Powder Coating Wood and Engineered Wood Substrates (electrostatic application, preheat & cure)

Substrate Criteria:

- Engineered Wood (i.e., MDF, HDF) specifications – generally:
  - Density at least 48lbs/ft^3
  - Internal bond strength at least 130 psi
  - Moisture Content 5-8%

- Natural Wood
  - Hardwoods (such as maple, oak, etc.) conditioned to 8-12% moisture content, are typically suitable for powder coating with appropriate chemistries.

Process Description

1) Substrate Moisture Content Conditioning (when needed)
   - Properly conditioned wood (too little will result in poor grounding, too much will result in outgassing during cure)
   - If moisture content is out of range, the substrate will need to be conditioned. Conditioning is accomplished by storing the substrate in a temperature and humidity-controlled environment until the specified moisture content is achieved (if boards are racked in such a way as to expose all surfaces to the surrounding air, conditioning is typically completed in 12-24 hours).
   - See chart below to determine the relative humidity and temperature needed to condition wood-based materials:

Moisture Content of Wood at Various Temperatures & Relative Humidity Conditions

Temp (°F)	25%	30%	35%	40%	50%
50°	5.5	6.3	7.1	7.9	8.7
60°	5.4	6.2	7	7.9	8.6
70°	5.4	6.2	6.9	7.7	8.5
80°	5.3	6.1	6.8	7.6	8.3
90°	5.1	5.9	6.7	7.4	8.1

Relative Humdity (percent)

Source: Wood Handbook: Wood as an Engineering Material, (Agriculture Handbook 72), Forest Products Laboratory, US Dept of Agriculture

3) Substrate Preparation
    - The typography of the substrate surface will telegraph through the coating. To avoid this, especially when a smooth finish is desired, all substrate surfaces should be sanded smooth.
    - Surface should be smooth and free of saw dust.
    - Edges should be sanded to achieve a slight rounding of the edge.
4) Pre-heating (may not be required depending on the substrate.)
    - The work piece is pre-heated in order to equalize the moisture content (and thus the electrostatic properties on the surfaces) of the board.

        ✓ Pro Tip: To avoid damaging to heat-sensitive substrates, pre-heat to the lowest surface temperature at which electrostatic properties are optimized (this range is generally from 120°F to 140°F [at the point of powder application],but can vary depending on type of substrate and process design).
5) Powder Application
    - Gun Settings
        ✓ Maintain target distance to control pattern development and coverage based on the gun tip selected (typical range 8-12")
        ✓ Optimize energy settings (Voltage & Current) to maximize first pass transfer efficiency based on desired film and the manufacturer's recommendations.
        ✓ Powder output range (typically 170 – 210 gr/min) based on manufacturers recommendation for optimal charge potential, atomization and film control

6) Curing
    - Cure at surface temperature as specified in either the Technical Data Sheet instructions or as per the powder manufacturer.

7) Cooling/De-racking
    - Fans may be used to speed up cooling of the parts as they exit the cure oven.
    - Part temperature should be comfortable to the touch to be able to packaged and handled.

8) Final Inspection
    - The coating should be allowed to cool to room temperature before any destructive inspection test are performed. Some chemistries incorporate a thermoplastic component and require a MEK or crosshatch and if it is tested prior to cooling, the test will show a failure.

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