Assessment Requirements

Unit PO013K – Knowledge of Vehicle Colour Matching

Content:

The effects of the viewing environment on colour matching:
- a. Artificial light
- b. Natural light
- c. Light box
- d. Direct sunlight
- e. Shaded light
- f. Reflection

The purpose of paint materials:
- a. Anti-corrosion
- b. Protection
- c. Reflection
- d. Visual
- e. Body sound deadening (all list to go in content)

Types of undercoats and their function:
- a. Primer
- b. Primer surfacer
- c. Anticorrosion
- d. Etch primers
- e. Plastic primers
- f. Primer fillers
- g. Electrodepositing (E-coating)
- h. e-coat replacement products
- i. Sealers/isolators
- j. Anti chip/texture coatings

Types of paints and their function:
- a. Single pack
- b. Two pack
- c. Acrylic
- d. Alkyd
- e. Epoxy
- f. Polyurethane
- g. Phenolic
- h. Polyester

Types of pigments available and their function:
- a. Coloured
- b. Metallic
- c. Pearl
- d. Anti corrosion
- e. Extender
- f. Special effects
The purpose of testing paint materials:
   a. Adhesion
   b. Durability
   c. Corrosion
   d. Resistance to chemicals
   e. Abrasion
   f. Acid rain
   g. Ultraviolet

Types of topcoat
   a. solid colours
   b. clear over base colours
   c. metallic colours
   d. pearl colours

Methods and importance of correctly identifying paint substrates prior to undertaking any refinishing work
   a. Workshop tests to determine substrates to include:
      i. solvent wipe test (1k or 2k)
      ii. colour of flattening sludge (straight colour or C O B)
      iii. VIN plate
   b. Substrates to determine selection of undercoat with reference to:
      i. condition of surface
      ii. type of substrate
      iii. process requirements
      iv. material requirements
   c. The physical properties of a substrate to include:
      i. surface condition
      ii. adhesion
      iii. flexibility
      iv. porosity
   d. The technical properties of a substrate to include:
      i. type of paint
      ii. steel
      iii. aluminium
      iv. plastic
      v. coated steels
      vi. repaired panels
      vii. OE finish

How to prepare existing paint substrates for colour matching
   a. The required preparation for the listed substrates to include
      i. steel
      ii. aluminium alloys
      iii. GR plastics
      iv. thermo plastics
      v. cured 2k materials
      vi. synthetic enamels
   b. The procedures for the preparation of paint finishes to include:
      i. thorough cleaning and drying
      ii. compounding to restore original colour
   c. The procedures for the preparation of plastics to include:
      i. identification
      ii. tempering
      iii. porefilling
iv. release agent removal  
v. cleaning  
vi. adhesion promotion  
vii. elastic primers

d. The preparation requirements for textured and special effect coatings to include:
   i. spoilers  
   ii. bumpers  
   iii. exterior trim

How different light sources can affect the perception of colour for matching purposes  
a. Colour in terms of light reflected from a surface to include:
   i. light quality  
   ii. surface quality  
   iii. absorbed light  
   iv. reflected light

b. The effects of metamerism under:
   i. sodium light  
   ii. mercury vapour  
   iii. explain how this phenomenon is created

types of refinishing materials by their film forming characteristics  
a. The different types of paints to include:
   i. non convertible  
   ii. nitro cellulose  
   iii. 1k acrylic  
   iv. convertible  
   v. oil based synthetics  
   vi. 2k acrylics  
   vii. 2k polyurethane  
   viii. polyesters  
   ix. isocyanate resins  
   x. waterborne basecoats  
   xi. microgel  
   xii. latex

b. The properties of binders to include:
   i. convertible  
   ii. oxidise  
   iii. high temperature reactants  
   iv. chemical reactants

c. Non-convertible:
   a. solvent evaporation

d. The forms of binder such as:
   i. nitro-cellulose  
   ii. alkyds  
   iii. urethanes  
   iv. polyesters  
   v. isocyanates  
   vi. acrylics

e. The uses of binders in paints:
   i. film forming  
   ii. binding the pigments  
   iii. adhesion  
   iv. cohesion  
   v. flexibility

f. The principles of operation of water based materials.
g. The materials used in water based paint technology.

h. The environmental advantages of using water based paints.

**Distinguish between paint system classification, such as MS, HS, UHS, waterbased, etc.**

a. The difference between paint systems to include:
   i. medium solids
   ii. high solids
   iii. ultra high solids
   iv. waterbased

**The properties of different types of solvents, thinners and hardeners**

a. The properties of different types of solvent, thinners and hardeners such as:
   i. evaporation rate
   ii. ability to dissolve the binder
   iii. ability to be tolerated by the binder
   iv. fade out properties
   v. drying rate

b. The forms of solvent/thinner such as:
   i. alcohols
   ii. ketones
   iii. glycol ethers
   iv. blends

c. The use of solvent/thinner
   i. to make the paint fluid in the tin
   ii. to reduce the paint to a spraying/ application viscosity

d. The properties of 2K hardeners to include:
   i. effectiveness at blocking out harmful ultra violet light
   ii. necessity for adding to 2k paints to effect curing
   iii. inclusion of isocyanates requires special H&S procedures

**The properties of paint system additives**

a. Listed additives and describe their properties to include:
   i. adhesion promoters
   ii. flexible additives
   iii. texture finishes
   iv. extenders
   v. UV absorbers
   vi. flow aids

b. The characteristics of additives to be added to textured paints such as those for:
   i. textured finish
   ii. leather look finishes
   iii. crackle finishes
   iv. metallic additives other than aluminium

**The factors to be considered when choosing and using refinishing systems**

a. The characteristics and properties of surface coatings to include:
   i. nitro-cellulose- non convertible-low build –fast surface dry
   ii. oil based synthetics-convertible-slow dry through uptake of oxygen
   iii. two packs- convertible- chemical reaction –high build
   iv. basecoats- solvent or water borne -non convertible-very low build-high opacity have to be overcoated with clearcoat

b. The listed paint materials in terms of their:
   i. preparation of substrates
   ii. mixing procedures
   iii. application
iv. drying processes
v. working techniques
vi. covering and hiding power
vii. rectification
viii. cleaning processes

Spraying equipment adjustments can alter the colour of refinishing materials
a. The spray gun adjustments that can be made to determine the surface finish of a colour coat to include:
   i. air pressure
   ii. fluid volume
   iii. fan width

Sources of information relevant to the mixing and matching of vehicle paint colours
a. The information that may be gained from the Vehicle Identification No. (VIN) plate with regard to paint codes.
b. Alternative areas of the vehicle where the paint code may be found.
c. The sources of information relevant to paint finishing to include:
   i. PC based material
   ii. paint manufacturers information
   iii. trade magazines
   iv. specialist magazines (customising periodicals)
   v. vehicle manufacturers information sheets
   vi. paint data sheets
   vii. microfiche
   viii. world wide web
ix. Thatcham methods manuals
d. Types of information recoverable from the above sources to include:
   i. product and mixing information
   ii. health and safety information
   iii. first aid procedures
   iv. application techniques
   v. rectification procedures
   vi. colour information
e. The meaning of the symbols used on most microfiche such as:
   i. colour data
   ii. formula field
   iii. technical field
   iv. on line finish
   v. coding field
   vi. formula in development
   vii. special technical information
   viii. variants
   ix. respray
   x. poor opacity
   xi. 3-stage colour
   xii. colours for mouldings/bumpers
   xiii. revised formula
f. The extra colour information available such as:
   i. colour variants
   ii. colour ‘wheel’
   iii. on-line colour back up
g. The sources of tinting information available to the painter to aid colour matching of metallics.

The principles of colour, the colour wheel, and Munsell’s Notation
a. The theory of colour matching to include:
   i. primary and secondary colours
   ii. metamerism
   iii. quality of light source
   iv. colour circles
b. The terminology used to describe the matching of metallic colours with reference to:
   i. the munsell colour circle
   ii. the variant shade
   iii. hue
   iv. chroma
   v. value
c. What is meant by subtractive mixing.
d. What is meant by additive mixing.

The factors affecting colour and colour perception, including metamerism
a. Factors affecting colour variation such as:
   i. orientation of metallic particles
   ii. flip and face tones
   iii. coating thickness and viscosity
   iv. spraying temperatures
   v. spraying pressures
b. How each of the above has an effect on the colour match
c. How the above problems can be overcome
d. The process of light and pigment interaction with reference to:
   i. colour spectrum
   ii. colour effects
   iii. refraction
   iv. diffusion
   v. light wavelengths
   vi. thickness of pigment particles
   vii. type of pigment particles
e. The function of a light box testing unit as:
   i. testing under normal daylight conditions
   ii. testing for metamerism
   iii. comparison of colour standards
f. The operation of a light testing unit with reference to:
   i. operation
   ii. type of light used

How to obtain matching colours and how to compare them with the original finish in terms of
colour, tone and effect, including the use of dried test cards or panels
a. The procedures and principles for using colour chips such as:
   i. cleaning the panel
   ii. matching in daylight conditions
   iii. matching adjacent panels
b. What is meant by subtractive mixing
c. What is meant by additive mixing
d. The mixing of basecoat materials to include:
   i. mixing tinters
   ii. thinners, solvents or water
   iii. additives
e. The preparation of a clearcoat material to include:
   i. hardeners
   ii. thinners/solvents
   iii. additives
f. The types of 'advanced pigments' used in modern paints:
   i. metallic (aluminium and titanium)
   ii. pearlescents (micas)
   iii. ‘multi flip’ pigments

g. The operation and characteristics of different pigments to include:
   i. acicular-noodle shaped-add strength and reinforcing
   ii. lamollar - flakes-increased durability
   iii. nodular- roughly spherical-most common

h. The function of spray out cards to determine:
   i. opacity of colour
   ii. hiding power
   iii. colour comparison
   iv. as a reference for future use

i. The functions of spray out cards with reference to a 'colour library':
   i. reference functions
   ii. colour tinting information
   iii. information required
   iv. recording of information

Different application techniques
a. The differences to applying a base coat material compared with one stage solid colours such as:
   i. gun distance
   ii. gun speed
   iii. air pressure
   iv. ‘drop coats’
   v. flash off

b. The application of clear coat with reference to:
   i. gun speed
   ii. flash off
   iii. number of coats
   iv. MS, HS and UHS

The importance of using material application methods which assist in achieving colour match
a. The differences to applying a base coat material compared with one stage solid colours such as:
   i. gun distance
   ii. gun speed
   iii. air pressure
   iv. ‘drop coats’
   v. flash off

b. The effects of applying metallic colours:
   i. wet
   ii. dry

c. The application of clear coat with reference to:
   i. gun speed
   ii. flash off
   iii. number of coats
   iv. MS, HS and UHS

The use of blending techniques as an aid to achieving an acceptable colour match
a. The procedure for carrying out paint blend to include:
   i. panel preparation
   ii. masking
   iii. gun technique
   iv. final thinning
   v. spraying onto adjacent areas and panels to assist in matching colours
The methods used to rectify mismatches caused by over tinting
a. The requirements of tinting colours to:
   i. lighten the colour
   ii. darken the colour
   iii. tint the colour
   iv. ‘clean’ the colour
b. The procedure of colour matching with reference to:
   i. identifying the mismatch
   ii. describing the hue and value
   iii. identifying the required tinter
   iv. regulating the tinter additions