

**Feather River Air Quality Management District  
Rule Development**

**PROPOSED**

**STAFF REPORT**

**Regulation III: Rule 3.20 - Wood Products Coating Operations**

## **BACKGROUND**

Under the provisions of the California Clean Air Act (CCAA) of 1988, Yuba County and the northern portion of Sutter County and all of the Northern Sacramento Valley Air Basin (NSVAB) have been designated as "moderate" non-attainment areas for failing to meet the state ozone standard. The southern portion of Sutter County is designated as "serious" on-attainment for failing to meet the state ozone standard. Ozone occurs when volatile organic compounds (VOC) and nitrogen oxides react in the atmosphere in the presence of heat and sunlight. Ozone is a strong irritant which attacks the respiratory system, leading to the damage of lung tissue. Prolonged exposure can cause permanent lung damage. Ozone decreases the flow of oxygen in the lungs and increases resistance to air passage in the lung tissue. Ozone damages the individual air sacs in the lungs where the exchange of oxygen and carbon dioxide between the air and blood takes place. Persons suffering from asthma, bronchitis, and other respiratory ailments, as well as cardiovascular disease, are particularly susceptible to the effects of ozone. Other groups which are susceptible include children, the elderly, and persons engaged in heavy exercise.

**Other Damage:** Ozone causes crop damage estimated to cost at least \$330 million dollars per year in California. Additionally, ozone has been linked to the damage of certain materials, including paint and rubber.

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Rule 3.20 - Wood Products Coating Operations regulates the volatile organic content (VOC) of coatings and strippers. Generally, the rule affects anyone who supplies, sells, offers for sale, or uses a wood products coating or stripper, including surface preparation and cleanup solvents regulated under this rule. The rule also applies to anyone who solicits, requires the use of, or specifies the application of a wood product coatings or strippers that does not comply with this rule.

For consistency among the Northern Sacramento Valley Air Districts, Rule 3.20 is based on Sacramento Metropolitan AQMD's Rule 463, Wood Products Coatings.

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## **Authority for Stationary Source Rules**

The Feather River Air Quality Management District Board of Directors is authorized by Sections 40000, 40001, 40702, 40716 and 40910 of the California Health and Safety Code to adopt, amend, and repeal rules that regulate stationary sources of air pollution.

- Section 40000: Local and regional authorities have the primary responsibility for controlling air pollution from stationary sources.
- Section 40001: Air districts shall adopt rules to achieve and maintain state and federal ambient air quality standards.
- Section 40702: An air district shall adopt rules to execute its statutory powers and duties.
- Section 40716: An air district may adopt rules to reduce or mitigate emissions from indirect and area wide sources.
- Section 40910: Districts shall endeavor to achieve and maintain state ambient air quality standards for non-attainment pollutants and their precursors.

## **Legal Mandates**

**State Mandates:** The District is designated as non-attainment for the state ozone standard. The California Clean Air Act requires areas designated as “moderate” non-attainment for ozone to adopt control measures required in Section 40918 of the California Health and Safety Code. California Health and Safety Code Section 40913 requires districts to develop a plan to achieve California’s ambient air quality standard by the earliest practicable date.

**All Feasible Measures Requirement:** California Health and Safety Code Section 40914 requires each district plan to demonstrate that the plan includes “every feasible measure” to control emissions. Accordingly, districts must adopt the most effective control measures to reduce VOC emissions from wood products coating operations. The District evaluated the standards in the rule against similar requirements contained in the feasible measure document and requirements recently adopted by other districts. The results are summarized in the section titled “IDENTIFICATION OF ACHIEVABLE PERFORMANCE STANDARDS AND EMERGING TECHNOLOGIES FOR WOOD PRODUCT COATINGS.”

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## **IDENTIFICATION OF ACHIEVABLE PERFORMANCE STANDARDS AND EMERGING TECHNOLOGIES FOR WOOD PRODUCT COATINGS**

The California Clean Air Act requires districts unable to achieve five percent (5%) annual emission reductions to demonstrate to the California Air Resources Board (CARB) satisfaction that it has included every feasible emission control measure in its plan and has an expeditious rule adoption schedule. According to CARB, no district has been able to demonstrate five percent (5%) annual reduction in ozone precursors. Therefore, every district’s plan is evaluated on the basis of demonstrating adoption of “Every Feasible Measure.”

CARB has used the definition for “feasible” from the California Environmental Quality Act (CEQA) (14 California Code and Regulations, Section 15364). CEQA defines “feasible” as: “capable of being accomplished in a successful manner within a reasonable period of time, taking into account economic, environmental, legal, social, and technological factors.” According to CARB the adoption of every feasible measure involves the adoption of regulations that have been successfully implemented elsewhere. CARB’s interpretation is explained in length in Identification of Achievable Performance Standards and Emerging Technologies for Stationary Sources, March 1998.

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## **EPA Regulatory Negotiation Committee**

The Wood Furniture Regulatory Negotiation Committee began its meetings to discuss wood products coatings in mid-1993. Previously, members of the Committee had participated in a series of public meetings which laid the groundwork for the negotiations in terms of identifying information needs and beginning to define the scope of issues. Committee members represented Federal and State regulators, large and small wood furniture manufacturers, coatings and resin manufacturers, and the environmental community.

The Committee's charge was to develop a framework of principles to serve as a basis for a draft national emission standard for hazardous air pollutants (NESHAP) and a control techniques guideline (CTG) covering volatile organic compound emissions for the wood furniture industry. The U.S. EPA, a party to

these negotiations, is responsible for issuing the NESHAP and CTG, and agreed to use any framework and principles, that it and all the other Committee members agreed to during the course of these negotiations. The NESHAP, issued on November 14, 1995, covers emissions of HAPs from wood furniture manufacturing sources. The CTG covers VOC emissions from wood furniture finishing and cleanup operations.

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### **2000 Attainment Plan**

The proposed rule is included as a control measure in the District's "2000 Air Quality Attainment Plan for the Northern Sacramento Valley Air Basin.

## **II. WOOD PRODUCTS COATING OPERATIONS:**

### **Coating Operations**

Surface coating of wood products may be completed in a single step or in several steps using primers, sealers, topcoats, etc., and/or touch-up operations. These process steps may be done in a single spray booth or in a series of booths, separated by flash-off areas and ovens. The flash-off area allows a solvent to rise to the surface of the coating before high temperature curing operations can occur. In applications involving air dried coatings, which typically do not exceed 194°F (90°C) while curing, the flash-off operation and the drying operation become indistinguishable. Typically, it is during the flash-off and curing/drying phases that VOC is emitted to the atmosphere. In general, multiple coatings are applied in the following order: stain, wash coat, filler, sealer, highlight coat, and top coat. A typical coating contains solids and liquid solvents. The solids portion contains pigments and resins (binders or film former) and at times plasticizers. The solvent portion may include VOC, exempt solvents, and water. Conventional coatings normally contain 70 to 80 percent solvent. Waterborne coatings are those that contain water as a solvent or diluents. Merely having water in a coating, however, does not ensure that the coating complies with applicable regulations, as many water borne coatings also contain VOC. Coatings with "high solids" content (solids content greater than 60%) have a reduced VOC content. Powder coatings typically contain less than 1% to 2% VOC, and may emit small amounts of monomer or low molecular weight components during the cure cycle. Powder coatings generally require electrostatic application. Emissions occur primarily from the solvents used during the coating process.

It is reasonable to assume that all of the solvents used in the coating process eventually reach the atmosphere. According to the U.S. Environmental Protection Agency (EPA), the most common hazardous air pollutant chemicals contained in the solvents used in wood coatings are: toluene (26%), xylene (15%), methyl isobutyl ketone (7.3%), methyl ethyl ketone (5.5%), and glycol ether and esters (1.7%).

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### **Coating Application**

Coatings are applied by several different methods, including but not limited to, spray, roller, dip, flow, and brush application. In spray coating, electrostatic, air-assisted/airless, airless, High Volume-Low Pressure (HVLP), and conventional air-spray methods are used. Coating application methods which are more efficient in applying coatings are advantageous since they improve transfer efficiency which decreases coating usage thereby reducing VOC emissions. Application techniques which have high transfer efficiency include HVLP, electrostatic spray, dip coating, flow coating, and roller or brush application.

**HVLP** is an application method using a high volume of low pressure air (typically 0.1 to 10 psi at the nozzle). The low air pressure greatly reduces the amount of over spray, resulting in a transfer efficiency greater than 65%.

In **electrostatic spray coating**, the coating flows over an electrode which charges the paint to 60 - 75 Kilovolts (KV). The parts are grounded and the coating is attracted to the part and wraps it. Round parts are almost totally wrapped while flat parts get a good wrap at the edges. The operator must be grounded and wear specific clothing while painting to bleed off the charge that will build up in the body. Transfer efficiency is 90% or better.

**Dip coating** means that a wood product is dipped into a coating bath to cover the part by submerging and upon removal from the bath; the excess coating is allowed to drain off. This process is used for parts that have no fine finish requirements as there are drain marks from the coating flowing off the part. Transfer efficiency is 90% or better.

**Flow coating** is a method of coating application where the coating is poured onto the part and the excess is drained into a sump for reuse. Transfer efficiency is 90% or better, but the finish is of poor quality due to drain marks. "Vacuum coating" is a kind of flow coating. The coating chamber is flooded with coating and vacuum pulls the coating across the product. "Curtain coating" is also a type of flow coating. In this process, the coating is not pumped from all angles but instead cascades over the part as a waterfall. Curtain coating is used mostly for flat goods.

In **roller or brush application**, the coating is applied by either roller or brush. Transfer efficiency is better than 90% while maintaining a good finish. A major drawback to roller or brush applications is the amount of time involved in coating a part. The process of coating a part by brush or roller is very labor intensive.

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## **Control Technology**

There are four major categories of control strategies that can be used to reduce VOC emissions from wood coating operations. They are:

1. Add-on control devices
2. Low-solvent reformulated coatings
3. Emerging technologies
4. Improved work practices

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## **Add-on Control Devices**

Add-on control devices are incorporated into a process to remove or destroy VOC's after the coating process occurs. There are three add-on control methods: thermal oxidation, catalytic oxidation, and adsorption.

**Thermal oxidation** involves heating VOC contaminants to their auto-ignition temperatures in the presence of sufficient oxygen to effectively complete destruction. Although chemicals have different auto-ignition temperatures, incinerators are usually operated at a single temperature that will result in the efficient destruction of most VOC's found in the exhaust stream. Factors affecting incinerator performance are residence time in the combustion zone, mixing, and incinerator temperature. A thermal incinerator is typically comprised of a refractory-lined chamber with gas burners at one end. The chamber is sized to allow a residence time of 0.3 to 1.0 second at the maximum gas flow rate. Using flue gases to preheat

combustion air and/or vent gases is a common method of heat recovery. However if a heat recovery process is used, insurance regulations require that VOC concentrations be kept below 25% of the lower explosive limit of the VOC in order to prevent explosion hazards. EPA test results demonstrate that thermal oxidizers can achieve a 98% VOC destruction efficiency for most VOC's at combustion chamber temperatures ranging from 700°C to 1300°C and residence times of 0.5 to 1.5 seconds.

**Catalytic oxidation** introduces a catalyst to dramatically increase the rate of the chemical reaction between the VOC's and oxygen. The catalyst itself is not altered during the reaction. The increased reaction rate can greatly reduce the auto-ignition temperature which, in turn, reduces the minimum combustion chamber temperature to a range of 260°C to 427°C. The reduced temperatures result in significant fuel savings when compared to a thermal incinerator. Catalytic converters can also process dilute VOC streams in which the concentration of VOC's is well below the lower explosive limit of the VOC. The disadvantages of catalytic units include higher installation costs and the possibility of catalyst poisoning by sulfur, metals, and phosphorous. Overall destruction efficiency is dependent upon space velocity, operating temperature, oxygen concentration and VOC composition and concentration. Under proper conditions, a catalytic unit can achieve 95% VOC destruction efficiency.

**Adsorption** is a mass-transfer operation involving the conversion of VOC's from a gas phase to a solid phase. The most common adsorption system uses activated carbon, which is effective in capturing most VOC's through a physical adsorption mechanism. In addition, activated carbon can be regenerated by steam, nitrogen stripping, or high-vacuum regeneration. At a minimum, two adsorption beds and a regeneration facility are required for an adsorption process. In practice, process vent emissions are directed to the first adsorption bed until equilibrium is reached. The emissions are then directed to the second adsorption unit while the first is being regenerated. The run time on the unit must be longer than the time for completion of the regeneration cycle. Removal efficiency by adsorbers can be as high as 95% for certain VOC's.

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### **Low-solvent Reformulated Coatings**

In wood product coating operations, VOC emissions result from the application and subsequent evaporation of the coating materials. The use of reformulated coatings that contain less solvent will reduce VOC emissions. Currently, most of the low-VOC reformulated coating alternatives available are clear coats, which could potentially be used to replace nitrocellulose clear lacquer coats in the coating process.

The conversion from solvent based coatings to waterborne coatings involves more than simply changing the coating being applied. Waterborne coatings require the use of spray guns designed for spraying water borne coatings, or that existing spray guns be retrofitted to include stainless steel or plastic parts to prevent rust from forming. In addition, the manner in which the coating is applied requires additional steps, and new application techniques. Unless some provision is made for drying waterborne coatings, the climate in the Feather River Air Quality Management District during the winter is not conducive to rapid evaporation of the waterborne product, leading to longer drying times.

One of the most noteworthy problems related to the use of waterborne coatings is that the water in the coating causes the wood grain to raise, more than is the case with solvent-borne coatings. This "grain raise" then requires additional sanding, and re-coating of the product until the wood product meets the level of quality control imposed by the manufacturer of the product. This problem can be overcome, but not without the cost imposed by the additional steps.

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### **Emerging Technologies**

Efforts are underway to improve several technologies that have potential applications in the wood product coating industry. These developments include advances in spray booth design that will reduce the volume of air exhausted, new curing methods that involve three-dimensional UV curing, and research into bio-filtration that will improve add-on controls.

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### **Improved Work Practices**

Improved work practices, such as employing high transfer efficiency application methods and reducing the volume of clean-up solvent, can lower VOC emissions by minimizing the quantity of VOC-containing materials used.

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### **Businesses Affected By Rule 3.20**

The wood products industry is characterized by a large number of small businesses typically producing wood household furniture, kitchen cabinets, television cabinets, office furniture, and store fixtures. There are approximately 43 businesses in Yuba and Sutter Counties that use some amount of wood products coatings.

The majority of the wood products industry in the District consists of smaller businesses which manufacture their own wood products, coat products which have been manufactured somewhere else, or which refinish wood products.

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## **III. SUMMARY OF RULE REQUIREMENTS**

### **Exemptions**

Rule 3:20 exempts the following:

1. Sources using less than 55 gallons per year, (singly or in any combination) of wood products coatings and/or strippers.
2. Wood products coatings that are sold in non-refillable aerosol-spray containers.
3. Coating of architectural components that are not coated in a shop environment. (Such components are regulated by District Rule 3:15 - ARCHITECTURAL COATINGS)
4. Stencil coatings when used to comply with U.S. Military Specifications.

Note: An exemption for Coating operations for the purpose of manufacturing a finished wood panel intended for attachment to the inside walls of buildings, including, but not limited to, homes and office buildings, mobile homes, trailers, prefabricated buildings and similar structures; or a finished exterior wood siding intended for use in construction has been removed from the draft rule. Other districts have adopted a rule for Flat Wood Stock Coating that limits VOC content of coatings for this type of application. FRAQMD has not proposed in our attainment plan to adopt a Flat Wood Stock Coating rule. Therefore the district does not propose to exempt this source from Rule 3.20.

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## **Standards**

Limits for the VOC content of wood products coatings, strippers, surface preparation materials, and cleanup materials are included in the rule, as well as alternative requirements for emissions control systems. Application equipment requirements indicate the types of equipment to be used in the application of wood products coatings, but without any specified transfer efficiency, since there is no EPA approved test method at this time. The application equipment requirements apply to all wood coating businesses, except those using less than 55 gallons of coating and stripper material per year.

Coating manufacturers have developed waterborne coatings that work very well on new wood products; however, these coatings do not work as well on older furniture that has been coated with furniture oils and waxes for many years. Because of this, the rule establishes higher VOC standards for coatings used in refinishing and repair operations, compared to the standards for new product coating operations.

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## **Administrative Requirements**

Administrative requirements for this rule provide the following:

1. The calculation to be used in determining partial vapor pressure. This calculation is for the purpose of determining which VOC limit applies.
2. The calculation to be used in determining the weight of VOC per volume of coating, less water and exempt compounds. This determination is for the purpose of calculating the VOC content of a coating.
3. The requirements for the Operation and Maintenance Plan, if an emission control device is used in lieu of compliant coatings.
4. The requirements placed on manufacturers to display the maximum VOC content of the coating, as applied.
5. A restriction on specifying the application of a wood product coating that does not meet the limits and requirements of this rule.

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## **Records and Test Methods**

Businesses regulated by this rule will be required to maintain records of the actual products used and in storage. The records must include a data sheet or material list, any catalysts, reducers, or other components used, and the mix ratio, and the VOC content limit as applied. On a monthly basis, records must be kept to indicate the amount (e.g. gallons) of each wood product coating material used.

A person using an emission control system or emission averaging to comply with this rule will be required to maintain daily records during periods of emission producing activities.

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### **Cost-Effectiveness**

Radian Corporation, under contract with the federal Environmental Protection Agency (EPA), prepared a Technical Support Document (TSD) for the Wood Products Coatings Rule. The TSD uses cost estimates developed by the South Coast Air Quality Management District (SCAQMD). These cost estimates have been modified in order to derive a cost-effectiveness figure for the Northern Sacramento Valley Air Basin based on 1995 dollars. The cost-effectiveness for Rule 3:20 is estimated to range from \$.01 per pound of VOC reduced if compliant coatings are used, to \$5.80 per pound of VOC reduced if add-on control devices are used.

Essentially, the costs of complying with this rule fall into two categories. The first category includes the capital cost of new equipment used to apply the coatings, as well as the higher cost of the compliant coatings. The District estimates that the higher cost of coating application equipment, such as the HVLP spray guns, is offset by the higher transfer efficiency and lower amount of coating waste. The higher cost for compliant coatings will also be offset by the reduced amount of product required, as well as the reduced cost of disposing hazardous waste. The second category includes the cost of control equipment that would need to be installed if the business operator decides to continue the use of non-compliant (higher VOC) coatings.

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### **Emission Reduction**

The following data is from the year 2001 ARB CEIDARS database. Estimated VOC emissions for the Northern Sacramento Valley Air Basin were 0.289 tons per day (105.44 tons per year) from the wood products industry. District contributions are separated as follows:

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<b>Air Quality Management Dist.</b>	<b>tons/day</b>	<b>tons/year</b>
Butte	.035	12.74
Colusa	.002	.69
Feather River	.133	48.41
Glenn	.011	3.85
Shasta	.080	29.27
Tehama	.029	10.47
<b>NSVAB Totals</b>	<b>.289</b>	<b>105.44</b>

The Air Resources Board uses two control effectiveness values for estimating emissions reductions explained in two tiers below:

Tier 1- 40% reduction, Implemented at time of adoption:

Tier 2- 58% reduction, Implemented by year 2005:

District	CEIDARS 2001 ROG Emissions (tons/day)	Emission Reduction (tpd)	
		Tier 1 Limits (assume 40% reduction)	Tier 2 Limits (assume 58% reduction)
Butte	.035	.014	.020
Colusa	.002	.001	.001
Feather River	.133	.053	.077
Glenn	.011	.004	.006
Shasta	.080	.032	.046
Tehama	.029	.011	.017
<b>Totals</b>	<b>.289</b>	<b>.115</b>	<b>.167</b>

Note: The reductions are rough estimates and data does not account for emission growth from 2001 into the future. Tier 2 reductions are estimates based on limits that have not yet been implemented.

- (1) Air Resources Board, State of California (1998). *Industrial Surface Coatings-Wood Furniture and Fixtures Emission*, June. Inventory Development  
 (2) Air Resources Board, State of California. *California Emission Inventory Development and Reporting System (CEIDARS) database*.

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#### **IV. OTHER FACTORS:**

##### **Enforceability**

Record keeping requirements and test methods are included in the rule to increase its enforceability, as required by ARB and EPA.

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##### **Public Acceptability**

Based on the cost-effectiveness figures previously discussed, the District expects the rule and any associated costs to be acceptable to affected industry. If a business chooses to comply with the requirements of the rule by using compliant wood product coatings, monthly records will be required; whereas those choosing control equipment or emissions averaging must maintain daily records.

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##### **Permit Fees**

In addition to the actual costs incurred by industry for the compliant coatings, higher transfer application equipment, or add-on equipment to destroy VOC emissions, District regulations also require payment of permit fees for stationary sources. In the wood coatings industry, the average initial fee within the NSVAB

for permitting VOC emissions and proper equipment varies from \$300-\$500. Each Management District has various factors that determine final fee due.

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## **V. SOCIOECONOMIC IMPACTS:**

### **Type of Industry Affected**

This rule will affect manufacturers, suppliers, users, and those who specify the use of wood coatings, inks, stains, surface preparation materials, cleanup materials, and/or strippers. Those businesses using the wood products coatings will be required to comply with the solvent and coating limits specified in the rule, as well as to apply the coatings in a manner that maximized the transfer efficiency.

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### **Impact on Employment & Economy of Region**

If Rule 3:20 is adopted, no adverse impact on employment or the economy is anticipated in the District. The basis for this statement is found in the relatively low cost of compliance, as stated in the section on cost-effectiveness.

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### **Range of Probable Costs**

See section dealing with Cost-Effectiveness, above.

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### **Alternatives**

No alternatives to the Rule are proposed at this time

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### **Necessity for Rule**

See Section A, Necessity and Authority.

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## **VI. FINDINGS:**

The California Health and Safety Code, Division 26, Air Resources, requires local Districts to comply with a rule adoption protocol as set forth in Section 40727 of the Code. This section has been revised through legislative mandate to contain 6 findings that the District must make when developing, amending, or repealing a rule. These findings, effective January 1, 1992, and their definitions are listed in the following table.

<b>FINDING</b>	<b>DEFINITION</b>	<b>REFERENCE</b>
Authority	The District is permitted or required to adopt, amend, or repeal the rule by a provision of law or a state or federal regulation.	California Health and Safety Code; Sections 40919(e), 41062(a), and 41011(b).
Necessity	The District has demonstrated that a need exists for the rule, or for its amendment or repeal.	It is necessary for the District to adopt this rule in order to comply with the 2000 Northern Sacramento Valley Air Basin Attainment Plan.
Clarity	The rule is written or displayed so that its meaning can be easily understood by the persons directly affected by it.	To date, there is no indication that the rule is difficult to understand by persons directly affected by it.
Consistency	The rule is in harmony with, and not in conflict with or contradictory to, existing statutes, court decisions, or state or federal regulations.	The District has found the proposed new rule is consistent with, and not in conflict with, or contrary to existing statutes, court decisions, or state or federal regulations.
Non-duplication	The rule does not impose the same requirements as an existing state or federal regulation, unless the District finds that the requirements are necessary or proper to execute the powers and duties granted to, and imposed upon the District.	Rule 3:20 is being proposed for local rule adoption, and does not duplicate an existing state or federal regulation.
Reference	Any statute, court decision, or other provision of law that the District implements, interprets, or makes specific by adopting, amending, or repealing the rule. An example of this would be the 1988 EPA State Implementation Plan call to revise District rules.	Adoption of this rule is recommended in order to meet one of the goals of the 2000 Northern Sacramento Valley Air Basin Attainment Plan.