Matthews Paint Training Series

The MPC Training Team is committed to continuous improvement and the highest standards in providing support to all internal and external customers served by Matthews Paint. We achieve this by creating and delivering continuously updated, quality training programs focusing on the safety, environmental and technical needs of the sign painting industry.

Participants recognize and understand that Matthews Paint is providing this training, which includes written materials and oral presentations, as a customer service. As such, Participants acknowledge the objective of raising the educational level and occupational safety and health and other legal requirements that may affect the operation of the Participants' business. Accordingly, Participants understand that this program is no more than a general overview and therefore cannot be construed as a compressive program of instruction or means for guaranteeing legal compliance or sound business conduct. Participants assume all responsibility, risk, and liability in connection with use of the information and instruction provided under this program, and in no event shall Matthews Paint be held liable for any incidental, special or consequential damages regardless of cause whatsoever (including negligence) arising out of the use or inability to use the information provided by PPG—Matthews Paint.

MPC Intermix System Features and Benefits

Features	Benefits
Single pigment base colors	Cleaner mixed colors, better tinting
15 base colors + 3 specialty bases 6 additional bases for metallic colors	Less inventory
70,000+ color formulas on file for the sign industry	Colors to match nearly anything including PMS and 3M vinyl
Color formulas on CD ROM & online—www.matthewspaint.com	Easy CD-ROM menu system, no microfiche to search, backup book in case computer goes down
High quality urethane resin with excellent UV barriers	Extremely good durability against sun, moisture and graffiti
Basecoat converter is available	Single stage (non clear coated) or two stage (basecoat/clear coat) paint system options are available with one mix system
High pigment load in base colors	Great color "holdout", color resists fading
Custom color formulation from Matthews Color Lab	Fast turn-around, proprietary colors
Mix what you need when you want it in the perfect quantity	Avoids excess and shortages of color, small quantity touch up color available, don't wait for delivery, less storage of partially used colors
Mixing what you need for each job is easier to track cost and saves money	Accurate job cost accounting, less hazardous waste
System available in satin, no post add flatting agent required for satin finishes	No need for flattening paste, consistent color production, satin hides imperfections in substrate, less glare, gloss level meets ADA specification
System available in gloss	It's shiny! Can be flattened to any gloss level
Convenient and labor saving when installed in shop	Eliminates need to run after paint, have it tinted, have it re-tinted or wait for delivery

Notes:

Mixing Practices in the Mix Room

Notes:

Mixing Bank

- Mixing banks: Initial power-up of mixing banks should agitate paint toners for 30 minutes. Then repeat throughout the day or at least 3 times per day for 15 minute intervals.
- If any lubrication to the mixing bank is required, 'castor' or 'mineral oil' should be used since they do not cause fisheyes.
- For especially hot/humid climates, keep the mix room as cool as possible to help keep the toners from drying out. Once the toner loses too much solvent its weight changes and can possibly compromise the color match.

Toners

- Store toner replacements upside down to avoid pigment settling.
- New cans of paint toners should be placed on the shaker 30 minutes before placing on the mixing bank.
- MPC does not recommend POUR OFFS. Gallon toners are not to be poured off into a quart container for use.
- Check toner cans. Bent cans may not properly fit on to mixing bank and prevent proper agitation.
- Store mixing containers (cups, cans, etc.) upside down to prevent dust and dirt from collecting in the can before use.
- Keep agitator lids clean. This ensures an airtight seal so that solvent loss and contamination are minimal. The 'mouth' of the mixing lid should be wiped off after each use.

Mixing Color

- Check your mixing lids for connection of the paddles with the paint can. Mixing bases that have not agitated properly can lead to mismatched colors.
- Newly mixed color formulas should be placed on a shaker for 20 minutes—especially when using Powdered Pearls.
- Be careful to pour the toner into the container and not on the lip of the can. If it doesn't get into the container, it won't be part of the mix.
- If you must leave the mixing area for a brief time, place a lid over your mix container to prevent contamination.
- If re-using a mixing container, make sure all residues from previous mixing are cleaned out. Residual paint can throw off a formula.
- Use only MPC approved mixing cups (MPC108 pint or MPC132 quart). However a metal can is recommended over the use of a plastic mixing cup because the color MUST be put on the shaker to ensure a uniform mix.
- Do not use a mixing stick in a container with tapered sides.
- When reducing products, do not "guess" the amount when you are mixing. Use an MPC mixing cup, mixing stick or the digital scale.
- When tinting, do not substitute toners. Follow what is in the formula.

Safety

As a result of studying the Safety presentation, and with the training manual for reference, the participant will be able to:

Learning Objective 1. Choose the proper personal safety gear for prepping, mixing and spray painting operations.

☐ Done

Learning Objective 2. Identify general safety precautions at work.

☐ Done

Learning Objective 3. State the basic goals of the OSHA and EPA organizations and explain how it relates to their work.

☐ Done

Look for the Learning Objectives icon to find areas within the manual that relate to the Learning Objectives above.

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Personal Safety Gear Recommendations

Paint prepping, mixing and spray operations

Sanding, Prepping and Mixing

- Non-supplied air dual cartridge respirator— NIOSH/MSHA TC-23 approved (use approved safety glasses with side shields if using a half-mask)
- Solvent-resistant footwear or boot coverings

Spraying Paint

- Positive pressure, air supplied hood or full face respirator— (recommended) NIOSH/MSHA TC-19 approved
- Solvent resistant footwear or boot coverings

Mixing and Spraying Paint

- Solvent-resistant coveralls such as TYVEK
- Solvent-impervious gloves, such as TYVEK/SARANEX 23-P, butyl rubber, viton, PE/EVAL/PE or nitrile rubber
- Solvent-resistant footwear or boot coverings

! Each coating system has its own unique chemical, physical, and physiological properties. Before you use a coatings product, read the entire product label and Safety Data Sheet / Material Safety Data Sheets.

Isocyanate Products in Coatings Applications

Questions and answers about the safe use of Isocyanate products in coatings applications

PPG manufactures a wide variety of coatings. There are many raw materials (or ingredients) that are used in coatings (or paint) formulations. Each ingredient has a specific purpose for being used in the formulation.

A product is designed to have certain properties based on the customer's end use requirements. For example, customers who use coatings to paint home interiors have different requirements than customers who use coatings to paint automobiles.

Each coating system has its own unique chemical, physical, and physiological properties. Before you use a coatings product, read the entire product label and Safety Data Sheet / Material Safety Data Sheets (SDS/MSDS). This way, you will know what you are working with and how to safely handle the product.

Use this text with the PPG Product Safety Data Sheet / Material Safety Data Sheet (SDS/MSDS) as well as any Product Technical Bulletins. There are publications on certain types of isocyanates, which provide more details than this text. To request such information, call your PPG contact.

Isocyanates

Q1. What are isocyanates?

A. Isocyanates are compounds containing one or more –N=C=O groups. These groups react with compounds containing alcohol (hydroxyl, OH) groups to

produce polyurethane polymers, which are components of polyurethane foams, thermoplastic elastomers, spandex fibers, and polyurethane paints."[1]

The term "isocyanates" herein will refer to the broad range of isocyanate products, including diisocyanates, prepolymers, and polymeric isocyanates.

Q2. Why are isocyanates used in paint?

A. Isocyanates are used in paints because they provide a cross-linking mechanism (chemical bond) that is unique from other coatings. As a result of these chemical bonds, isocyanates help create more durable coatings with outstanding aesthetic properties. Isocyanate-containing coatings provide films that cure quickly at low temperatures. They also have excellent application properties, producing smooth films and high gloss coatings.

Q3. What is a "blocked" isocyanate?

A. A blocked isocyanate is an isocyanate that has been chemically "capped" so that it does not react at low cure temperatures like an unblocked isocyanate. At elevated temperatures, however, a blocked isocyanate "unblocks" to yield the isocyanate functionality. When blocked isocyanates are used in coatings, small amounts of isocyanate may be released along with some of the blocking agent and other organic fragments during the normal curing process.

Health Hazards

Q4. Can isocyanates be used safely?

A. Yes. Always consult the PPG product SDS/MSDS and label for proper handling instructions. If you follow the recommended procedures for handling the product and controlling isocyanate exposure, isocyanates can be used safely.

Q5. What are the major human health effects of overexposure to isocyanate products?

A. Overexposure to isocyanate products can cause skin, eye, nose, throat, and lung irritation. It can also lead to skin or respiratory tract sensitization. A third effect for which there is some evidence is a chronic (long-term) loss of lung function. Refer to the product SDS/MSDS for a more complete list of potential health effects and symptoms.

Q6. What is sensitization?

A. Sensitization is the body's allergy-like response to a substance which has been inhaled or touched by a person. Sensitization may result from a large single overexposure or from repeated overexposures at lower levels.

Respiratory sensitization may be caused by inhalation of airborne isocyanates. Symptoms of respiratory sensitization may include asthma-like responses such as coughing, wheezing, tightness in the chest, shortness of breath, and headaches. Respiratory sensitization to isocyanates may be permanent.

Many isocyanates are also skin sensitizers. Skin sensitization may occur in response to skin contact. A skin sensitizer causes normal skin tissue to have an allergic reaction after repeated exposure. The skin sensitization reaction may include rash, itching, swelling, or hives.

Onset of sensitization depends on the type of isocyanate, the dose, the route of exposure, and the susceptibility of the individual. The response may be immediate, delayed, or both. Once sensitized to an isocyanate, it may take only a small amount via inhalation or skin contact to trigger an allergy or asthma-like respiratory response or reddening of the skin. There is some evidence that sensitization to one type of isocyanate may trigger an asthma-like response when the person is exposed to a different type of isocyanate.

Notes:

! Overexposure to isocyanate products can cause skin, eye, nose, throat, and lung irritation. It can also lead to skin or respiratory tract sensitization and chronic loss of lung function.

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Q7. Is there any way to prescreen individuals to determine if they are likely to become sensitized to isocyanates?

A. There is no simple test that can be done to identify people with a higher than average risk of becoming sensitized. Pre-placement and periodic medical surveillance is recommended for all employees who work with or who come into contact with products that use reactive isocyanates. Persons with asthmatic conditions, chronic bronchitis, previous isocyanate sensitivity, a history of skin or respiratory allergies, or other respiratory conditions should be medically evaluated on a case-by-case basis to judge the fitness of the individual to work with isocyanates. If a person is diagnosed as sensitized to isocyanates, no further exposure to any type of isocyanate should be permitted.

Q8. Are there any warning signals to indicate that I am being overexposed?

A. Isocyanates are difficult to detect by your senses alone. Occupational Exposure Limits (OEL) for isocyanates are typically below the concentration that your eyes or nose can detect. This means that isocyanates have "poor warning properties," and that even if you cannot sense isocyanates you may still be overexposed.

Q9. Are there any other hazards related to isocyanate products?

A. Consult the product SDS/MSDS to review the potential health effects of other hazardous ingredients or the potential hazards of associated products. The PPG product SDS/MSDS and label provide all the information necessary to safely handle, use, and store the product.

Q10. What factors may lead to overexposures when using isocyanate products?

A. Inhalation exposure hazard varies depending on many factors. Some of these factors are vapor pressure, volatility, application method, temperature, and characteristics of the work area. Isocyanates have much lower vapor pressures compared to those of other liquids such as water and organic solvents. This means that isocyanates evaporate very slowly compared to the other liquids. However, when isocyanate products are used in spray applications or at elevated temperatures, inhalation exposure is a larger concern. The volume of material being used, the size of the area in which it is used, the size and shape of the part being formed, the temperature of the material, and the amount of ventilation in the work area are also factors that have an effect on potential overexposure.

Controls

Q11. How can isocyanate exposures be controlled?

A. Exhaust ventilation, enclosure of the operation, and personal protective equipment (PPE) are typical methods of isocyanate overexposure control. For example, during spray application, spray booths are used to help enclose the isocyanate operation and prevent exposure to other employees. PPE for the eyes, respiratory tract, and skin may include chemical splash goggles, positive pressure air-supplied respirators, impervious gloves, and protective clothing. Local exhaust or general dilution ventilation (adding more air to an area) is needed to remove decomposition products when welding or flame cutting on surfaces coated with isocyanates.

Q12. Do I have any options for the type of respiratory protection?

A. A supplied-air respirator with a full facepiece is considered to be one of the most effective types of respirators in protecting against airborne contaminants, including isocyanate vapors and spray. This type of respirator is designed to protect the face, eyes, and respiratory tract when worn properly and connected to

! Exhaust ventilation, enclosure of the operation, and personal protective equipment can control isocyanate exposure.

an appropriate source of breathable air. Half-mask supplied-air respirators, when worn with a face shield and chemical splash goggles, are another option.

During selected situations involving solvent-containing isocyanate products, some users may elect to use air-purifying respiratory protection equipped with appropriate chemical and particulate filter cartridges. This option is only appropriate as part of a comprehensive health and safety evaluation of the workplace operation and the implementation of a complete respiratory protection program. This evaluation needs to include a review of governmental regulations, an exposure assessment, an evaluation of control measures, and the capabilities of the available respiratory protection.

Q13. How can I measure my potential exposure?

A. Industrial hygiene air sampling is recommended to evaluate potential airborne exposure to isocyanates. The sampling and analytical methods selected should be based upon the particular isocyanate to be sampled and the application method. Be sure to share the SDS/MSDS(s) with the laboratory performing the analyses. Surfaces can be checked for isocyanate contamination using commercially available surface wipe sampling kits.

Q14. What other methods can I use to minimize employee exposure to isocyanates during spray applications?

A. Using a brush or roller method rather than a spray application method will reduce the potential for exposure to airborne isocyanates. Non-heated coatings applications reduce the likelihood of isocyanate evaporation because the isocyanate's vapor pressure decreases with decreasing temperature. Good work practices, such as positioning workers so they do not spray directly toward each other and minimizing the number of employees in the immediate work area, also help to decrease exposure.

Q15. What should be done if there is a spill of an isocyanate product?

A. Follow the spill procedures for your work location and dispose of waste in accordance with your federal, state, provincial, and local environmental control regulations. Plan to have spill control/neutralization materials and employee protective equipment located so that it is readily available in emergencies. Non-essential personnel should be immediately evacuated from the contaminated area and all sources of ignition (flames, hot surfaces, and electrical, static or frictional sparks) should be eliminated. It is important to ventilate the area. Dike or contain the spilled material and try to control further spillage. Vermiculite, Fuller's earth, or other absorbent materials can be used to absorb the spill. Containers of spilled material should not be sealed for 72 hours due to carbon dioxide pressure buildup which could cause the container to rupture. It is recommended that the product's SDS/MSDS be reviewed for specific spill and handling instructions.

Q16. How do I decontaminate an area after a spill?

A. For most isocyanates, the following is a recommended decontamination solution:

- 20% liquid nonionic surfactant, such as Dow Tergitol TMN-10, that mixes well with water
- 80% water

If the spill involves hydrogenated MDI (dicyclohexylmethane-4,4'-diisocyanate), sometimes called HMDI, a combination degreaser/monoethanolamine/water solution is recommended.

Handling Cured Parts

Q17. When is it safe to touch a newly cured part?

A. Check with your PPG representative to determine the proper curing time and

Notes:

! In case of a spill of isocyanate products, follow the spill procedures for your work location and dispose of waste in accordance with your federal, state, provincial, and local environmental control regulations.

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other requirements for the PPG product you are using. Isocyanate exposures are not expected from cured parts or films.

Q18. Are there any hazards associated with sanding or machining isocyanate products?

A. For cured parts or films, it is not expected that isocyanates would be generated in the dust produced during sanding or machining processes. It is still recommended that a respirator suitable for preventing inhalation of dust particulates formed during these operations be worn.

Sanding or machining uncured isocyanate coatings poses a potentially larger hazard than cured parts since it is possible that airborne isocyanates can be generated. "Wet" sanding reduces the total amount of sanding dust generated and should be used whenever possible. Local exhaust ventilation, such as a vacuum sander, is another control measure that can be used to minimize potential exposure to airborne contaminants. PPE should also be used to prevent skin and respiratory tract exposure to isocyanates when handling or machining uncured isocyanate products.

Q19. What types of hazardous substances can evolve during heating, flame cutting, or welding substrates that have been coated with isocyanate products?

A. Flame cutting, brazing, welding, or fire conditions are situations that generate high temperatures which could result in thermal decomposition of the coating. Fumes, gases, and vapors that are generated by these processes may include, but are not limited to, carbon monoxide, oxides of nitrogen, traces of hydrogen cyanide, and free isocyanate. Refer to the product SDS/MSDS for other possible hazardous decomposition products. The nature of the fumes, gases, vapors, or particulates may vary depending on the type of process being used to weld or cut, the nature of the base metal, and the type of coating system. Removing the coating before high-temperature processing will reduce the potential exposure to isocyanate-containing fumes and vapors. Ventilation (local or general area) is needed to remove decomposition products during these operations.

For more information, contact your PPG representative or PPG Product Stewardship.

References

1. US Department of Labor: Occupational Safety & Health Administration. http://www.oshaslc.gov/SLTC/isocyanates/. (Accessed: June 2003)
2. Baur, X.; Dewair, M.; Rommelt,H.; Journal of Occupational Medicine. 1984, 26(4), 285-287.
3. Desmodur N: Hexamethylene Diisocyanate Based Polyisocyanates, Health and Safety Information; Bayer: Pittsburgh, 1999; p 4.
4. Meyer, H. E.; Blocked Isocyanates: Questions and Answers About Use and Handling; Bayer: Pittsburgh, 1993.
5. Isocyanates: Questions and Answers About Use and Handling in Coatings Applications; Bayer: Pittsburgh, 2002.

Safety Tips While Working

The following items are general safety tips to keep in mind as you work. These tips will help reduce the number of accidents that occur in the workplace and maintain good personal health:

- Keep the workplace clean and tidy and immediately clear up any spillage to prevent accidents.
- Maintain good ventilation and protect all persons from the inhalation of dust, vapors, and spray mists—not just the individual performing the operation.
- Do not consume or store food or drink in the workplace or storage areas. Do not smoke in these areas.
- Protect skin with a barrier cream and gloves. Wash off paint splashes with soap and water or proprietary cleaner—do not use solvents or thinners. Wash hands thoroughly before eating or drinking.
- Wear suitable eye protection to prevent eye damage from splashes.
- Read material safety data sheets (MSDS) and labels and follow the instructions carefully.
- Use the protective clothing, masks, goggles, and other safety equipment recommended.

Notes:

First Aid Procedures In the Event of an Accident

- **Inhalation:** Move patient to fresh air, keep warm and at rest. If breathing is irregular or has stopped, administer artificial respiration. Give nothing by mouth.
- **Eye Contact:** Irrigate with lots of clean, fresh water for at least ten minutes, holding the eyelids apart.
- **Skin Contact:** Remove contaminated clothing, wash skin thoroughly with soap and water, or use an appropriate skin cleanser. Do not use solvents or thinners.
- **Ingestion:** There is no hazard by this route in normal industrial activities. If accidentally swallowed, do not induce vomiting. Keep at rest and obtain medical attention.

When seeking medical attention, show the product and MSDS to medical personnel to assist in a speedy diagnosis.

General Precautions

The following precautions should be observed at different stages of operations:

Mixing and Handling

- The opening and mixing of industrial finishing products should be carried out in a well-ventilated area separate from the storage and application areas.
- Used or partially used containers should be securely closed and returned to the storage area as soon as possible after use.
- Isocyanate, Peroxide or other activators should be incorporated with their base products strictly in accordance with the instructions given in the Technical Data Sheets.

Application

- Spraying must be confined to spray booths or enclosures fitted with mechanical exhaust ventilation.
- Booths and similar enclosures should be designed, installed and maintained to provide sufficient air flow velocity to prevent any vapors or spray mists escaping into the general atmosphere of the workroom or the operator's breathing zone. Exhaust ventilation should be designed in such a way that vapors and spray mists are conducted away to a safe place in the open air without the possibility of re-entry into any buildings.

! Maintain good ventilation and protect all persons from the inhalation of dust, vapors, and spray mists—not just the individual performing the operation.

Notes:

- Booths should be constructed of fire-resisting materials and fitted with either replaceable dry filters or a water wash system to prevent the discharge of residues into the general atmosphere.
- The mechanical exhaust ventilation systems should be kept running for a short period after spraying has stopped to ensure the complete removal of vapors and spray mists.

Housekeeping

- High standards of housekeeping are the basis of creating and maintaining a safe and healthy working environment. Strict attention to good housekeeping is therefore essential.
- The accumulation of spray deposits on booths, and accumulation on fans should be minimized by regular cleaning and removal.
- Sweeping or scrapings should be placed immediately in metal receptacles with suitable covers, and removed without delay to a safe place outside the buildings.
- Storage and working areas should be kept tidy with gangways and exits clearly identified and unobstructed.

Health Risks

The main potential risks to health arising from industrial finishing products are:

- Inhalation of solvent vapors may lead to dizziness, nausea, mental confusion and in extreme cases, loss of consciousness. Irritation to the respiratory system and internal damage may also occur.
- Inhalation of dusts and spray mists may also lead to irritation of the respiratory system.
- Contact with skin may cause irritation and, with certain products, eye damage.
- Accidental ingestion may cause irritation of the mouth, throat and digestive tract, resulting in vomiting and abdominal pain. Significant absorption may cause drowsiness or loss of consciousness.

Health Precautions

Precautions to be observed to control and minimize these risks should include the following:

- High standards of housekeeping.
- High standards of personal hygiene, e.g. operators should wash their hands before eating, drinking, or using the lavatory.
- Operators should be protected against the inhalation of dusts, vapors and spray mists at all stages in the process by the provision of good standards of general ventilation, where necessary, to keep atmospheric concentrations below dangerous levels. Local exhaust ventilation should be provided at all points where emissions to the workroom atmosphere may occur.
- Splashes of paint on the skin should be removed promptly with soap and water. If necessary an appropriate skin cleansing material should be used. Solvents and thinners should not be used for skin cleaning.
- A suitable barrier cream may help to protect exposed areas of skin.
- Suitable eye protection appropriate to the process must be worn at all times.
- Accidental ingestion should be avoided by the prohibition of eating, drinking, and smoking in all working areas. Food and drink should not be brought into, stored or prepared in work rooms and storage areas.

! Smoking should be prohibited in all areas where paint is stored, handled or used.

Selection of Protective Clothing and Equipment

Protective clothing and equipment, particularly respiratory protective equipment, must be selected carefully and with proper consideration to the circumstances in which it will be used.

Fire and Explosion

Sources of Ignition

- All possible sources of ignition should be strictly controlled.
- Smoking should be prohibited in all areas where paint is stored, handled or used.
- Matches and lighters should not be taken into any workroom.
- Electrical apparatus should be to a recognized standard.
- Vehicle engines should not be switched on or allowed to run where a flammable concentration of vapors may reasonably be expected to be present.
- Static electricity may be generated from activities in workrooms, e.g. from handling flammable liquids or from the wearing of unsuitable clothing and footwear. Under certain conditions, to minimize the static risk, the following precautions should be observed where flammable liquids are handled or used:
    - Dispensing equipment must be properly bonded and grounded.
    - Overalls should be anti-static.
    - Floors should be conductive and paint deposits regularly removed.
    - Operators mixing, decanting or transferring flammable liquids should wear non-insulating footwear.
    - Working surfaces should not be constructed from non-conductive materials such as plastics.

Fire Precautions

- Means of escape should be adequate, clearly identified and kept free from obstruction at all times. Fire escape doors should be kept unlocked whilst the premises are occupied.
- Adequate fire prevention and fire fighting equipment should be provided and maintained in all areas where industrial finishing products are used, handled, and stored. Fixed automatic sprinkler systems may be appropriate to provide fire protection for some installations.

Fire Fighting

Fire will produce dense black smoke containing harmful by-products of combustion. Use foam or dry powder extinguishing agents. Do not use water. Cool containers exposed to fire with water spray.

Spillage

Contain and collect spillage with non-combustible or absorbent materials, e.g. sand or earth. Do not allow to enter drains. Exclude sources of ignition. Ventilate area.

Environmental

Waste materials must be treated as a fire hazard. Empty containers can retain vapors of solvents present in the original product and are therefore hazardous in respect of fire, explosion, and noxious vapor risks. Storage in a non-combustible, clearly labeled container with a secure lid is recommended prior to disposal.

MATTHEWS PAINT

Notes:

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Notes:

Environmental Awareness and Self Inspection Checklist

The Federal Occupational Safety and Health Act (OSHA) encourages each state to assume the fullest responsibility for the administration and enforcement of occupational safety and health programs.

For example, federal law permits any state to assert jurisdiction, under state law, over any occupational safety or health standard not covered by a federal standard. For more information regarding OSHA guidelines and how they apply to you, contact your OSHA regional office.

As the owner or manager of a small business, your attitude toward shop safety and health will be reflected in your employees' actions. If you are not interested in preventing accidents, nobody else is likely to be. Health and safety should not be considered an option but a necessary procedure in your shop.

Here are some action items for your consideration:

- Post the OSHA workplace poster.
- Hold a meeting with all employees to discuss job safety and health matters.
- This would also include good housekeeping.
- Write a policy statement and post this statement near the OSHA workplace poster.
- Consider establishing a "Code of Safe Operating Procedures."
- Include job safety topics in all future production meetings.
- Make sure employees understand all requirements for labeling and storage of hazardous waste.

You may need to ensure the availability of medical personnel for advice and consultation on matters of employee health. This does not mean that you must provide health care. But, if health problems arise in your operation, you are expected to get medical help to treat them and their causes.

You should have an emergency medical procedure for handling injuries, transporting ill or injured workers, and notifying medical facilities. Posting emergency numbers is a good idea. Survey the medical facilities near your business and make arrangements with them to handle routine and emergency cases.

You should have a procedure for reporting injuries and illnesses that is understood by all your employees. If your location is remote from medical facilities, you may need at least one person trained in first-aid, available at all times.

Adequate first-aid supplies must be readily available for emergency use. Where the body or eyes of any employee may be exposed to injurious corrosive materials, suitable equipment for quick drenching or flushing of the eyes and body must be provided in the work area for immediate emergency use.

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EPA and RCRA

At the end of WWII, the United States was generating roughly 500,000 metric tons of hazardous waste per year. In 1985, a national survey conducted by the EPA estimated that 275 million metric tons of hazardous waste were generated nationwide.

It became clear to Congress and the nation that action had to be taken to control hazardous waste, so the following goals were set:

- To protect human health and the environment.
- To reduce waste and conserve energy and natural resources.

From this the Resource Conservation and Recovery Act (RCRA), an amendment to the Solid Waste Disposal Act, was enacted to address this enormous problem.

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Hazardous Waste

A waste is any solid, liquid, or contained gaseous material that you no longer use or recycle, store to treat, or dispose of. As a result of doing business, a company may generate wastes that can cause serious problems if not handled and disposed of carefully. To determine what hazardous waste generating category your operation falls into and what requirements you must meet, you must measure the amount of hazardous waste your facility generates in a calendar month. There are three basic categories recognized by federal standards:

- Conditionally exempt small quantity generator
- Small quantity generator
- Large quantity generator

Transporters of hazardous waste are the critical link between the generator and the ultimate off-site disposal facility. Carefully choosing a hauler is important. The hauler will be handling your waste beyond your control. You are responsible for your hazardous waste from the "cradle to the grave."

Before choosing a hauler or designated disposal facility you should check with the following sources:

- Friends or colleagues in your industry
- Trade associations
- Better Business Bureau
- Chamber of Commerce
- State Hazardous Waste Management Agency
- EPA Regional Office

The manifest is part of a controlled tracking system. Each time the waste is transferred from a transporter to the disposal facility or from a transporter to another transporter, the manifest must be signed. Once the waste is delivered to the disposal facility, the owner or operator of the facility must send a copy of the manifest back to the generator.

Reducing Hazardous Waste

Reducing hazardous waste means saving money on raw materials and reducing the cost to your business for managing and the disposal of the waste generated. To reduce the amount of hazardous waste you should:

- Not mix non-hazardous waste with hazardous waste.
- Avoid spills and leaks.
- Make sure the original containers of hazardous products are completely empty before you throw them away.
- Never mix more material than you need to get the job done.

! A waste is any solid, liquid, or contained gaseous material that you no longer use or recycle, store to treat, or dispose of.

Notes:

OSHA/EPA Regional Contact Numbers

	OSHA	EPA
Region 1 (CT, ME, MA, NH, RI, VT*)	(617) 565-9831	(617) 565-3420
Region 2 (NY, NJ*, PR, VI*)	(212) 337-2378	(212) 637 3000
Region 3 (DE, DC, MD*, PA, VA*, WV)	(215) 596-1201	(215) 597-9800
Region 4 (AL, FL, GA, KY*, MS, NC*, SC*, TN*)	(404) 562-2300	(404) 347-4727
Region 5 (IL, IN*, MN*, MI*, OH, WI)	(312) 353-2220	(312) 353-2000
Region 6 (AR, LA, NM*, OK, TX)	(214) 767-4731	(214) 665-6444
Region 7 (IA*, KS, MO, NE)	(816) 426-5861	(913) 551-7000
Region 8 (CO, MT, ND, SD, UT, WY)	(303) 844-1600	(303) 293-1603
Region 9 (CA*, AZ*, NV*, HI*, American Samoa, Guam)	(415) 975-4310	(415) 744-1305
Region 10 (AK*, ID, OR*, WA*)	(206) 553-5930	(206) 553-4973

*These states and territories operate their own OSHA approved job safety and health plans (Connecticut and New York plans cover public employees only). States with approved plans must have a standard that is identical to, or at least as effective as, the federal standard.

Make an OSHA Self-Inspection List

The most widely accepted way to identify hazards is to conduct a self-inspection of your shop. This is a must, if you are to know where probable hazards exist and whether they are under control.

The following is a "Self-Inspection Check List" for your consideration:

Notes:

General

Do you have:

❑ Yes ❑ No The OSHA Workplace poster properly displayed?
Comments:

❑ Yes ❑ No Requirements to report all accidents?
Comments:

❑ Yes ❑ No Requirements to maintain injury reports?
Comments:

❑ Yes ❑ No Scheduled safety meetings?
Comments:

❑ Yes ❑ No Employees that know what to do in case of an emergency?
Comments:

❑ Yes ❑ No First aid supplies in the facility?
Comments:

❑ Yes ❑ No Emergency phone numbers clearly posted?
Comments:

Electrical

Do you have:

❑ Yes ❑ No Electrical installation in hazardous dust and vapor areas that meet the National Electrical Code (NEC)?
Comments:

❑ Yes ❑ No Electrical cords free of grease, oil, and solvents?
Comments:

❑ Yes ❑ No Electrical switches that show evidence of overheating?
Comments:

❑ Yes ❑ No Electrical switches marked to show their purpose?
Comments:

Notes:

Exits and Access

Do you have:

❑ Yes ❑ No Exits visible and unobstructed?
Comments:

❑ Yes ❑ No Exits that are posted with signs?
Comments:

❑ Yes ❑ No Sufficient numbers of exits in case of an emergency?
Comments:

❑ Yes ❑ No Proper lighting in hallway exits?
Comments:

Fire Protection

Do you have:

❑ Yes ❑ No Portable fire extinguishers?
Comments:

❑ Yes ❑ No Fire extinguishers inspected monthly and noted in an inspection log?
Comments:

❑ Yes ❑ No Fire extinguishers wall mounted in an accessible location?
Comments:

❑ Yes ❑ No Employees trained in the use of fire extinguishers?
Comments:

❑ Yes ❑ No A local fire department familiar with location and material in the facility?
Comments:

❑ Yes ❑ No Monthly tests of your fire alarm system?
Comments:

❑ Yes ❑ No Sprinkler heads clear of obstructions?
Comments:

Paint Area

Do you have:

❑ Yes ❑ No No Smoking signs posted in a visible area?
Comments:

❑ Yes ❑ No Proper protective equipment for Technicians in paint area?
Comments:

❑ Yes ❑ No Metal cans with lids for solvent soaked rags?
Comments:

❑ Yes ❑ No Proper labels on all metal waste cans?
Comments:

❑ Yes ❑ No All metal containers properly bonded and grounded?
Comments:

❑ Yes ❑ No Approved flammable storage cabinets with spill trays?
Comments:

❑ Yes ❑ No All employees keep lids on containers when not in use?
Comments:

❑ Yes ❑ No Explosion-proof equipment in mixing and spray area?
Comments:

❑ Yes ❑ No Proper air ventilation in spray area?
Comments:

❑ Yes ❑ No Air regulators in the spray area?
Comments:

❑ Yes ❑ No MSDS available for all products used?
Comments:

❑ Yes ❑ No Employees trained to understand the MSDS?
Comments:

❑ Yes ❑ No Grounding cables for transferring solvents or flammables?
Comments:

❑ Yes ❑ No Skin and eye flush stations in spray areas?
Comments:

❑ Yes ❑ No Fresh air respiratory equipment in paint spray area?
Comments:

❑ Yes ❑ No Regular maintenance schedule for fresh air equipment?
Comments:

Notes:

Notes:

Hazardous Waste

Do you have:

❑ Yes ❑ No A list of the different kinds and amounts of waste that you generate?
Comments:

❑ Yes ❑ No A U.S. EPA identification number?
Comments:

❑ Yes ❑ No Documentation of your hauler, their I.D. number and the designated waste management facility?
Comments:

❑ Yes ❑ No Copies of all manifests used to ship waste?
Comments:

❑ Yes ❑ No Your hazardous waste stored in approved containers?
Comments:

❑ Yes ❑ No The containers properly dated and marked?
Comments:

❑ Yes ❑ No Emergency phone numbers located properly?
Comments:

❑ Yes ❑ No Spill control materials located in accessible areas?
Comments:

❑ Yes ❑ No Employees familiar with proper waste handling and emergency procedures?
Comments:

❑ Yes ❑ No Paint filters being disposed of properly?
Comments:

❑ Yes ❑ No Hazardous product containers cleaned out prior to throwing away?
Comments:

MSDS

As a result of studying the MSDS presentation, and with the training manual and MSDS for reference, the participant will be able to:

Learning Objective 1. Explain what MSDS is.
☐ **Done**

Learning Objective 2. Find the section of a particular MSDS that contains the information they need to know, whatever it may be.
☐ **Done**

Learning Objective 3. Explain where to obtain MSDS for Matthews Products.
☐ **Done**

Look for the Learning Objectives icon to find areas within the manual that relate to the Learning Objectives above.

Notes:

Notes:

MSDS Information (Material Safety Data Sheet)

This information is supplied to help users of Matthews products comply with various Hazard Communication Statutes and Rights to Know Regulations.

MSDS—What They Are

Material Safety Data Sheets provide useful safety, healthy, handling, emergency and other information about Matthews products. Most products have their own MSDS; some products are grouped together on one MSDS. **State and Federal Hazard Communication Standard — 29 CFR 1910.1200, requires that MSDS for all products used be kept on site and readily accessible at any time.** An explanation of the various sections of the MSDS is covered in the following pages, including a sample MSDS.

EPA and RCRA

At the end of WWII, the United States was generating roughly 500,000 metric tons of hazardous waste per year. In 1985, a national survey conducted by the EPA estimated that 275 million metric tons of hazardous waste were generated nationwide. It became clear to Congress and the nation that action had to be taken to control hazardous waste, so the following goals were set:

- To protect human health and the environment.
- To reduce waste and conserve energy and natural resources.

From this the Resource Conservation and Recovery Act (RCRA), an amendment to the Solid Waste Disposal Act, was enacted to address this enormous problem.

! Material Safety Data Sheets provide useful safety, healthy, handling, emergency and other information about Matthews products.

MSDS Explanation and Glossary of Terms

MSDS are divided into 10 sections. Each section contains a different type of very specific data.

Section 1. Product Information

Product Code / Identity: The sales code used to specifically identify a product. (Formula Date)

Product Trade Name: The common or other descriptive name under which a group of related or individual products are sold.

Chemical Family: The chemical compound(s), class or category that most accurately describes a product.

Shipping Information: The appropriate name(s), hazard class(es) and identification number(s) as determined by the United States Department of Transportation, International Regulation and International Civil Aviation Organization.

Section 2. Ingredients

Exposure Limits

(Permissible Exposure Limits), individual companies (PPG Internal Permissible Exposure Limits) and consensus groups such as the American Conference of Governmental Industrial Hygienists (Threshold Limit Values). A general definition is "airborne concentrations of substances which represent conditions under which it is believed that nearly all workers may be repeatedly exposed day after day without adverse effect." Duration (8-hour TWA vs. 15-min STEL vs. Ceiling) and potential skin absorption must also be considered.

SARA 311/312 Categories for This Product

SARA Title III Sections 311/312, require MSDS or lists of MSDS chemicals to be submitted to certain emergency response authorities. See 40 CFR 370. This product has been classified as to its acute and chronic health properties, as well as to its flammability, pressure and reactivity characteristics according to the definitions of the OSHA Hazard Communication Standard (29 CFR 1910.1200).

TSCA Status of Product

All materials or mixtures must be evaluated relative to the commercial, research or other requirements of the Toxic Substance Control Act. All ingredients / components used in formulating products are considered in the overall evaluation of them. Chemical Abstract Services Numbers (CAS #) are provided where appropriate.

Hazard Information

Acute (short term) and chronic hazards (long term) per Canada's WHMIS guidelines, plus SARA 311/312 categories for each ingredient are shown. LD/LC 50's (amount producing death in 50% of test animals) are also given when applicable /available.

SARA Title III and CERCLA Information

Yes or No identifies whether each ingredient is on the following lists:

1. Hazardous Substances, CERCLA Section 102
2. Extremely Hazardous Substances, SARA Section 302
3. Toxic Chemical, SARA Section 313

Appropriate Reportable Quantities and Threshold Planning Quantities (in pounds for discrete ingredients) are provided. Weight percentages are discrete chemicals and chemical classes covered under Section 313 are also provided.

Definitions

ppm: Parts of vapor or gas per million parts of contaminated air volume

mg/m^3: Milligrams of substance per cubic meter of contaminated air

mg/L: Milligrams of substance per liter of contaminated air

g/kg: Grams of substance per kilogram of test animal body weight

IARC: International Agency for Research on Cancer

NTP: National Toxicology Program

SARA: Superfund Amendments and Reauthorization Act

CERCLA: Comprehensive Environmental Response, Compensation and Liability Act

Section 3. Health Hazard Data

Possible health hazards as derived from human observation, animal studies or from the results of studies with similar products are presented. Gives the effects of overexposure to the product by skin or eye contact, breathing of vapors or dust and ingestion. Common symptoms which may occur from exposure to the chemical are given.

Notes:

! All materials or mixtures must be evaluated relative to the commercial, research or other requirements of the Toxic Substance Control Act.

Notes:

Section 4. First Aid Procedures

Gives emergency and first aid instructions for treating overexposure by inhalation, ingestion, skin and eye contact.

Section 5. Fire and Explosion Hazard Data

Flash point: The temperature at which a liquid gives off sufficient vapor to form an ignitable mixture when tested.

PMCC: Pensky-Martens Closed Cup Flashpoint Test.

LEL: The lower-limit percent by volume of vapor in air that will explode or ignite in the presence of spark or flame.

UEL: The upper-limit percent by volume of vapor in air that will explode or ignite in the presence of spark or flame.

Extinguishing Media: Specifics the fire fighting agents that should be used to extinguish fires.

Unusual Fire and Explosion Hazards: Refers to special procedures required if unusual fire hazards are involved.

Section 6. Spill or Leak Procedures (Accidental Release)

Steps to be taken in the event of accidental leak or spillage of material along with suggestions for proper disposal.

Section 7. Special Precautions

States or re-emphasizes any special precautions or handling requirements, especially regarding storage.

Section 8. Protection Information

Eye Protection: Specification of eye or face protection beyond normal use of safety glasses.

Skin Protection: Specification of gloves and clothing required based on type and degree of hazard from skin contact. Specific materials of construction (e.g., neoprene) are listed.

Respiratory Protection: Specification of other recommended personal protective equipment based on the type and degree of hazard.

Other: Specification of other recommended personal protective equipment based on the type and degree of hazard.

Ventilation: Specification of the type (local / general) of ventilation recommended to capture contaminants or prevent the build-up of hazardous atmospheres.

! MSDS gives emergency and first aid instructions for treating overexposure by inhalation, ingestion, skin and eye contact.

Section 9. Physical / Chemical

Vapor Pressure: The pressure exerted at a given temperature of vapor in equilibrium with its liquid or solid.

Vapor Density: The density of a material's vapor, compared to the density of air.

% Vol /Volume: The percent of volatile material by volume.

WT. / Gal (lbs): The weight in pound of a gallon of material.

pH: A number that describes the acidity or alkalinity of an aqueous solution.

Specific Gravity: The ratio of the weight of a given temperature of a vapor in equilibrium with its liquid or solid.

Notes:

Section 10. Reactivity Data

Stability: An expression of the ability of a material to remain unchanged under expected and reasonable conditions of storage and use.

Conditions & Materials to Avoid: Gives the conditions and materials that may cause unstable situations.

Hazardous Decomposition Products: Describes the hazardous materials produced during heated operations.

MSDS (Material Safety Date Sheet) Information Alphanumeric Order

All MSDS are arranged in Alphanumeric order. Please note that more than one product may be listed on one MSDS.

Important Note: Any distributor or individual using Matthews Products must have the proper MSDS on site and readily available by law.

Matthews Paint no longer creates CD's with the MSDS sheets. They are available on our website at the following address: www.matthewspaint.com

- Click on the "QUICKLINKS" on the top navigation bar of the homepage
- Then click MSDS library and corresponding search button
- Enter the desired product code and click on the search button

Call the Matthews toll free number with any questions: 1.800.323.6593

VOC

As a result of studying the VOC presentation, and with the training manual for reference, the participant will be able to:

Learning Objective 1. Tell what VOC stands for.
☐ Done

Learning Objective 2. Explain what VOC is and where it is found.
☐ Done

Learning Objective 3. Explain why VOC is regulated.
☐ Done

Learning Objective 4. Understand how the regulations affect the coatings they use.
☐ Done

Look for the Learning Objectives icon to find areas within the manual that relate to the Learning Objectives above.

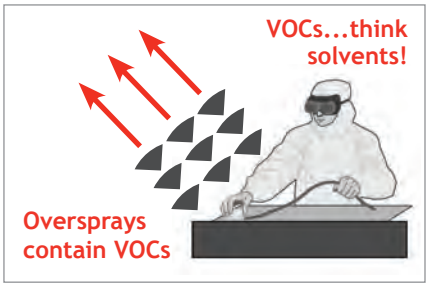
Notes:

Notes:

What Does VOC Stand For?

What is VOC?

- Volatile Organic Compound
- VOCs are released during application of industrial paint products and go into the atmosphere where they react with sunlight, auto emissions, and dust to cause pollutants known as Photochemical Smog.
- Oversprays contain VOCs
- In short, VOCs contribute to air pollution!



Where is VOC Found?

What is VOC?

- VOCs are found in paints, primer, solvents and catalysts/hardeners.

Does not necessarily represent actual percentage of content. Merely a graphical representation.

! VOCs are released during application of industrial paint products and go into the atmosphere where they react with sunlight, auto emissions, and dust to cause pollutants known as Photochemical Smog.

Why VOC is Regulated

VOCs are regulated by federal and state agencies such as the EPA and SCAQMD (South Coast Air Quality Management District) in Southern California. Several separate agencies may have different regulations in a state.

The regulations are designed to limit the amount of VOC that is put into the air because most evaporative solvents contribute to air pollution.

Notes:

How to Reduce VOC

The most efficient way to reduce the amount of VOC which goes into the air is to limit the amount of VOC which goes into the paint in the first place. But how?

- Reduce the amount of solvent added to paint when mixing and spraying.
- Make "hi-solids" paint from the factory with resin systems that work with less solvent.
- Another way is to use more efficient spray application equipment such as HVLP (Hi-Volume, Low Pressure) or electrostatic. This simply requires less paint to cover an area, which in turn uses less solvent.

Summary

- Regulations in your area may require the use of Low VOC Coatings. If so, Matthews has those coatings available.

! You can reduce the amount of VOCs going into the air by reducing the amount of solvent added to paint when mixing and spraying.

Fundamentals

As a result of studying the Fundamentals presentation, and with the training manual for reference, the participant will be able to:

Learning Objective 1. Identify 6 simple key factors which, if followed, can insure success in nearly every paint job.

☐ **Done**

Learning Objective 2. Identify the types of paint failures that can occur when substrates are not properly cleaned and prepped prior to painting.

☐ **Done**

Learning Objective 3. Identify specific problems associated with a poorly adjusted spray gun and improper atomization.

☐ **Done**

Learning Objective 4. Explain the effect proper and improper flash times have on paint coatings.

☐ **Done**

Learning Objective 5. List the problems associated with using the wrong solvent or catalyst for the temperature and airflow of the spray environment and size of the unit to be painted.

☐ **Done**

Learning Objective 6. Recognize the problems associated with varied temperature and airflow conditions within the spray environment and explain the "15 degree rule."

☐ **Done**

Learning Objective 7. Compile a checklist of basic procedures to follow before painting for reference at work.

☐ **Done**

Look for the Learning Objectives icon to find areas within the manual that relate to the Learning Objectives above.

Notes:

Six Simple Key Factors and Key Fundamentals of Spray Painting

This information is designed to help the user obtain maximum performance from the product. See the six key factors which follow ...

Notes:

Rule 1. Surface Preparation
Rule 2. Coating Selection and Compatibility
Rule 3. Spray Equipment Adjustment
Rule 4. Flash, Tack and Dry Times
Rule 5. Reduction and Solvent/Catalyst Selection
Rule 6. Spray Area Temperature and Airflow

Rule #1. Surface Preparation

Professionals do not even think about priming or painting over any substrate that hasn't been properly cleaned or prepped!

Paint problems or failures that stem from improper surface preparation (cleaning, treating or removal of defects) are costly. Properly prepared surfaces, be they metals, fiber glass, or organic substrates, must be both sound and chemically clean. These two factors are essential in order for the applied products to obtain their expected adhesion and durability.

Definition of "Sound" and "Unsound"
Sound substrates are free of defects that can affect a coating's designed performance limits. Unsound substrates have defects that can cause a coating's designed performance to be compromised!

Types of Unsound Substrates

Unsound Metal Substrate: A metal substrate that has been degraded by microscopic or visible rust or oxidation present within or on the substrate are examples of an unsound substrate. These types of defects must be removed first by the use of both mechanical and chemical means.

Types of failures normally associated with coatings over unsound metal substrates are:
1. Early loss of adhesion due to rusting, peeling or chipping
2. Early blistering of coatings after exposure to moisture
3. Fisheyes, cratering

Unsound Organic Substrate: An organic substrate (old paint for example) that has been degraded by film breakdown (such as checking, cracking, chalking, low gloss or humidity blistering) is an example of an unsound substrate and should be completely removed prior to recoating.

! Properly prepared surfaces must be both sound and chemically clean. These two factors are essential in order for the applied products to obtain their expected adhesion and durability.

Types of Failures

Types of failures normally associated with coatings over unsound metal substrates are:

1. Early loss of adhesion due to rusting, peeling or chipping.
2. Early blistering of coatings after exposure to moisture.
3. Fisheyes, cratering

Notes:

Unsound Organic Substrate

An organic substrate (old paint for example) that has been degraded by film breakdown such as checking, cracking, chalking, low gloss or humidity blistering, are examples of an unsound substrate and should be completely removed prior to recoating.

The types of failures normally associated with coatings over an unsound organic substrate are:

1. Telescoping of the previous defects such as splitting, cracking, or micro checking up through the newly applied coating after it has thoroughly cured.
2. Newly applied coatings are soaked up and are degraded by film breakdown such as chalking or low gloss.
3. The adhesion property of the newly applied coating is degraded to the level of the substrate.

NOTE: Humidity blistering may stem from either an unsound metal and/or organic substrate. This weakness allows the penetration of moisture, therefore loosening the bond of organic coatings.

Unsound Other Substrate

Like metal and old paint, any substrate can be unsound, including Plastics, Rubbers, Glass, Wood, Concrete and anything else you might try to paint. Failures associated with these surfaces if not properly cleaned and prepped are:

1. Loss of adhesion
2. Loss of gloss
3. Fisheyes or cratering
4. Dirt or contamination in finish
5. Cracking, checking, splitting

There are different cleaning and prepping techniques for different substrates. See the section in this manual titled "**Surface Preparation**" for specific procedures.

Rule #2. Coating Selection and Compatibility

Always use an approved primer or topcoat over a bare substrate or other coating. Always use flexible coatings over flexible substrates. Always use only approved additives, solvents, hardeners or accelerators in any coating.

The paint products (undercoat or topcoat) recommended for use in a given paint system are designed to be compatible with each other and for use over certain types of metal or organic coating. **Selecting the right paint system helps eliminate paint problems or failures during and after paint application.**

Paint products (undercoat or topcoat) that are not designed either for use over certain types of substrate (metal or organic) or with each other can produce numerous types of problems:

- Poor adhesion
- Lifting or wrinkling
- Splitting or cracking
- Poor drying
- Loss of gloss
- Water spotting
- Poor durability

! Selecting the right paint system helps eliminates paint problems or failures during and after paint application.

Notes:

Improper Gun Adjustment Problems

Rule #3. Spray Equipment Adjustment

Always perform a spray pattern check prior to spraying to insure the equipment is clean and properly adjusted.

Improper spray gun adjustment will lead to improper film builds, uneven drying, mottling of metallics, uneven appearance of flatted or matte coatings and various drips, runs and errors! Other appearance factors can be orange peel and dry spray. The adjustment of a spray pattern not only involves the fluid nozzle adjustment but also the pressure of the atomizing air.

Also, proper adjustment of the spray gun needs to be done after choosing the proper fluid needle and air cap for the coating to be sprayed.

The Spray Equipment section will detail how to choose the proper needle/nozzle combination and perform a spray pattern check.

Trapped Solvent Due to Improper Flash Time

Rule #4. Flash/Tack Times

Always follow the recommended flash/tack times for the coating being sprayed to avoid trapping solvent.

The need for flash or tack times would not exist if all products required only one coat to obtain the recommended film build. This is not always the case and the use of proper flash or tack time is essential toward achieving the recommended film builds and performance of some products.

Flash Time is a general definition of the primary amount of time required for the majority of thinners or solvents in a coat of paint to evaporate after being sprayed on a surface.

The following factors determine the length of time it takes a product to flash off:

1. The speed and amount of solvent in a ready-to-spray product.
2. The atomization of the product during application, the type of film build per coat, the temperature at the time of product application.
3. The amount of ventilation present at the time of product application.

Tack Time is considered the time between the application of the first and second coats of the same product. When a sufficient amount of solvent is released from a coating, the surface becomes tacky or slightly dry to the touch and they are generally ready for a second coat. If the "finger tip test" shows evidence of wet paint on the glove when the surface is touched, wait until the surface becomes tacky before applying the second coat.

The problems associated with improper flash times (generally, not waiting long enough between coats) are due to the trapping of solvent within a paint film. This leads to long dry times, loss of gloss, solvent popping and other things—all of them bad!

! The problems associated with improper flash times (generally, not waiting long enough between coats) are due to the trapping of solvent within a paint film.

Problems Associated with Using the Wrong Solvent

Rule #5. Reduction, Solvent and Catalyst Selection

Always choose a solvent (reducer or thinner) and/or catalyst that is recommended for the temperature and airflow in the spray area. Always reduce the paint according to manufacturer's specifications.

It can't be stressed enough that proper solvent and catalyst selection for the temperature of the spray area can make or break a job. Also factored in is the airflow within the spray area and even the size of the unit to be painted. Reducers are made up of a combination of fast, medium and slow evaporating solvents. These are blended together to give a reducer a temperature "range" to work within.

The common mistake is to choose a "fast" solvent in order to speed the dry time of the paint. This is a dangerous way to attempt to speed up the dry time, and in fact will lengthen the dry time. This happens because, as the fast solvent flashes off, the top of the paint film skins over and essentially traps remaining solvents within the film. Subsequent coats of paint will do the same thing and compound the problem. This will lead to all the same problems that improper flash times can cause. As the remaining trapped solvent battles its way out through the paint film, the overall dry time is increased.

In addition to the temperature in the spray area a few other factors should be considered.

Airflow: If the airflow in the spray area seems very fast across the surface of the unit to be painted, then the solvent will be pulled out of the paint too quickly. Choose a slower solvent or adjust the airflow. Never spray in an area with inadequate airflow and proper ventilation.

Job size: When spraying very large surfaces, especially flat ones, the air from the spray gun continually moving across the surface of the unit with each pass will blow some solvent out of the paint prematurely. Use a slower solvent for large surfaces.

Catalysts and additives: Most catalysts and additives contain solvents just like the ones in the reducers for the paint. If the catalyst has temperature range choices, then be sure to choose the proper one.

Proper reduction: Always reduce paint according to label directions. The paint and the surface to be painted should be room temperature. Don't try to add solvent to thin cold paint!

Undercoats: Many people make the mistake of always using the fastest available reducer for primers. Don't do that! Choosing the proper solvent for undercoats is just as important as it is for topcoats.

The proper solvent for the ambient temperature will allow the coating to stay "open" on top and allow the remaining solvent to pass through.

Notes:

! It can't be stressed enough that proper solvent and catalyst selection for the temperature of the spray area can make or break a job.

Notes:

Shop Temperature and Airflow Considerations

Rule #6. Spray Area Temperature and Air Flow

The spray area should be between 70 degrees F and 85 degrees F if possible. Under no circumstances should you paint below 60 degrees F. Maintain airflow in spray area at around 100 CFM.

The Shop Temperature

Paint products require certain shop conditions if they are to be properly applied. Match the reducers and catalysts to the temperature. Use slower solvents or retarders at very high temperatures. Use slower solvents in high humidity.

Dry Time

Dry Time is generally considered the initial time it takes a paint product to reach a cured state. In other words the paint is as "solid" as it will ever be and displays all the properties the cured paint film was intended to have (durability, gloss, chemical resistance, etc.). Industrial products perform best at "normal" temperatures of 70 - 85°F.

- When conditions are not in this range product performance may be compromised.
- Dry times increase if cold conditions prevail and decrease significantly if temperatures are above 85°F.

Ventilation (airflow) is Critical During the Initial Cure

If the sprayed unit is left in an enclosed area with trapped solvent vapor or fumes, the film will not be allowed to compact itself and "set." In the case of enamels, lack of free flowing oxygen interferes with the gloss and overall appearance of the finished product.

CAUTION: All cross-linking stops or slows significantly at temperatures below 60°F. Never subject freshly painted objects to temperatures below 60°F or improper curing will result in loss of gloss, poor water and chemical spotting resistance, decreased durability and soft paint film. In that case, proper repair would be to strip off all uncured paint and repaint entire area.

! If the sprayed unit is left in an enclosed area with trapped solvent vapor or fumes, the film will not be allowed to compact itself and "set." In the case of enamels, lack of free flowing oxygen interferes with the gloss and overall appearance of the finished product.

15 Degree Rule

Most dry times and pot life times are given at 70 - 75°F (21 - 24°C) at 50% relative humidity. When products are mixed properly, sprayed with adequate flash times, and at proper film builds, the following rules apply:

- For every 15 degree increase in temperature, the dry time and pot life can be cut in half.
- For every 15 degree decrease in temperature, the dry time and pot life will double.

Remember, all product cross-linking and curing in 2-component catalyzed products slows significantly below 60°F. Paint will not dry properly if subjected to cool temperatures during initial cure, resulting in a finish that may eventually dry but will exhibit reduced durability, gloss, and repairability.

Example: If the pot life of a product is 3 hours, what would it be at 90°F (32°C)?
Answer: 1.5 hours

Example: If the dry time of a product is 16 hours at 75˚F (24˚C), how can I calculate the dry time at a higher temperature?

Answer: Dry time is cut in ½ for every 15˚F increase (with adequate airflow)

- 16 Hours @ 75˚F (24˚C)
- 8 Hours @ 90˚F (32˚C)
- 4 Hours @ 105˚F (40˚C)
- 2 Hours @ 120˚F (49˚C)
- 1 Hour @ 135˚F (57˚C)

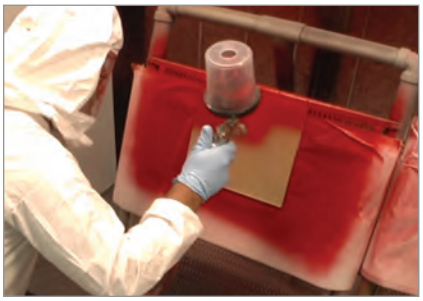
A 1-hour force dry at 135˚F (57˚C) is equal to 16 hours at 75˚F (24˚C)

NOTE: Dry times are NOT flash times. The flash time between coats ALWAYS stays the same because you have chosen a reducer to match the temperature. Dry time refers to the time after the last coat has been applied!

Notes:

The Golden Rules of Success!

Rule #1. Properly Clean that Substrate!



Professionals do not even think about priming or painting over any substrate that hasn't been properly cleaned and prepped!

Rule #2. Use the Right Stuff!

Always use an approved primer or topcoat over a bare substrate or other coating. Always use flexible coatings over flexible substrates. Always use only approved additives, solvents, hardeners or accelerators in any coating.

Rule #3. Adjust that Gun Properly!

Always perform a spray pattern check prior to painting to insure the equipment is clean and properly adjusted.

Rule #4. Allow Adequate Flash Times Between Coats!

Always follow the recommended flash/tack times for the coating being sprayed to avoid trapping solvent.

Rule #5. Choose the Proper Solvent for the Conditions!

Always choose a solvent (reducer or thinner) and/or catalyst that is recommended for the temperature and airflow in the spray area. Always reduce the paint according to manufacturer's specifications.

Rule #6. The Spray Area, the Paint and the Surface To Be Painted Must Be Warm (not cold and not too hot) and There Must Be Adequate Airflow!

The spray area should be between 70 degrees F and 85 degrees F, if possible. Under no circumstances should you paint below 60 degrees F. Maintain airflow in spray area at around 100 CFM.

Spray Equipment

As a result of studying the Equipment presentation, and with the training manual for reference, the participant will be able to:

Learning Objective 1. Identify the vital parts of a compressed air delivery system.
☐ Done

Learning Objective 2. Determine proper air line sizes, air hose sizes, hose fittings, air pipe configurations, and air dryer placement by referring to charts within this section.
☐ Done

Learning Objective 3. Identify common spray equipment used in finishing signs and related items and explain how each type of gun works.
☐ Done

Learning Objective 4. Understand the important balance between fluid delivery and atomization.
☐ Done

Learning Objective 5. Perform a proper observable spray pattern adjustment of a siphon feed, pressure feed or gravity feed spray gun.
☐ Done

Look for the Learning Objectives icon to find areas within the manual that relate to the Learning Objectives above.

Notes:

Notes:

Equipment Information

Air Supply, Pipe Sizes and Air Pressure Drop

Shop Air Supply[1]

The air supply in a paint department is one of the most important systems a shop can consider. There is too much to discuss about the air supply in a paint shop to put in this book. Detailed information is available from suppliers of air compressors, air dryers, filters, and spray gun manufacturers.

We can make a few suggestions to get the process of equipping or remodeling an air supply system started. The best suggestion is to consult an air delivery expert to help design a system to meet your needs.

Vital Components

- Air compressor
- Piping
- Air hoses
- Couplers, fittings
- Air dryers
- Air filters
- Oil and water separators

Choosing a compressor

There is diaphragm, rotary and reciprocating to choose from to start. The most popular is reciprocating. Among those are single and double acting, single and two stage, multi-stage and air or water-cooled.

Tables are available which can help calculate the type, horsepower and CFM delivery needed for shop operations. Consult an expert equipment supplier.

> ! Proper pipe size is very important to maintain adequate air delivery. When planning a system, consult a chart for pipe sizing based on compressor horsepower and length of the piping.

Piping recommendations

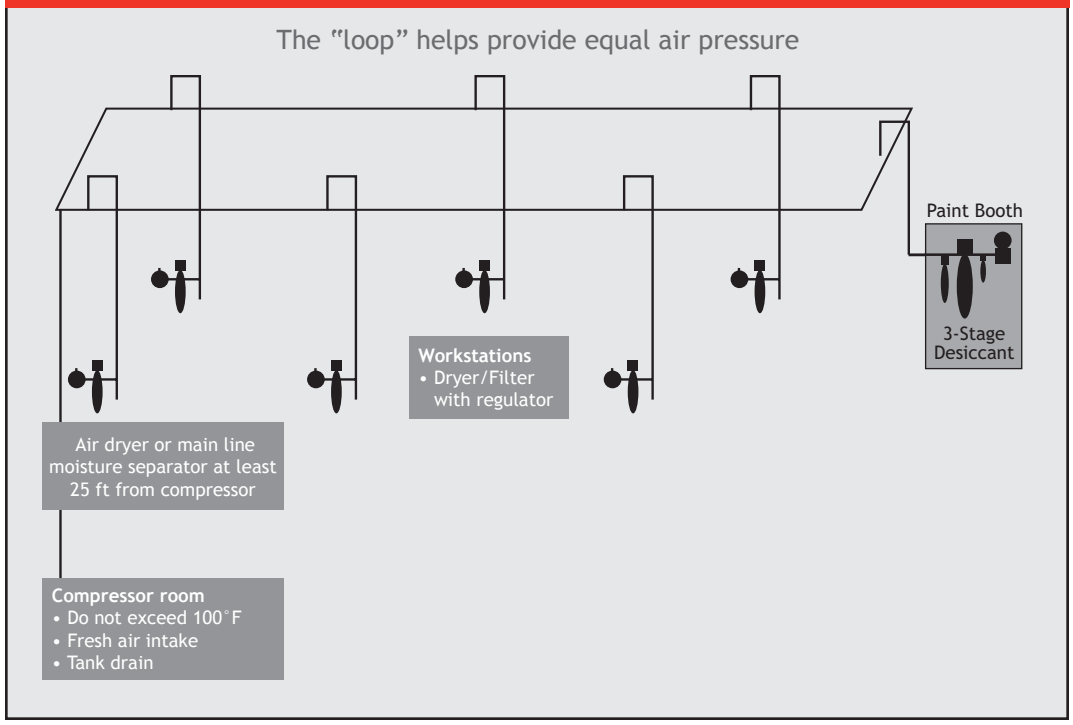
Copper is preferred. Galvanized or black iron pipe is good. PVC is discouraged due to possible sagging or bursting under pressure.

Proper pipe size is very important to maintain adequate air delivery. When planning a system, consult a chart for pipe sizing based on compressor horsepower and length of the piping. Pipes and air hoses which are too small will result in air pressure drops and inadequate CFM delivery.

Installing a "loop" piping system (page 41) will help equalize air pressure and avoid pressure drops. Locate the compressors in an area of good ventilation. If the temperature in the compressor's location reaches more than 100 degrees F while the compressors are running, this area is not suitable. Remember the cooler you can deliver air, the less moisture it will carry.

1 Information for this section was supplied by Binks Manufacturing Training Division publication TD 4-1R-6

Loop System Piping Diagram



Notes:

Installation Tips

- Place compressor in cool, dry area
- Allow space for service of compressor
- Install tank drain for water removal
- Use flex coupling between pipe and compressor
- Take air supply from top of piping system
- Use drip leg configuration on each drop leg
- Install ball valves on drops for easy service of dryer/filter
- Install mainline dryer or separator before loop system
- Install dryer/filter at every workstation leg
- Install 3-stage desiccant in each paint booth

Notes:

Pipe and Air Hose Size Charts

Minimum "Main" Line Air Piping Recommendations

Compressor Equipment		Main Line Dimensions	
Size	Capacity	Length	Size
1½ & 2 H.P.	6 to 9 CFM.	Over 50 ft.	1"
3 & 5 H.P.	12 to 20 CFM.	Up to 200 ft. Over 200 ft.	1" 1½"
5 to 10 H.P.	20 to 40 CFM.	Up to 200 ft. Over 200 ft.	1½" 1½-2"
10 x 15 H.P.	40 to 60 CFM.	Up to 100 ft. Over 100 ft.	1½" 1½-2"

Air Hose Pressure Loss

Air Hose Inside Diameter (ID) & Length (20ft)	At 15 CFM Air Flow	At 18 CFM Air Flow	At 20 CFM Air Flow	At 25 CFM Air Flow
¼" ID x 20 ft.	-20 psi	-26 psi	-28 psi	-34 psi
5/16" ID x 20 ft.	-7 psi	-10 psi	-12 psi	-20 psi
3/8" ID x 20 ft.	-2.8 psi	-4 psi	-4.8 psi	-7 psi

Couplers, Fittings, and Air Hose

The larger the inside diameter of all these items, the less restriction of air flow you will have in the air supply system. 3/8" I.D. air hose and large bore fittings are recommended.

Air Supply System Recommendations

- We recommend a minimum of 1" I.D. pipe size for any paint department.
- We recommend 3/8" I.D. air hose as the preferred hose size.
- We recommend 5/16" I.D. air fittings, hose end connections, and quick couplers to ensure maximum air flow at all times.

An example of large inside diameter 5/16" air fittings is shown here:
DeVilbiss industrial type, 5/16" I.D. fittings.

- P-HC-201-A93 Male fitting
- P-HC-196-M93 Female fitting
- P-HC-4100-A94 Male end coupler
- P-HC-4120-L93 Female end coupler

Other air fitting equipment manufacturers produce products equivalent to the examples listed above. The issue of inside diameter of air fitting and hoses can be **especially critical to successful use of HVLP type spray equipment.**

Compressed Air Drying and Filtration

Why Use an Air Dryer?

The quality of the compressed air system has a direct effect on the quality of the work. Dirt, water or oil in your air gun can ruin paint work! Water in your compressed air can reduce the life span of air tools causing premature equipment failure just when you need it most. Protecting the quality of your end product, as well as your investment, is only a matter of selecting the right air dryer for your shop.

Air, compressed or not, contains water in the form of vapor. The amount of water vapor in the air is most often expressed as humidity, the relative ability of air to hold water vapor.

If compressed air containing water is allowed to reach a spray gun it will contaminate the paint job with moisture and oil.

Refrigerated Air Dryers

This leaves some water in the air; if the compressed air temperature drops below this dew point temperature, water droplets will again form. This can happen at the gun nozzle by air releasing from the cap. Air has a tendency to cool down; also, when a solvent is released from a spray gun it will flash off giving a cooling effect on the air. This can drop the air temperature below the desired dew point temperature and cause a blushing effect on the paint. To eliminate trapping of moisture within a paint film, follow the manufacturer's guide lines when choosing a refrigerant type dryer to eliminate any such problems.

How They Work

- Like an air conditioner
- Cools compressed air and traps water
- Pros—Low maintenance
- Cons—Limit to temperature (33 degrees F) and could leave behind some moisture

Water Separators and Filters

A water separator does not remove all of the moisture from the air. When air is compressed, its ability to hold water in vapor form is reduced. Some of its water vapor is condensed into liquid droplets. Water separators and filters do an excellent job of taking this liquid water out of compressed air, however they cannot remove the remaining water vapor which eventually travels downstream to your paint gun or air tool.

- **Where To Place**—At all non-painting air drops
- **What To Expect**—Will not remove all moisture

There are two main ways to get the water vapor out of the compressed air. Refrigerate the air so that more of the water vapor is condensed out of it or remove the water vapor with a desiccant. Desiccant actually grabs the water molecules out of the air and stores it within the structure of the desiccant.

Desiccant Dryers

Desiccant air dryers use a desiccant to capture and hold water vapor from the air. This is accomplished by blowing compressed air though a container of desiccant. The desiccant eventually becomes loaded with water and must be either discarded or regenerated.

Notes:

! The quality of the compressed air system has a direct effect on the quality of the work. Dirt, water or oil in your air gun can ruin paint work!

Notes:

Regeneration in some units is done on a nightly basis with automatic functions built into the unit. Other units require the removal of the desiccant which then must be baked for a short time to remove the water trapped within the desiccant. All types of desiccant are sensitive to oil, so make sure the unit you choose has a good oil coalescer prior to the bed of desiccant. Let's look at two suitable types of desiccants for a paint shop.

Activated Alumina

Activated Alumina is a by-product of the manufacture of aluminum. This product is used for the removal of water vapor and can lower the dew point to 100 degrees below zero. It has a high crush strength and is a low dusting material. The capacity of this desiccant to hold water is slightly lower than silica gel. It can be regenerated by baking and has been determined to work well in a paint shop. When activated alumina is used as a desiccant, a good quality particle filter should be used after the bed of desiccant.

Silica Gel

Silica Gel is a very porous material which has a capacity of holding water in great volumes. This desiccant is a low dusting material, but it also requires a good particle filter after the bed of desiccant. It will fracture when liquid water is introduced into the bed of desiccant, so a good water/oil pre-filter before the desiccant must be used. It will lower the dew point to 40 degrees below zero and can be regenerated by baking. This desiccant has been determined to work well in a paint shop.

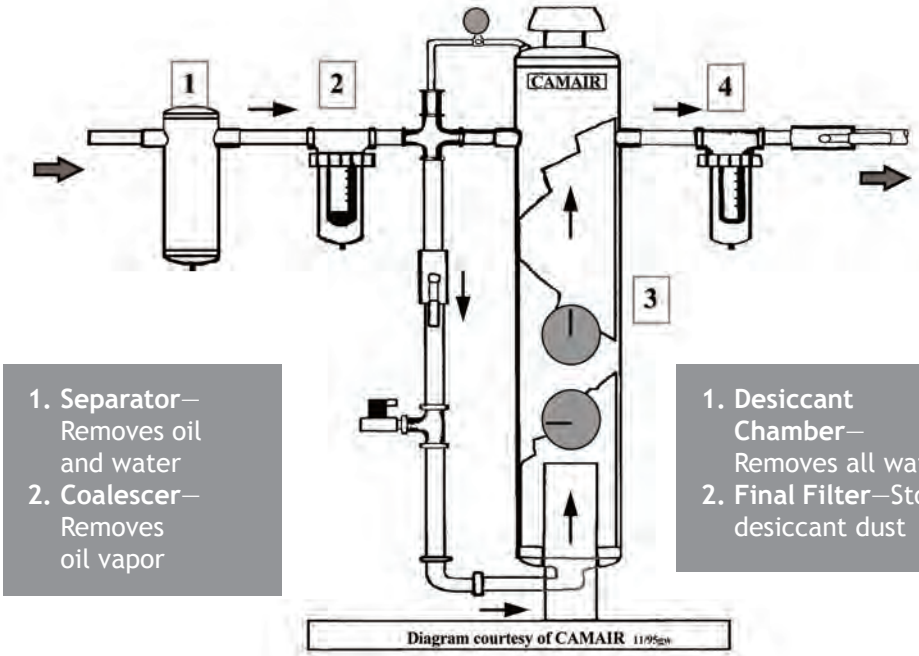
How They Work—Desiccant media absorbs water molecules out of air

Pros and Cons

- Eventually must regenerate or discard media
- Requires good oil and particle filters
- Lowers dew point to under 33 degrees F (40 - 100 below)
- Unlike refrigeration which is limited to 33 degrees F

! Silica Gel desiccant has been determined to work well in a paint shop but it requires good oil and particle filters and you must regenerate or discard media.

Desiccant Dryer Diagram



1. **Separator**—Removes oil and water
2. **Coalescer**—Removes oil vapor

1. **Desiccant Chamber**—Removes all water
2. **Final Filter**—Stops desiccant dust

Booth Filters

Booth and spray area filters are important in ensuring the final outcome of a paint job. When replacing your existing intake filters, look for a filter that possesses the capability of trapping particle sizes in the range of 5 - 10 microns. For even these small particles can ruin the appearance of the final product, as well as creating the need for extra work to remove them.

- Filter manufacturers offer very thin pre-skins that can be placed over the outside of the intake filter, which will increase the life span of your intake filters.
- Exhaust filters that are used in spray booths as well as walk up booths and filter benches should have the capability of trapping 90% of the paint particles passing through them. Remember the disposal of exhaust filters should be treated as hazardous waste.

Intakes

- 5-10 micron particle size
- Pre-skins increase filter life

Exhaust

- Should trap 98% efficiency of particles passing through for NESHAP 6H Compliance
- Dispose as hazardous waste
- May contain heavy metals
- Can be tested at a lab

Notes:

Spray Equipment Information

Spray Gun Technique Review

The Spray gun technique and its relationship to atomization of products is often misunderstood by many commercial refinishers. Proper gun techniques involve three facets.

1. Spray Gun Angle

The recommended spray gun angle to the surface being sprayed is 90 degrees. The atomized product at this angle reaches impingement in an even film. Holding the gun other than the recommended angle results in the atomized product being deposited in an uneven film.

2. Distance from Surface

The recommended distance for holding the gun from the surface is 6 to 8 inches for fast drying products (lacquer) and 8 to 10 inches for "slower" drying products (enamels). Holding the gun closer than recommended restricts the separation of atomized particles, resulting in excessive wetting of the product upon its impingement.

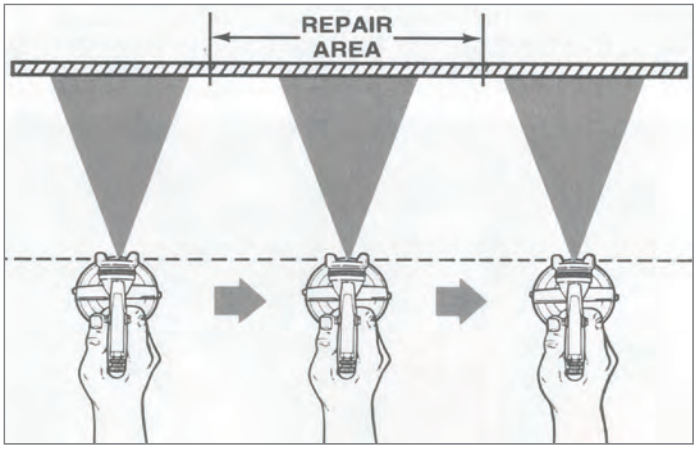


Photo courtesy of Chevrolet Productivity Network Program PTF-3(86-6)

! The recommended distance for holding the gun from the surface is 6 to 8 inches for fast drying products (lacquer) and 8 to 10 inches for "slower" drying products (enamels).

Notes:

Conversely, holding the gun back from the surface farther than recommended allows the atomized product to widely separate and on impingement will lack the required wetting.

Also, when the proper conditions of spray environment temperature and airflow are available within the spray area, the recommended gun distance will allow a certain amount of solvent to "release" or evaporate from the spray as it moves from the gun to the surface being painted. This is called "inflight loss of solvent" and is very important to attain proper film build and drying characteristics.

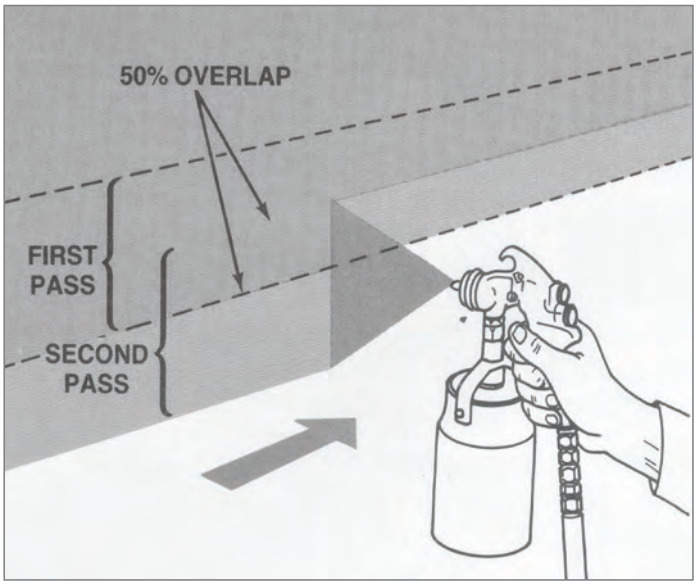


Photo courtesy of Chevrolet Productivity Network Program PTF-3(86-6)

3. Gun Travel Speed

The gun travel speed should be such as to insure proper uniform film build using a 50% overlap thus obtaining maximum wetness without creating an excessive film build.

Common Types of Spray Equipment

Types of Spray Equipment

- Air spray siphon feed
- Air spray gravity feed
- Air spray pressure feed
- Air spray HVLP (available in all the types above)
- Airless
- Air Assisted Airless
- Electrostatic

The term "air spray" simply means that compressed air is used as the power source for applying the paint to any particular object. The terms "siphon, gravity, and pressure feed" have to do with how and where the paint fluid is stored in the equipment and delivered to the spray gun for application. The terms are actually quite self-explanatory:

- **Siphon** = paint is "sucked" out of a paint cup/container.
- **Gravity** = paint "drops" from a high mounted paint cup/container.
- **Pressure** = paint is "pushed" from a paint cup/container.
- **Airless, air assisted airless, and electrostatic** require their own explanation later in this section.

The term "air spray" simply means that compressed air is used as the power source for applying the paint to any particular object.

Gun Setups

The manufacturers of air spray equipment provide a multitude of fluid tip/needle and air cap combinations. These combinations are commonly called "gun setups." The "gun setups" are generally designed for applying particular categories of paint material. It can often be difficult to determine the exact gun setup needed to apply a new product. One way to understand what kind of performance different gun setups are capable of has to do with a simple ratio:

Notes:

Learning Objective 4 Fluid to Air Ratio

The "Fluid to Air" Ratio

In other words, the amount of paint coming out of the fluid nozzle vs. the amount of atomizing air being supplied by the air cap. This ratio is the key performance factor for any type of air spray equipment.

If you have too much fluid and not enough atomizing air, the paint can:
- Go on too wet and cause runs, sags, curtains, etc.
- Have too much orange peel or rough-texture finish.
- Dry and cure slowly due to excessive film build.

If you have too much atomizing air and not enough fluid, the paint can:
- Go on dry with very little flow out of the product.
- Have too little film build—not enough paint to perform properly!
- "Flash dry" on the surface and trap solvents beneath. When they escape you risk solvent pop, die back, etc.!

Obviously neither of the alternatives above are acceptable. **The balance between paint fluid and atomization is too important to be left to chance.**

Find proper gun setups in manufacturers' charts, technical or product bulletins, training manuals, etc.

Learning Objective 5 Spray Pattern Adjustment

Spray Gun Adjustment

All spray guns (siphon, pressure feed, airless, HVLP, or electrostatic) must first be properly adjusted to fit the job. A spray gun's pattern and fluid control adjustments are two factors which influence the film build per coat for coats on the job.

! The balance between paint fluid and atomization is too important to be left to chance and is the key performance factor for any type of air spray equipment.

Pattern Board

Purpose: *To determine whether or not the spray gun is working properly and if the behavior characteristics of the material is in proper balance during the wet stage.* In other words the amount of fluid flow (paint) balanced with the proper atomization (air pressure) during application. We suggest using a moveable, reusable, 2' x 3' flat panel for your pattern board.

Check list prior to applying the test patterns

- Check the temperature in the spray area after allowing the exhaust fan to run for 5 minutes
- Solvent selection—if additional solvent is required or optional
- Reduction (the proper amount—if required or optional)

Notes:

- Air pressure (the correct atomizing pressure at the gun)
- Spray gun— Needle and nozzle correct
- Distance of spray gun from the work surface is correct
- Spray gun spreader and fluid controls full open or properly adjusted
- Gun held stationary at a 90° angle from the surface of the pattern board
- Spray three to four test patterns

Check List for Applying Test Patterns

Squeeze the trigger on the gun gently to full open position. Repeat the operation two or three times, making sure each separate test pattern has a similar amount of paint film thickness as would be applied per coat on the job. Turn the air cap so the pattern runs across the pattern board, rather than from top to bottom, as another test.

Visual Observation of Test Pattern

If everything is in balance, the shape of the pattern will be elliptical. The length of the pattern will be governed by the type of material sprayed. The material will be distributed evenly throughout the pattern.

Checking the Pattern

Allow the test pattern a couple of minutes of flash-off time. The material should not exhibit any signs of sagging, runs, or excessive overspray surrounding the pattern. **Whatever pattern and spray characteristics show up on the pattern board will also prevail on the paint shop floor. If the pattern is not "right," the job will not be.**

Air Spray Pressure Feed

This type of equipment is one of the most widely used in the light industrial market. Pressure feed technology uses a simple twist on the conventional siphon feed theory to operate. Siphon feed equipment uses an air vacuum to "suck" paint from the cup and combine it with atomizing air at the air cap. In a pressure feed system, the paint material in the gun cup is put under air "pressure" and forced or pushed out of the gun.

- With the introduction of HVLP pressure feed systems which combine increased transfer efficiency and the convenience of large, remote paint pots, industrial finishers now have a more productive way to do their jobs.
- The greatest advantage HVLP equipment can provide industrial finishers is a substantial decrease in the amount of material used (this means reduced cost per unit as well) without giving up productivity.

! Air spray pressure feed is one of the most widely used in the light industrial market.

Pressure Feed Spray Equipment Advantages

- The fluid and atomization air pressures can be independently controlled for better atomization and delivery of the material.
- Spray patterns are very adjustable to suit a wide variety of object sizes or hard to reach areas during painting. Can also mean less passes over large objects like earthmovers.
- Remote paint pots can hold from 1 qt. to many gallons of paint material. This means less time spent mixing paint, refilling equipment, and general increased efficiency.

Pressure Feed Spray Equipment Disadvantages

- Equipment is more difficult and time-consuming to clean due to hoses and other assemblies involved with remote paint pots.
- Long fluid/air hoses can be awkward to handle.
- Safety issues are of greater concern due to pressurized paint pot.

Later in this section we provide a step-by-step checklist for setting up a pressure feed air spray system. If you have never used pressure feed equipment, this will help you prepare the equipment correctly prior to spraying.

Step-by-Step: Initial Startup for Pressure Feed System

1. Pour a measured amount (1 quart/32 ounces) of the material to be applied into a clean pressure pot. Check the technical bulletin to make sure you have the viscosity of the material correct. Make sure fluid line is clean and bled.
2. Attach air supply to the pressure pot. Set pot pressure at approximately 5-7 psi for a 2 quart pot and 10-14 psi for larger pots as a "starting point."
3. Turn off atomizing air flow to the gun. If you squeeze the gun trigger, a stream of material will come out of the fluid tip. Adjust fluid control on gun to full open position.
4. Go into the spray area, bring along a measuring beaker and a stop watch or some other way for measuring time in "seconds." Set the measuring beaker up as a target and squeeze the gun trigger for 10 seconds, catching the fluid in the measuring cup.
5. Record how much material you "dumped" in the measuring cup and multiply by 6 to determine fluid delivered per minute—*10 seconds x 6 = 60 seconds or 1 minute.

   Example: A technician performs this test with these results:
   10 second dump test yielded 2 ounces of material in the measuring cup. 2 ounces fluid/10 seconds x 6 = 12 fluid ounces per minute! The "fluid ounces per minute" figure will be critical as you complete the test. If the equipment and product work well with the current fluid delivery rate, you now have a "standard" that can be duplicated for that paint product.

   NOTE: If too little or too much fluid is delivered, steps #6-8 will show it quickly. Now you can determine if you need a larger or smaller gun setup and you'll have a good idea how much more or less fluid delivery you'll need to do the job!
6. Prepare a "pattern board" or "test panel" (damaged part, old panel, etc.) to simulate the object to be painted.
7. Turn on the air regulator to provide atomizing air to the spray gun. Set the air regulator in the appropriate psi range. If using pressure feed equipment, set the pot pressure in the correct psi range.
8. Gradually adjust the air/fan control on the spray gun by adding air to the fluid stream until you have obtained a satisfactory spray pattern.

As a further check of the system, measure the wet film thickness for one "pass" and reference it against the product's Technical Bulletin recommendations. *(Don't forget to use a dry part of your test board to do the wet film test!)*

If you cannot get a satisfactory result see NOTE—Step #5 above and review the gun setup options for the equipment being used to make appropriate adjustments or corrections. **This simple process will ensure that you have the right gun setup and that your fluid vs. air ratio is balanced correctly.**

Notes:

Paint Chemistry and Terms

As a result of studying the Paint Chemistry presentation, and with the training manual for reference, the participant will be able to:

Learning Objective 1. Explain what the basic components of "paint" are.
☐ **Done**

Learning Objective 2. Reference some common paint-related terms.
☐ **Done**

Look for the Learning Objectives icon to find areas within the manual that relate to the Learning Objectives above.

Notes:

The Composition of Paint

Generally, paint products are composed of four key ingredients:

Liquid Resin

Liquid resin is the primary chemical building block for all paint products and determines its overall performance capabilities. The resin determines the handling, curing, and usage characteristics of any paint product as well as its durability. Matthews topcoat paint is primarily based on high quality acrylic urethane resins.

Pigment

Generally a heavy powdered substance that provides the actual "color" and opacity of undercoats or topcoat colors. Metallic flakes and pearls are generally considered pigments as well. Clearcoats have no pigment in their composition.

Solvents

Solvents provide "liquidity" to paint products and color. They also help control drying and curing characteristics. We are not referencing "thinners" added by the technician in mix ratios but the actual solvents built into paint products at our plants.

Additives

These components do a variety of important jobs for specific paint products. Some of these jobs include providing anti-gelling, anti-blister, UV screeners, aroma, filling capability, or other special performance characteristics.

! Liquid resin is the primary chemical building block for all paint products and determines its overall performance capabilities.

Notes:

Additional Paint Ingredients

Paint products generally have four additional ingredients that may be included in their mix ratios. They are added to paint just prior to use at the shop.

Thinners or Reducers

Solvents used to "thin" or reduce the product's viscosity and thus make them "sprayable." Matthews uses high quality reducers for use in different temperature conditions.

Catalysts or Hardeners

Reactive agents used to chemically "cure" 2K (two component) paint products. Catalysts react with paint resins to molecularly crosslink the product. This helps provide the long-lasting durability of a high quality paint.

Performance Ancillaries

Products such as accelerators or extenders which are added in small quantities to specific products. They generally alter dry and/or cure times.

Special Use Ancillaries

Products which are added in small quantities to specific products to alter their capability or appearance. Lowered gloss paints are a good example of where a Special Use Ancillary, such as matting base, is used.

Thermoplastic and Thermoset

Paint can generally be put into two categories called thermoplastic and thermoset. The first term refers to coatings (paint) in which no chemical reaction takes place upon curing and the other refers to coatings in which a chemical reaction does take place in the curing process.

! Crosslink is a term that describes the reaction that takes place in some coatings in which the molecules chemically bond together.

Crosslink (crosslinking, crosslinked)

A term that describes the reaction that takes place in some coatings in which the molecules chemically bond together.

Thermoplastic

Dries/cures by the release of solvent. No chemical crosslink occurs (lacquers, for example). Can be reflowed by heat or solvent.

Thermoset

Cures by chemical crosslink either by oxidation and/or the introduction of a catalyst. Once cured, thermoset coatings cannot be completely reflowed by heat or solvent since

the molecules have permanently bonded together. Crosslinking can occur in varying degrees. For example, an enamel paint that cures by oxidation without the addition of a catalyst may be a weaker crosslink than a urethane cured with an isocyanate catalyst.

Oxidation

As a basic enamel paint dries, a reaction takes place with the oxygen in the air, creating a thermoset coating.

Mud and Concrete

The difference between thermoplastic and thermoset coatings has been described as the difference between mud and concrete.

- **Mud**—can dry and become hard and brittle but if re-wetted with water will return to its former muddy state.
- **Concrete**—starts as solution similar in consistency to mud and will dry and become hard and durable. If re-wetted it will not return to its former solution.

Therefore, thermoset coatings are generally preferred as longer lasting, more durable coatings which can stand up to harsher environments.

Notes:

Families of Paint Products

Polyesters

Good chemical resistance, fair weathering.

Oil Alkyds

Used on outdoor advertising boards, one to three year durability at most, general purpose resin.

Lacquers

Non-crosslinking, thermoplastic coating which dries by solvent evaporation. Poor graffiti resistance. Usual life expectancy of approximately one to three years depending on color.

Enamels

General term for a thermoset hard finish usually curing by oxidation. May use a chemical catalyst as well.

Epoxies

Good chemical resistance, terrible weathering which precludes its use as a long lasting topcoat. Mostly used as a primer. 2K amine crosslink.

Acrylic

Main component of some resins, decent chemical resistance, three to five year life expectancy, excellent weathering.

Acrylic Urethane

An acrylic resin with a urethane crosslink, excellent chemical resistance, outstanding color and gloss retention. Life expectancy of 8-15 years. MAP is an excellent acrylic urethane.

! MAP is an excellent acrylic urethane with exceptional chemical resistance, outstanding color and gloss retention. Has a life expectancy of 8-15 years.

Gloss and Color

Gloss levels

Gloss levels based on a 60 degree gloss meter.

- **Matte** 0-5 degrees
- **Satin** 15-20 degrees
- **Semi gloss** 50-60 degrees
- **High gloss** 85+ degrees

Color Matching Tips

Use an actual paint chip or sample as a standard. Do not use an ink chip. Matthews will match any color and spray 3” x 6” color match panels by request at no charge.

Notes:

Matthews Paint Intermix System Charts: Conventional Satin

Notes:

Conventional Satin Intermix Colors 15-20° Gloss

N202SP White	N911SP Violet	N912SP Maroon	N913SP Magenta	N914SP Dark Red	N915SP Red Oxide	N917SP Yellow Oxide	N920SP Blue
N921SP Green	N923SP Black	N925SP New Blue	N930SP Light Red	N940SP Red Yellow	N942SP Green Yellow	N947SP Scarlet Red	

Conventional Satin Intermix Colors 15-20° Gloss with 6 Metallic Colors

N202SP White	N911SP Violet	N912SP Maroon	N913SP Magenta	N914SP Dark Red	N915SP Red Oxide	N917SP Yellow Oxide	N920SP Blue
N921SP Green	N923SP Black	N925SP New Blue	N930SP Light Red	N940SP Red Yellow	N942SP Green Yellow	N947SP Scarlet Red	
N951SP Medium Silver	N952SP Sparkle Silver	N953SP Super Sparkle Silver	N954SP Fine Silver	N931SP Trans Red Oxide	N932SP Trans Yellow Oxide		

Matthews Paint Intermix System Charts: Conventional Gloss

Notes:

Conventional Gloss Intermix Colors 90° Gloss + / -5°

SOA202SP White	SOA911SP Violet	SOA912SP Maroon	SOA913SP Magenta	SOA914SP Dark Red	SOA915SP Red Oxide	SOA917SP Yellow Oxide	SOA920SP Blue
SOA921SP Green	SOA923SP Black	SOA925SP New Blue	SOA930SP Light Red	SOA940SP Red Yellow	SOA942SP Green Yellow	SOA947SP Scarlet Red	

Conventional Gloss Intermix Colors 90° Gloss + / -5° with 6 Metallic Colors

SOA202SP White	SOA911SP Violet	SOA912SP Maroon	SOA913SP Magenta	SOA914SP Dark Red	SOA915SP Red Oxide	SOA917SP Yellow Oxide	SOA920SP Blue
SOA921SP Green	SOA923SP Black	SOA925SP New Blue	SOA930SP Light Red	SOA940SP Red Yellow	SOA942SP Green Yellow	SOA947SP Scarlet Red	
SOA951SP Medium Silver	SOA952SP Sparkle Silver	SOA953SP Super Sparkle Silver	SOA954SP Fine Silver	SOA931SP Trans Red Oxide	SOA932SP Trans Yellow Oxide		

Matthews Paint Intermix System Charts: Low VOC Satin (SVOC) & Hi-Solid (VOC)

Low VOC Satin (SVOC) Intermix Colors

SV202SP White	SV911SP Violet	SV912SP Maroon	SV913SP Magenta	SV914SP Dark Red	SV915SP Red Oxide	SV917SP Yellow Oxide	SV920SP Blue
SV921SP Green	SV923SP Black	SV925SP New Blue	SV930SP Light Red	SV940SP Red Yellow	SV942SP Green Yellow	SV947SP Scarlet Red	

Notes:

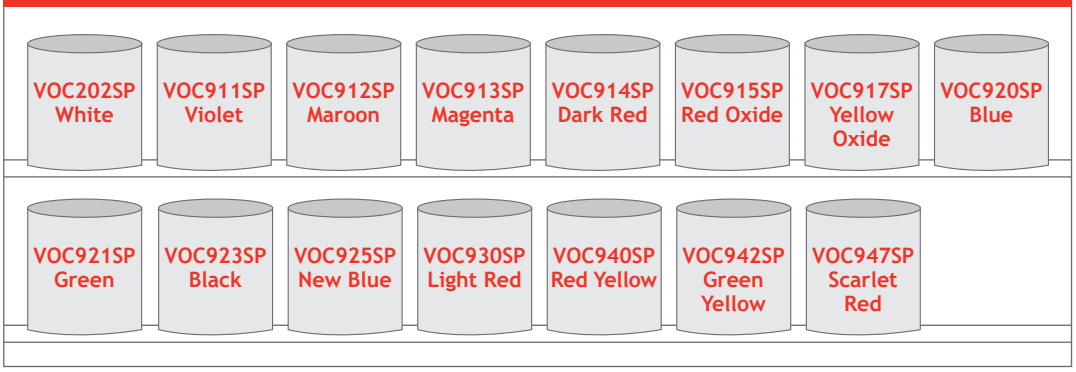
Low VOC Satin (SVOC) Intermix Colors with 6 Metallic Colors

SV202SP White	SV911SP Violet	SV912SP Maroon	SV913SP Magenta	SV914SP Dark Red	SV915SP Red Oxide	SV917SP Yellow Oxide	SV920SP Blue
SV921SP Green	SV923SP Black	SV925SP New Blue	SV930SP Light Red	SV940SP Red Yellow	SV942SP Green Yellow	SV947SP Scarlet Red	
SV951SP Medium Silver	SV952SP Sparkle Silver	SV953SP Super Sparkle Silver	SV954SP Fine Silver	SV931SP Trans Red Oxide	SV932SP Trans Yellow Oxide		

Matthews Paint Intermix System Charts: Low VOC Hi-Solid (VOC)

Notes:

Low VOC Hi-Solid (VOC) Intermix Colors

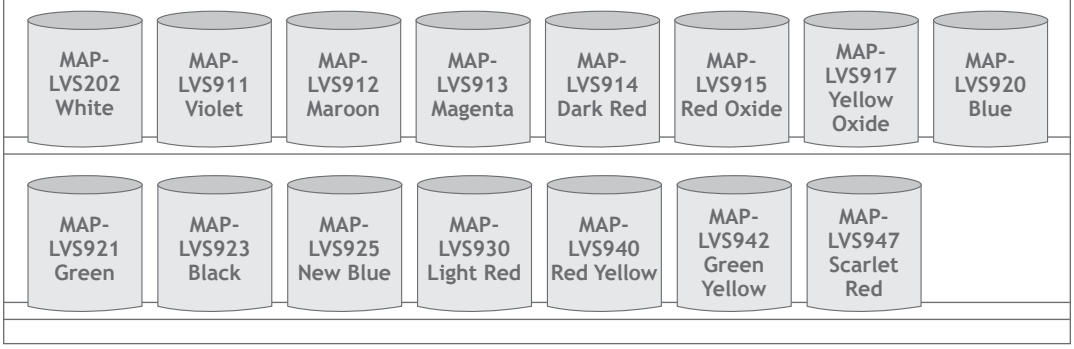


Low VOC Hi-Solid (VOC) Intermix Colors with 6 Metallic Colors

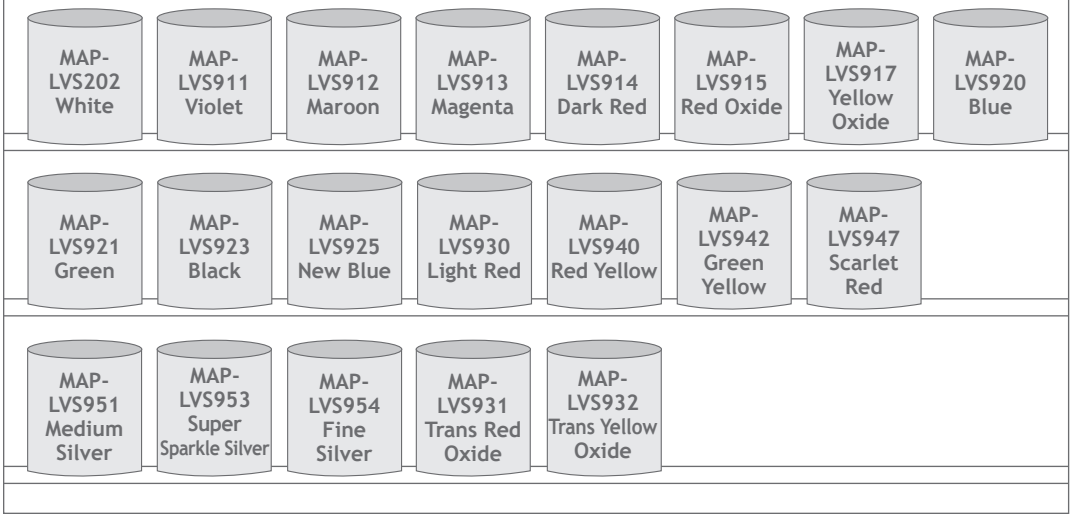
Matthews Paint Intermix System Charts: MAP-LV Satin

Notes:

MAP-LV Intermix Colors Satin



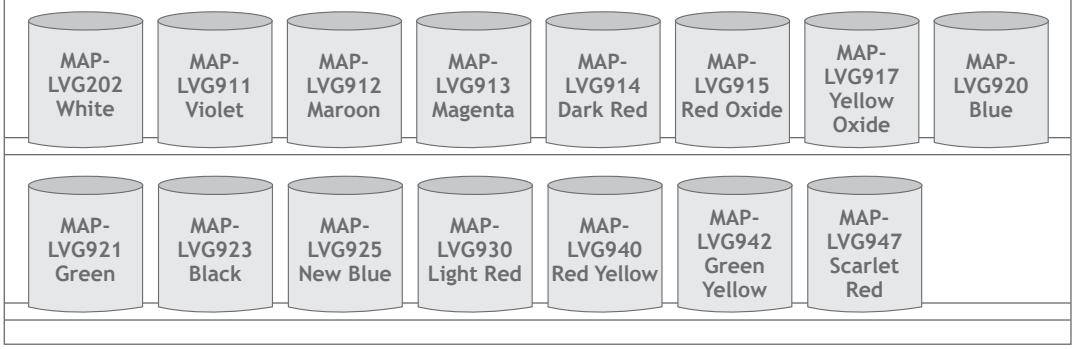
MAP-LV Intermix Colors Satin with Metallic Colors



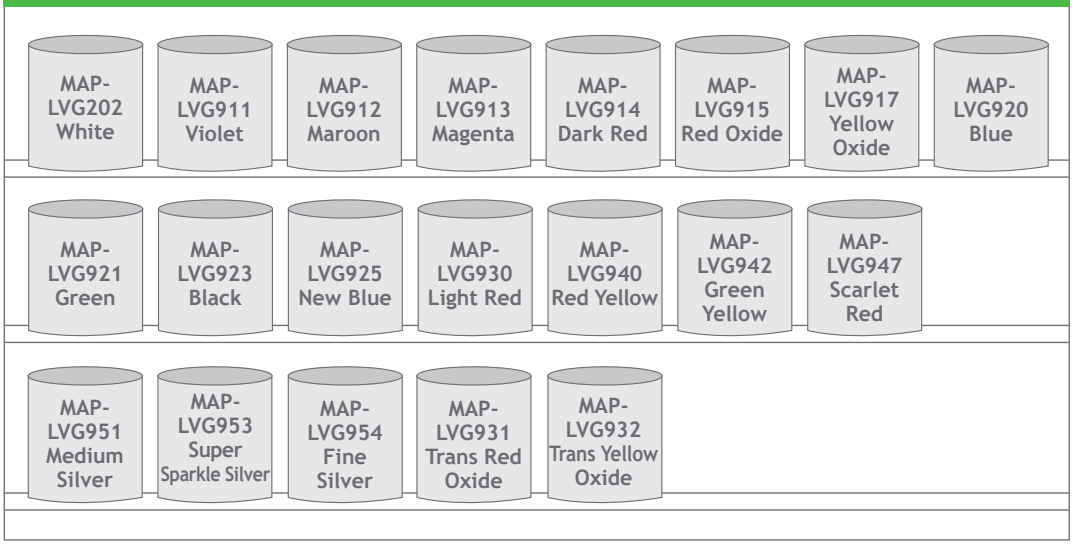
Matthews Paint Intermix System Charts: MAP-LV Gloss

Notes:

MAP-LV Intermix Colors Gloss



MAP-LV Intermix Colors Gloss with Metallic Colors



Spray Equipment Specifications Charts

This chart describes specific spray gun setups for various Matthews finishes. We could not list every gun available; however, it does provide a starting point. Further information is available from equipment manufacturers.

Notes:

Gun Setup Chart for Matthews Topcoat

Spray Gun Models	Fluid Tip	Air Cap	Comments
I. Conventional (Siphon, Gravity and Pressure Feed)			
A. Binks Models			
1. #7 Black	36	36SD	Siphon Feed
2. #7 Gold	66	66SD	Siphon Feed
3. #18-2001*	66	66SD	Siphon Feed
4. #630	2086	67SA	Gravity Feed
5. #7 Black	33B	33PM	Pressure Feed
6. #18-2001*	63D	63PW	Pressure Feed
B. DeVilbiss			
1. JGA, JGV, MBC	EX	80	Siphon Feed
2. GFG	EX	80	Gravity Feed
3. JGA, JGV, MBC	FF	797/264	Pressure Feed
C. Sharpe			
1. 75, 775, 975	70	10	Siphon Feed
2. 775	55	9P	Pressure Feed
II. HVLP (High Volume Low Pressure)			
A. Binks Mach I	97	95P	
B. DeVilbiss JGHV, 520	FX ------ GX ------	14	
C. HVLP 5000	5100-10	5004-05	Pressure Feed
D. CAN AM 900	9074 Nozzle / 9084 Needle	9062	7-8 PSI Turbine Pressure

* Models include series 69 & 600

- MAP, Satin MAP, Satin VOC MAP
- **Note**: All spray equipment settings are starting point recommendations. Some adjustment may be necessary for best performance.

Notes:

Gun Setup Chart for Chromaflex, Fast Dry Epoxy Primer, Armagrip Wash Primer			
Spray Gun Models	**Fluid Tip**	**Air Cap**	**Comments**
I. Conventional (Siphon, Gravity and Pressure Feed)			
A. Binks Models			
1. #7 Black	36 (.070")	36SD	Siphon Feed
2. #7 Gold	66 (.070")	66SD	Siphon Feed
3. #18-2001*	66 (.070")	66SD (SD, SG)	Siphon Feed
4. #630	2070 (.070")	66SD	Gravity Feed
5. #18-2001*	63B	63PM	Pressure Feed
B. DeVilbiss			
1. JGA, JGV, MBC	EX tip	30, 43 cap	Siphon Feed
2. GFG	FW tip/616 Needle	43 cap	Gravity Feed
3. JGA, JGV, MBC	FX tip	704 cap	Pressure Feed
C. Sharpe			
1. 75, 775, 975	70 tip	#10 cap	Siphon Feed
2. 775	45 tip	#9P cap	Pressure Feed
II. HVLP (High Volume Low Pressure)			
A. Binks Mach I	#91 tip	#95P cap	
B. DeVilbiss 501, 520	FX tip GX ------	#14 cap	
C. HVLP 5000	5100-12 tip	5004-07 cap	
D. CAN AM 900	9072 Nozzle / 9082 Needle	C cap	7-8 PSI Turbine Pressure
III. Airless, Electrostatic—Not recommended for Chromaflex			

* Models include Model 18; series 18D, 21, 24: Model 61 & 62; series 69 & 600: Model 2001

Spray Gun Fluid Orifice Conversion Chart

Metric (millimeters) to American (thousandths of an inch)

Formula: Millimeters X 39.3 = Thousandths of an inch
Example: 1.4mm X 39.3 = .055 or 55 thousandths of an inch

Note: Most Matthews products will spray very well in the range between 1.2mm to 1.6mm. That is actually a wide range for a spray gun, whether it is a gravity or suction type or HVLP or conventional.

Many factors such as gun type, job size and type of paint material affect the choice of fluid orifice size. Ask your Matthews instructor or technical person how to choose the best setup depending on the situation.

Notes:

Spray Gun Fluid Orifice Conversion Chart	
Metric (mm)	**American (inches)**
.7mm	.027 or 27 thousandths
.9mm	.035 or 35 thousandths
1.0mm	.039 or 39 thousandths
1.2mm	.047 or 47 thousandths
1.4mm	.055 or 55 thousandths
1.6mm	.062 or 62 thousandths
1.8mm	.070 or 70 thousandths
2.0mm	.078 or 78 thousandths
2.2mm	.086 or 86 thousandths
2.3mm	.090 or 90 thousandths
2.4mm	.094 or 94 thousandths
2.6mm	.102 or 102 thousandths