well spent. **It is the route to the perfect finish**.

This note provides general guidance. Weather, temperature and work conditions can dramatically affect final results. Moreover, as every person works in a slightly different manner, individual applicator/sander differences can require different work practices in any given situation to achieve a desirable result. In any case, it is always the responsibility of the applicator/paint crew to balance these and other factors to achieve the desired aesthetic result.