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**South African Qualification and Certification Committee (Corrosion Protection)**

**APPENDIX PA1**

**SYLLABUS**

**MODULE PA1**

**PAINT APPLICATORS COURSE**

**DURATION:**

*The planned duration is a 5 day course with the exam on the 6<sup>th</sup> day - 40hrs training.*

**1.0 PRE-REQUISITES FOR STUDENTS**

- Basic knowledge of English.
- Ability to understand basic instructions in English.
- ABET level 2 Literacy or 4 years schooling.

**2.0 RECOMMENDED MINIMUM LEVEL OF PRACTICAL EXPERIENCE**

- The candidate must be currently employed in a painting position for a period of 6 months, and must therefore have a minimum level of prior paint experience.

**3.0 TECHNICAL SUBJECTS COVERED BY THE COURSE**

*THIS COURSE IS AIMED AT PROVIDING A BASIC UNDERSTANDING AND AWARENESS OF THE SUBJECTS AND TOPICS OUTLINED BELOW:*

Day 1 to 4: 4 hrs practical every day in the afternoon.

**3.1 SURFACE PREPARATION**

(Day 1: 4hrs)

**Types of contaminants:**

- Steel Substrate: oil, grease, dust, moisture, millscale, rust, old paint, soluble salts.
- Previously painted surfaces: chalking, salts, dirt and dust.

**Concrete/Plaster substrate:**

Foreign matter inclusions (clay, cigarette butts, plastic sheet, paper from cement bags), shutter release agents, effect of laitance, salts and efflorescence.

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**Protection of non-coated surfaces:**

Masking tape, drop sheets.

**Methods of surface preparation for:**

- Mild steel (wire brush, abrasive blast clean).
- Grind radii on edges (3mm) or as specified) before abrasive blasting.
- Fettle before abrasive blasting.
- Degrease before blast cleaning:
- Galvanised surfaces (sweep blast, or scotchbrite pads and water dispersible degreaser to a water break free surface).
  - Wood surfaces(sandpaper):
    - Cementitious (Concrete) surfaces (acid etching, water washing, scabbling).
    - Previously painted surfaces (scraping, wirebrushing, abrasive blast cleaning).
    - Sweepblasting.
    - Feathering.
    - Water jetting and water blasting (Awareness only).

**Care of Surface Preparation Equipment and Material**

- Nozzle wear and how to check for wear.
- Oil/water traps-description: how they work, how to blowdown and how to check for clean air.
- Abrasive grit: Types, grades, grit sizes – explain blast profile, danger of using sand.
- Cleanliness standards (ISO 8501:1:1988) - explain the different standards for mechanical cleaning and abrasive blast cleaning. (Sa and St terms).
- Toolbox and basic contents to be on site.

**3.2 PAINT TYPES AND SYSTEMS (Day 2: 2hrs)**

- **Basic components of paint coatings**
  - (Binder, Solvent and Pigment)
  - Twin pack paints – importance of correct mixing of the base and catalyst.
- **Coating systems**

Single Packs	Twin Packs Hardener activator	Twin Packs Catalyst: peroxides
Alkyds	Epoxies	Polyesters
Vinyls	Polyurethanes	Vinyls esters
Waterbased PVA/Acrylic emulsions	Inorganic Zincs (Moisture cure)	Polyureas

**Remarks:**

- Alkyds – not for heavy duty use.
- Epoxies – solvent based – will chalking in sunlight – pot life time/temperature dependant.

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- Inorganic zincs.
- Oversickness causes mud cracking.
- Water curing needed to help cure.
  - MEK test used for cure.
  - Polyurethanes – no chalking – pot life time/temperature dependent.
  - Vinyls – easy to apply, good chemical resistance.
  - Waterbased PVA/Acrylics – used for offices.
  - Waterbased – epoxies – pot life characteristic – no 'end point' – pot life time/temperature dependent.
  - Vinyl and Polyesters – contain glass flake – used to line tanks – goods abrasion and chemical resistance.

Duplex systems – painting galvanized steel.

- Surface preparation very important. Use Galvanized cleaner and scotchbrite pads to give a dull waterbreakfree surface or sweep blast with ultrafine abrasive grit.

Solvent selection

- Solvents for washing.
- Solvents for dilution – different to the washing solvent – explain.

Paint type selection:

- Recognize base and catalyst components – explain effect of temperature on cure.
- Explain induction times.
- Explain pot life (time vs temperature).

MEK (methylethylketone) cure tests (refer to ASTM D4752)

- Cure test for Inorganic Zincs : 30 double rubs using cottonwool bud soaked in MEK must show only a slight discolouration. The zinc must not become 'muddy'.
- Cure test for twin pack materials.
- Explain the test method (refer to ASTM D4752) – no softening of the paint must take place.

### 3.3 PAINT APPLICATION

- |  |               |
|--|---------------|
| Brush application  | (Day 2: 1hr)  |
| <ul style="list-style-type: none"> <li>• Types of brushes.</li> <li>• Application techniques.</li> <li>• Stripe coating.</li> </ul>                                  |               |
| Roller application   | (Day 2: 1hr)  |
| <ul style="list-style-type: none"> <li>• Construction of rollers (mohair, lambs wool, short pile, stipple).</li> <li>• Use of different types of rollers.</li> </ul> |               |
| Spray application  | (Day 3: 2hrs) |
| <ul style="list-style-type: none"> <li>• Conventional spray (LP and HP).</li> <li>• Airless spray.</li> <li>• Techniques of spraying.</li> </ul>                     |               |
| Repairs  | (Day 3: 1hr)  |
| <ul style="list-style-type: none"> <li>• Patch repair procedures to areas damaged during erection or transport.</li> </ul>   |               |

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### 3.4 CARE OF EQUIPMENT

Blasting Equipment:

- Inspection of the hoses.
- Check the nozzle:
  - o Check 'dead mans handle'
  - o Check air pressure at the nozzle using pressure gauge with hyperdemic needle.
- Check the couplers.
- Check the compressor:
  - o Water and oiltraps
  - o Pressure as per data sheet.

Brushes - cleaning

Rollers - cleaning

Spray Equipment - cleaning

Paint mixers (flat paddles, pneumatic stirrers) - cleaning

### 3.5 CONTROL OF QUALITY APPLICATION

(Day 3: 1hr)

Inspection of surface preparation prior to paint applications (What does the specification say? Mechanical clean or Abrasive blast clean – explain St and Sa standards).

- How to read a QCP

Control of coatings:

- Wet and Dry film thickness (explain how to use the WFT).
- Explain the use of a DFT instrument.
- Freedom from pin-holes and misses.

Quality control records:

- Paint batch numbers:
  - Labeling of tins.
  - Weather conditions (How to measure and record % RH, Surface Temperatures, Dew Point explained).

Key DATA to obtain from the paint Data Sheet:

- Mix Ratios:
  - o By weight?
  - o By volume?
  - o Induction Time
  - o Spray tip size for spray application
  - o Airless spray:
    - Spray Angle
    - Aperture or Fan angle
    - Atomization Pressures
    - Spray tips (check tip wear)
    - Airless hose sizes

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### 3.6 HOLIDAY DETECTION METHODS

- High spark tester – demonstrate (by instructor for awareness only).
- Wet sponge tester – demonstrate (competency is required by individuals).
- Repair procedures to effect areas.
- Re-test methods (after correct curing period).

### 3.7 IDENTIFICATION OF PAINT AND APPLICATION DEFECTS (Day 4: 2hrs)

Colour  
 Skinning  
 Settlement  
 Slow and fast drying  
 Lifting or pulling  
 Thickening or gelling  
 Mud cracking  
 Saponification (Explain that it occurs when an Alkyd is painted onto an Inorganic Zinc – forms a 'soap').  
 Rivelling or wrinkling  
 Crazeing or alligatoring  
 Sagging, curtaining and runs  
 Overspray and dry spray

### 4.0 HEALTH, SAFETY, ENVIRONMENT AND SECURITY AWARENESS (Day 4: 2hrs)

- OSHA introduction
  - Induction sessions – explain importance:
    - Ascertaining Site Rules
      - The location of Fire extinguishers and Hoses to be known.
      - The operation of Fire fighting equipment to be understood.
      - The EMERGENCY numbers to be on hand and communication verified:
        - Safety requirements – site, personnel and equipment.
        - PPE (breathing equipment, masks, glasses, hard hat, gloves, ear plugs, safety boots, overall, visor):
          - Security regulations.
          - Lockout - explain meaning of.
  - Risk Assessment – explain with example:
  - Abrasive Blast Cleaning.
  - Check compressors.
  - Hose inspection- check for internal wear areas by physical handling of the hose.
  - Check venting operations.
  - Check couplings for proper connections.

### 5.0 ELECTRICAL

- Check earthing requirements for all electrical equipment(Applicators must understand the basic of earthing (requirements).
- Airless spray pumps.
- When mixing flammable paint use intrinsically safe drills or pneumatic driven equipment.
- Lighting.

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- Safety lighting compulsory for confined spaces. To conform to Class 1 Division 1 of the safety. All lights must be intrinsically safe.
- Mixing Equipment.
  - The safe handling of paints.
  - Types of mixing methods (agitated pressure pot and explain why?).
  - Use intrinsically safe electrical mixers or air driven equipment only.
- Application equipment.
  - Must be intrinsically safe and earthed.
  - Check all requirements for either airless spray, conventional spray or diaphragm methods are in place.
  - Check correct spray tips are used.
  - Check correct pressures are used.
  - Check agitated pressure pots are in good condition and gauges are clear and readable.

## 6.0 CONFINED SPACE ENTRY WORK

- Entry permits.
- Understand 'lockout' procedures.
- Check that ventilation requirements conform with the paint manufacturers requirements.
- The safety officer to grant permit for work in confined spaces.
- Always two workmen present - one doing the work inside and one at the entrance.
- Communication signals to be in place and understood by the workmen.

## 7.0 ENVIRONMENTAL SAFETY

- Keeping the environment clean.
- Good housekeeping.
  - Isolate solvent soaked rags.
  - Discard used paint tins in a skip.
  - Disposal of such waste to be in accordance with the instructions.

Day 5: Lecture 10 and revision, discussions and questions. (1hr + 4 hours practical training)

## 8.0 FORMAT AND STRUCTURE OF EXAMINATIONS

The examination will be divided into three Skills viz.

### Skill 1: **Abrasive Blast Cleaning Operator:**

Abrasive Blast Cleaning and all mechanical cleaning methods.

### Skill 2: **Spray Paint Applicator:**

(Conventional spray, Airless spray, cup gun – must understand levels of surface preparation and that these agree with the specification).

### Skill 3: **Brush and Roller Applicator:**

(Must understand levels of surface preparation and that these agree with the specification).

A candidate may choose the Skills in which he wishes to be examined i.e. any one, two or all three.

The candidate may apply for another skill to be added to his level of expertise at any time, and will be required to attend the relevant course and be examined for that skill.

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The examination shall consist of two sections:

- (1) Theoretical oral with optional combined written (these can be used for a combined assessment tool for the evaluation).
- (2) Practical section.

All candidates must sit the oral examination, the questions for which will be pertinent to the selected Skills.

### **8.1 THEORETICAL EXAM (Followed by the practical exam)**

The theoretical section shall consist of a 30 minute oral optional combined written examination covering the following topics as applicable to the chosen Skills:

- QUESTION BANK – Monkey puzzle format
  - Paint Data Sheet
  - Mix ratio (by weight and by volume - show understanding)
  - Pot life and temperature
  - Dew point
  - Blast profile
  - Solvents (Difference between Dilution and Cleaning solvents)
  - Drying times
  - Cure times
  - Effect of temperature on curing
  - Humidity and abrasive blasting – when not to blast (why?)
  - Blasting techniques
    - Distance from item
    - Dead mans handle
    - Hose length
    - Pressure

Duplex systems (galvanizing and paint)

Solvent selection

Paint application and the care of the equipment

Mixers

Brush application

Roller application

Spray application

- Types of mixers
- Types of brushes
- Application techniques
- Construction of rollers
- Use of different types of rollers
- Conventional spray (LP and HP)
- Airless spray
- Diaphragm pumps
- Spray tips and problems
- Spray pressures
- Techniques of spraying

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The control of the quality of the application

- Understand what the coating inspector will inspect (DFT, No runs, Cure where applicable, Pinhole test where applicable, compliance to specification)

The identification of paint and application defects  
Final Colour must be to specification.

## 8.2 PRACTICAL EXAM

A maximum of 10 students can be accommodated for the one day exam (unless arrangements can be made with the SAQCC examining body for additional examiners to be available for a larger number of students)

The practical section shall consist of a 1 day practical examination for a group of 10 students. The candidates shall be required to demonstrate their competency in their selected Skill areas:

Skill 1: **Abrasive Blast Cleaning Operator:**

Abrasive Blast Cleaning, Understand various forms of grit sizes, understand blast profile, nozzle pressure and nozzle sizes understand cleanliness standards including mechanical cleaning methods. Water jetting is excluded from the practical for safety reasons. Water jetting is a specialized application and special training will be given by the equipment supplier where needed. The Abrasive Blast Cleaning Operator is considered to have the necessary skills to adapt to water jetting after completing this course. Use of a Profile gauge demonstrated.

Skill 2: **Spray Paint Applicator:**

Conventional spray, Airless spray, cup gun – must understand levels of surface preparation and that these agree with the specification. Use of a WFT comb demonstrated.

Skill 3: **Brush and Roller Applicator:**

Must understand levels of surface preparation and that these agree with the specification and use the brush or roller correctly. Use of a WFT comb demonstrated.

## 9.0 MINIMUM EXAMINATION MARKS REQUIRED

The candidates shall be required to obtain the following minimum examination pass marks:

Theoretical Examination: 60%

Practical Examination: 80%

## 10.0 CONDITIONS FOR RE-EXAMINATION

Should a candidate fail either the theoretical or practical section of the examination (while passing the other section) the candidate shall be required to re-write only that section which they failed in order to complete the requirements for the module.

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### **11.0 REQUIREMENTS FOR RE-EXAMINATION**

Previously certified Candidates who have been out of the painting operation industry for more than six months shall be required to be re-examined.

### **12.0 PERIOD OF VALIDITY OF CERTIFICATE**

The certificate shall not have an expiry date.

If the candidate wants to include another skill at a later stage, he will be required to be examined on that skill only. Should he fail this examination he will be required to repeat the full course.

### **13.0 CERTIFICATE ISSUED BY SAQCC (Corrosion Protection)**

The certificate will be prescriptive for what skill the candidate is qualified for.

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