

The Testing Manual of Paints, Varnishes and Resins

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Paint can be applied to almost any kind of object. It is used in the production of art, in industrial coating, as a driving aid (road surface marking), or as a barrier to prevent corrosion or water damage. Quality control for paint product can be achieved through conducting a number of physical and chemical tests to paint samples. In the paint and coating industries, paint testing is often used to determine if the paint or coating will adhere properly to the substrates to which they are applied. Testing of paint, varnishes and resins can be done in a number of different ways. The fact of the matter is that many industries use several different paint testing methods in order to ensure accurate results. Products of the surface coating are essential for the preservation of all types of architectural structures, including factories, from ordinary attacks of weather, micro and macro organisms, atmospheric pollutant, etc. Architectural coatings are usually applied to wood, gypsum wall board, or plaster surfaces. Bituminous coatings are used on surfaces to reduce or eliminate the destructive effects of weather, chemicals and water vapour. They are also used as sound deadeners, to provide resistance to heat transfer and to provide abrasive coatings to minimize slip hazards. Traffic paint is an important factor in the control of traffic, not only of motor vehicles but also of aircraft at airports and of pedestrian traffic. Proper paint formulations depend upon raw materials selection and accurate calculation of the amounts of its constituents. Therefore it becomes necessary to adopt various test methods for testing the quality of product. The final product shall have no adverse effect on the health of personnel when used for its intended purpose and applied in approved facilities with the use of approved safety equipment.

This testing manual elaborates the methods used to determine the physical and chemical properties of paint, varnish, resins, and related materials. Some of the fundamentals of the book are biological deterioration of paints and paint films, weathering tests natural weathering, artificial weathering machines, new jersey zinc company machine, gardener parks wheel, atlas weather Ometer, sunshine carbon arc weather Ometer, British railways machine, British paint research station machine, waxes and polishes, putty, glazing compounds, caulking, compound and sealants, tile like coatings, applicable specifications, adhesion tests, Evans adhesion test, resistance to alkaline peeling (Evans method), paint for electrocoating, synthetic resins, driers and metallic soaps, natural resins

The purpose of this book is to help its readers to establish standardized testing methodologies and to eliminate unnecessary or undesirable variations in test results when evaluating a products adherence to specification requirements. It is hoped that this book will help its readers who are new to this sector and will also find resourceful for new entrepreneurs, existing industries, technical institution etc.

1. BIOLOGICAL DETERIORATION OF PAINTS AND PAINT FILMS

Description of the Problem, Microorganisms Associated with Paint, Growth Structures of Fungi, Chemical Methods for Fungal Identification, Antimicrobial Agents, Determining Microbiological Resistance of Paints, Bacterial Resistance of Liquid Paints, Measuring the Fungal Resistance of Paint Films, Insect-Resistant Paints

2. WEATHERING TESTS NATURAL WEATHERING

Introduction, Effect of Climate, Test Racks, Offset-Rack, Angle of Exposure, Follow-the-Sun Racks, Application of Paints, Tests on Wood, Number of Specimens, Tests on Iron and Steel, Substrates, Cleanliness of Surfaces, Pictorial Standards for Steel Surfaces to be Painted, Manual Scraping and Wire Brushing, Blast Cleaning, Specifications of Steel Structures Painting Council for Preparation of Surfaces, Tests on Galvanized Steel, Tests on Aluminum, Tests on Magnesium, Tests on Masonry, Evaluating Weathering Tests, Gloss, Chalking, and Erosion, Checking and Cracking, Flaking, Scaling, and Peeling, Integrity Protection, Dirt and Mold (mildew), Rust and Metal Stain, Color Retention (fading, darkening, and yellowing), Moisture Blistering of Paint on Wood, Detecting Rainfall and Dew, "Washing" of Paints, Recording Weathering Tests, Scheifele Summary, Nomographs for Rating Weathering,

3. ARTIFICIAL WEATHERING

Introduction, Artificial Weathering Machines, New Jersey Zinc Company Machine, Gardner-Parks Wheel, Atlas Weather-Ometer, "Snushine" Carbon Arc Weather Ometer, British Railways Machine, British Paint Research Station Machine, British Standards Institution Test, ABEM IV Machine, Dew Weather-Ometer, Fluorescent Ultraviolet Light Sources, ASTM Artificial Weathering Procedures, Actinic Values, Intensified Tests, Photochemical Embrittlement Test, Ozonization Test, Lightfastness of Pigments, Thin Substrates Corrosion Test, High Frequency Tide Range Test, Sudden Chill Test

4. ATMOSPHERIC POLLUTANTS

Source of Pollutants, Regulations, Analytical Methods, Smog Chambers

5. SPECIFIC PRODUCTS TESTS ON VARNISHES

Introduction, Test on Liquid Varnish, Appearance, Color, Viscosity, Viscosity Control During Manufacture, Nonvolatile Content, General Method, Method Flash Point A, Resin Solutions, Density (specific gravity), Elasticity (toughness), Linseed Oil Addition, Predicting Kauri Reduction, Leafing Test, Spatula Test, Beaker Test, Skinning, Reactivity, Acid Value, Alkali Increase Test, ASTM Reactivity Test, Rosin Content, Drying Time, Tests on Dry Films, Film Irregularities, Bell Jar Test, Oven (cabinet test), Smokey Joe Oven, Rogers Test, Draft Test, Resistance to Selflifting, Rubbing Property, Hardness and Abrasion Resistance, Plasticizer Migration, Temperature Change Resistance (cold check test), Tests on Clear Floor Sealers, Specimens, Appearance, Resistance to Ink Stain, Restoration of Worn Areas, Finishing with Other Coatings, Tests on Shellac Varnish, Color, Drying Time, Nonvolatile Content

6. ARCHITECTURAL PAINT

Introduction, Conditions Affecting Use of Paint, Exterior Paint, Interior Paint, Liquid Paint, Condition in Container, Skinning, Settling, Curds, Agglomerates, and the Like, Coarse Particles, Fineness of Dispersion, Density, Flash Point, Dilution Stability, Consistency (Viscosity, Rheological Properties), Working Properties, Brushing Properties, Wet-Edge Time, Spraying Properties, Rolling Properties, Absorption and Holdout, Subjective Test, Vehicle Migration Test, Stain Test, Freeze Thaw Stability, General Method, Special Method for Multicolor Lacquer, Resistance to Microorganisms, Color Acceptance, Drying Time, Test on Dry Film, Appearance, Adhesion, Elongation, Moisture Blister Resistance, Fume Resistance, Efflorescence from Interior Latex Paint, Resistance to Fungi, Washability, Scrub Resistance, Stain Resistance, Fading, Yellowness Index

7. CEMENT BASE PAINT AND THE PAINTING OF MASONRY

Introduction, Typical Properties of Portland Cement, Tests on Dry Powder, Color, Coarse Particles, Oil Absorption, Set Time, Performance Tests of Cement-Base Coatings, Sentel

Studies, ASTM Concrete and Masonry Panels, Federal Concrete Panels, Alkali Resistance of Coatings Concrete, Wet Feet Test for Concrete Paint, Croll-Rhue Plaster Cup Test, Efflorescence Resistance of Masonry Paints, Waterproofing, Ready-for-Paint Stage of Masonry

8. WAXES AND POLISHES

Introduction, Tests on Raw Materials, Melting Point, Specific Gravity, Acid Value, Saponification Value, Crystallinity of Petroleum Waxes, Paraffin Hydrocarbons in Carnauba Wax, Detection of Glycerides, Detection of Stearic Acid, Detection of Rosin, Tests on Liquid Polishes, Nonvolatile Matter in Emulsion Polish, Nonvolatile Matter in Solvent-Type Waxes, Ash, Silica, and Sulfur, Sediment, Stability of Emulsion-Type Waxes, Stability of Solvent-Type Wax, pH of Emulsion Wax, Abrasive Matter, Test on Films, Preparing Test -Films of Emulsion Floor Polishes, Drying Time, Water Spoiling, Gloss, Removability, Powdering, Metal-Glide Adhesion Test, Softening of Tile Substrate, Subjective Method, Objective Method, Slip Resistance, Practical Field Tests

9. PUTTY, GLAZING COMPOUNDS, CAULKING, COMPOUND AND SEALANTS

Introduction, Definitions, Working Properties, Subjective Test for Knife Compounds, Cone Penetrometer for Consistency, Mobilometer for Consistency, Sandwich Squeeze for Consistency, Brookfield Viscometer for Consistency, Extrudability with Caulking Gun, Extrusion Rheometer, Shearing Adhesiveness, Rheological Properties, Leveling Test, Sag (slump) Test, Tack-Free Time, Shrinkage, Apparatus, Procedure, Cohesiveness, Tensile Adhesiveness (cohesion), Tenacity, Bend Test, Low Temperature Flexibility, Adhesion, Bond Strength by Direct Pull, ASTM Method for Bond Strength, Shear Method for Bond Strength, Peel Method for Bond Strength, Bend Test for Adhesion, Gravity Test for Adhesion, Impact Test for Adhesion, Hardness, Durometer Hardness under Standard Conditions, Durometer Hardness After Heat Aging, Penetrometer for Hardness, Penetrometer for Degree of Set, Compression Set, Aging Tests on Caulks and Sealants, Heat Aging Tests, Artificial Weathering Tests, Oxygen Bomb Aging Test, Stain Tests, Filter Paper Stain Test, Practical Stain Test on Masonry, Accelerated Stain Test, Stain from Back-Up Material, Stability, Chemical Analysis.

10. TILE LIKE COATINGS AND SEAMLESS FLOOR TESTING

Introduction, Tile-like Coatings, Applicable Specifications, Adhesion Tests, Evans Adhesion Test, Resistance to Alkaline Peeling (Evans Method), Dowel Test for Adhesion, Elcometer Test for Adhesion, Ability to Smooth Concrete Block, Gloss Readings on Rough Surfaces, Smoothness (holdout), Color Retention, Effect of High Humidity on Color Retention, Fungus Resistance, Stain and Chemical Resistance: Washability, Staining, Ease of Soil Removal, Scrubbability, Abrasion Resistance, and Hardness, Abrasion Resistance, Impact Test, Hardness, Seamless Floor Testing, Introduction, Test Specimens, Tests and Test Methods, Appearance Factors, Resistance Factors, Physical Properties, Adaptability to Existing Floor Surfaces

11. BITUMINOUS COATINGS

Definitions, Identification of Bituminous Materials, Solubility in Carbon Disulfide, Differentiating Asphalt and Coal Tar, Oliensis Spot Test, Tests on Solid and Semisolid Bituminous Materials, Penetration, Softening Point, Ductility, Softening Point Drift and Flow, Oliensis Contact Compatibility Test, Tests on Solvent-Thinned Cut-Back Coatings, Uniformity, Consistency, Flash Point, Nonvolatile Content, Distillation, Water Content, Asphalt Content, Filler Content, Aluminum Content of Roof Coatings, Roof Coatings Setting Test, Application, Blistering and Sagging, Flexibility Test, Reflectance of Aluminized Roof Coating, Tests on Emulsions, Uniformity and Stability, Nonvolatile Content, Ash, Water, Application Properties, Wet Flow, Setting Characteristics, Heat Test, Flexibility Test, Water Resistance, Alternate A, Alternate B, Stability, Flame Test, Flamability

12. TRAFFIC PAINT

Introduction, Stability and Settling Properties, Tests on Glass Beads, Crushing Test, Roundness Test,

Sieve Analysis, Surface Moisture, Chemical Resistance, No-Pick-Up Time, Flexibility, Night

Visibility, Nelson- Werthan Illuminometer, Hunter Night Visibility Meter, Hill-Ecker Photometer, Photographic Method, Resistance to Abrasion, Hickson Traffic Paint Abrasion Tester, Payne Abrasion Machine, Abradometer, Dorry Abrasion Tester, New Jersey Zinc Company (NJZ) Abrasion Tester, Resistance to Bleeding, Water Resistance, Accelerated Weathering, Road Tests, Detecting Adulteration of Traffic Paint, Bean-Chaiken Method, Procedure, ASTM Recommended Practices

13. PAINT FOR MARINE ENVIRONMENT

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General Principles, Quality Tests, Test Panels, Nonvolatile Content of Electro coating Bath, Hydrogen Ion Concentration and Titratable Alkalinity, Ash-Binder Ratio in Electrocoating Paint, Preparation of Electrocoated Test Panels, Throwing- Power of Electrocoating Paint, Pumping Stability of Electro-coating Paints, Procedure, Current Requirements for the Electrocoating Process, Control and Testing of Feed Materials, Laboratory Electrocoaters, Glidden Laboratory Electrocoater, Ford Laboratory Strip Coater

15. ANALYSIS OF WHOLE PAINT

Sampling, Separations and identification of Binder and Solvent, Sampling, General Precautions and Suggestions, Procedure, Preliminary Tests on Whole Faint, Nonvolatile Content by Weight, Nonvolatile Content by Volume, Pigment Content, Water Content, Flash Point, Separation of Pigment, Separation of Vehicle, Identification of Binder, Solvent Based Paints and Lacquers, Water Based Paints, Separation of Solvent, Identification of Solvent

16. CHEMICAL ANALYSIS OF PIGMENTS

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Strontium, Chromium, Chloride, Sulfate, Zinc Yellow (zinc chromate yellow), Combined Water, Aliquots for Tests, Chromium, Alkaline Salts, Matter Insoluble in Acetic Acid, Yellow, orange, red, and brown pigments containing iron and manganese, Iron Oxide, Calcium Compounds, Calcium Carbonate (in Venetian Red), Sulfates Soluble in Hydrochloric Acid, Qualitative Test for Lead Chromate in Ochre, Manganese (in sienna and umber), Other red pigments, Cuprous Oxide (antifouling) and Other Copper Pigments, Special Precautions for Sample Treatment, Total Copper, Total Reducing Power as Cuprous Oxide, Metallic Copper, Cuprous Oxide, Cupric Oxide, Metals Other than Copper, Chlorides and Sulfates, Acetone-Soluble Matter, Dry Red Lead, Total Lead and Insoluble Matter, Lead Peroxide and True Red Lead, Zinc, Total Silica, Carbon Dioxide, Soluble Sulfate (other than barium sulfate), Iron Oxide, Dry Mercuric Oxide Ash, Free Mercury, Total Mercury, Organic Pigments and Colorants, Solubility in Chloroform, Qualitative Test for Identity and Purity, Resistance to Acids and Alkalis, Henlein Color Identification Chart

17. SYNTHETIC RESINS

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18. RAW MATERIAL

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On Heating, Moisture by Karl Fischer Method, Reagents and Calibration, Procedure, Chloroform-Insoluble Matter, Hydroxyl Value, Reagents, Heat Bodying Rate, Acetone Tolerance, Heat Bleach, Oxygen Content of Blown Oils, Peroxide Value, Drying Properties, Gelation Tests, Browne Heal Test, Worstall Quality Test, Bolton Test for Tung OH, Miscellaneous Tests for Tung Oil, Detection of Boiled Linseed Oil, Determining Dimers and Trimers in Bodied Oil, Detection of Fish Oils and Paints, Blinker Test for Oils and Resins, Chromatographic Methods, Poxon Chromatogram

19. DRIERS AND METALLIC SOAPS

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20. NATURAL RESINS

Classifications, Identification of Natural Resins, Identification of Rosin, Identification of Lac, Commercial Grades of Natural Resins, Manila (Macassar) Spirit Soluble, Manila (Philippine) Spirit Soluble, Manila (Singapore), Congo (American Gum Importers Classification), Refractive Index, Hardness, Softening Point, Capillary Tube Method, Ring and Bull Method, Preparation of Sample, Durrans Method, Wilter Method, Paramet Method, Drip Method, Density, Bulking Value, Solubility, Nonvolatile Content of Resin Solutions, Dirt in Resins, Volumetric Method for Dirt, Gravimetric Method for Din, Ash Content, Moisture Content, Acid Value, Reserve the specimen for the indirect acid value, AGI Indirect Acid Value, AGI Saponification Value, Rosin, Sampling and Grading Rosin, Sampling Rosin, Color of Rosin, Softening Point of Rosin, Dirt in Rosin, Toluene Insoluble Matter, Georgi Photographic Method, Ash in Rosin, Iron Content, Spectrophotometric Procedure, Visual Photometric Procedure, Acid Value, Saponification Value of Rosin, Unsaponifiable Matter in Rosin, ASTM Method D 1065, Volatile Oils, Fatty Acids Content of Tall Oil Rosin, Viscosity, Pour Point, Ash, Acid Value, Saponification Value, Unsaponifiable Matter, Rosin Acids, Fatty Acids, Lac, Insoluble Matter in Lac, Extraction Method,

Hot Filtration Method, Iodine Value, Purity, Detection of Rosin, Detection of Copal, Estimating Adulteration, Wolff Method for Rosin in Shellac, Volatile Matter (moisture), Matter Soluble in Water, Acid Value, Saponification Value, Orpiment, Color, General Comparison Method, Color Index

21. CELLULOSICS

Cellulose Nitrate, Viscosity Grade, Solubility and Appearance of Solution, Film Test, Toluene Dilution Ratio, Cellulose Nitrate Base Solutions, Viscosity, Nonvolatile Content, Appearance, Cellulose Acetate, Viscosity, Color and Haze, Solubility and Appearance of Solution, Cellulose Acetate-Butyrate and Cellulose Acetate-Propionate, Ethylcellulose, Viscosity, Methylcellulose, Viscosity of Water-Soluble Methylcellulose, Viscosity of Alkali-Soluble Methylcellulose, Sodium Carboxymethylcellulose, Viscosity, Hydroxyethylcellulose, Hydroxypropyl Methylcellulose, Viscosity, Hydrogen Ion Concentration, Solids

22. PLASTICIZERS

Introduction, Physical and Chemical Test Methods, Acidity, Color, Compatibility, Copper Corrosion, Distillation Range, Electrical Properties, Ester Value, Flash Point, Refractive Index, Residual Odor, Sampling, Solidification Point, Specific Gravity, Viscosity, Water, Chemical Methods of Identification and Measurement, Isolation of Plasticizer, Qualitative Methods, Quantitative Methods, Instrumental Methods, Identifications by Refractive Index and Density, Fluorescence, Spectrophotometry, Chromatography

23. SOLVENTS

Definition and Requirements, Solvency, Solubility Parameter System, Viscosity Reduction, Aniline Point, Kauri-Butanol Value, Dilution Ratio, Dilution Limit, Evaporation (volatility), Vapor Pressure, Evaporation Rates by Electrobalance, Butyl Acetate Evaporation Standard, Historical Evaporation Rate Methods, Evaporation of Solvent from Coatings, Solvent Retention by Films, Distillation Temperature, McArdle-Robertson Evaporation Index, Analytical Distillation, Flash Point, Composition, Chromatography, Liquid Chromatography, Acid Absorption and Bromine Number Methods, Refractively Intercept, Ester Value of Lacquer Thinners, Physical Properties, Density and Specific Gravity, , Refractive Index, Purity and Impurities, Color, Acid Wash Color, Odor, Sulfur Compounds, Nonvolatile Residue, Water Contamination, Acidity and Alkalinity, Other Contaminants, Specifications, Systematic Identification and Analysis

About NIIR

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