

**State of California  
AIR RESOURCES BOARD**

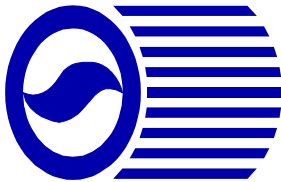
**DETERMINATION OF REASONABLY AVAILABLE CONTROL TECHNOLOGY  
AND BEST AVAILABLE RETROFIT CONTROL TECHNOLOGY  
FOR ADHESIVES AND SEALANTS**

December 1998

Prepared by:

Industrial Section  
Criteria Pollutants Branch  
Stationary Source Division

P.O. Box 2815, Sacramento, California 95812



**California Environmental Protection Agency  
California Air Resources Board**

**DETERMINATION OF REASONABLY AVAILABLE CONTROL TECHNOLOGY  
AND BEST AVAILABLE RETROFIT CONTROL TECHNOLOGY  
FOR ADHESIVES AND SEALANTS**

Principal Authors

Jose Gomez  
Sue Kaiser  
Terrel Ferreira  
Bob Nguyen  
Erik White

CAPCOA

Adhesives Committee

Stan Cowen, Chair	Ventura County APCD
Gary M. Yee	Air Resources Board
Tad Bixler	Santa Barbara County APCD
Angela Durr	San Diego County APCD
Ali Mohamad	Sacramento Metropolitan AQMD
Bill Millner	South Coast AQMD
Bill Guy	Bay Area AQMD
Yvonne Fong	U.S. EPA Region IX
Lee Huo	San Joaquin Valley Unified APCD

Reviewed by:

Dean C. Simeroth, Chief, Criteria Pollutants Branch  
Gary M. Yee, Manager, Industrial Section

This report has been prepared by the staff of the Air Resources Board in cooperation with the CAPCOA Adhesives Committee. Publication does not signify that the contents reflect the views and policies of the Air Resources Board, nor does mention of trade names constitute endorsement or recommendation for use.

## ACKNOWLEDGMENTS

This determination was prepared by the Air Resources Board staff in cooperation with the California Air Pollution Control Officers Association's Adhesives Committee and with the participation of industry representatives. We would like to thank other district and ARB staff who contributed to the completion of this project. They are:

Al Baez, Marty Kay, Anupom Ganguli, Corie Choa, and Andrew Lee, South Coast AQMD;

Dave Hodges, Duane James, and Nicole Reaksecker, U.S. EPA Region IX;

Maria Lima, San Joaquin Valley Unified APCD;

Anita Shuhevych, Bay Area AQMD; Laura Yannayon, and Paul Chad, San Diego APCD;

Jack Ferguson, Sacramento Metropolitan AQMD; and

Janette Brooks, Air Resources Board.

## **DEDICATION**

This RACT/BARCT guidance document is dedicated to the memory of Monty Price, a founding member of the CAPCOA Adhesives Committee, who passed away in May 1994. Although Monty was not around to see the publication of this document, he was instrumental in its development. Monty worked tirelessly for the South Coast Air Quality Management District and authored many rules including Rule 1168, which was the basis for much of this document. All of us who worked with Monty have nothing but praise for his ability, his knowledge, his willingness to listen and communicate, his caring, and his great sense of humor. Monty touched our lives, and we are better for it. We will miss you, our dear friend and colleague.

## Table of Contents

<u>Contents</u>	<u>Page</u>
I. INTRODUCTION	1
A. Background	1
B. Overview of Adhesives and Sealants	2
C. Adhesive and Sealant Emissions	2
II. RACT and BARCT RECOMMENDATION	4
A. Overview of Requirements	4
B. RACT Limits	10
C. BARCT Limits	11
D. Prohibition of Sales	12
III. CONTROL TECHNOLOGY	14
IV. COST-EFFECTIVENESS	15
A. Cost of Compliant Adhesives and Sealants	15
B. Cost of Add-On Control Technology	16
C. Cost-effectiveness	16
V. IMPACTS	17
A. Economic Impacts	17
B. Emission Reductions	17
C. Socioeconomic Impacts	18
D. Other Impacts	18
VI. REFERENCES	19

## **APPENDICES**

- A. RACT/BARCT DETERMINATION FOR ADHESIVES AND SEALANTS
  
- B. DISTRICTS WITH ADOPTED AND PROPOSED ADHESIVES AND SEALANTS RULES
  
- C. COMMENTS AND RESPONSES

## **RACT/BARCT DETERMINATION FOR ADHESIVES AND SEALANTS**

### **I. INTRODUCTION**

This report presents the determination of reasonably available control technology (RACT) and best available retrofit control technology (BARCT) for controlling volatile organic compound (VOC) emissions from the commercial and industrial application of solvent-based adhesives and sealants. The determination also applies to the manufacture and sale of adhesives and sealants. The determination was developed by the Air Resources Board (ARB) staff, in cooperation with the Adhesives Committee of the California Air Pollution Control Officers Association (CAPCOA). The RACT/BARCT determination is presented in Appendix A.

#### **A. Background**

The California Clean Air Act (CCAA) of 1988 requires, among other things, that local air quality management and air pollution control districts (districts) develop attainment plans to achieve the state ambient air quality standards as expeditiously as practical. These plans must include regulations that require control technologies for reducing emissions from existing sources. RACT/BARCT determinations are developed to aid districts in developing regulations to attain and maintain the state ambient air quality standards. The determinations also promote consistency of controls for similar emission sources among districts with the same air quality attainment designations.

While the CCAA does not define RACT, RACT for existing sources is generally considered to be those emission limits that would result in the application of demonstrated technology to reduce emissions (ARB, March 1990, p. 3). BARCT is defined in the California Health and Safety Code, section 40406, as "an emission limitation that is based on the maximum degree of reduction achievable, taking into account environmental, energy, and economic impacts by each class or category of source."

In developing this RACT/BARCT determination, the Adhesives Committee (Committee) evaluated district adhesive and sealant rules to ascertain ways in which the standards could be improved. The Committee reviewed the adopted rules of the South Coast Air Quality Management District (AQMD) (Rule 1168), Bay Area AQMD (Rule 8-51), and Ventura County Air Pollution Control District (APCD) (Rule 74.20). These rules in aggregate represented the most current and effective standards to reduce VOC emissions from adhesives and sealants at the time the RACT/BARCT determination was initially developed. Since then, five other districts have adopted adhesives and sealants rules: El Dorado County APCD, Placer County APCD, Sacramento Metropolitan AQMD, San Joaquin Valley Unified APCD, and Yolo-Solano AQMD. A list of the districts with adopted adhesives and sealants rules, the rule numbers, and dates of adoption is presented in Appendix B.

Public workshops to discuss the RACT/BARCT VOC limits were held on September 30

RACT/BARCT Determination for Adhesives and Sealants

and October 5, 1993, August 19, 1997, and January 8, 1998. Appendix C contains a summary of comments received and staff's responses to those comments.

## **B. Overview of Adhesives and Sealants**

Adhesives and sealants are used in product manufacturing, packaging, construction, and installation of metal, wood, rubber, plastic, ceramics, or fiberglass materials. An adhesive is any material used to bond two surfaces together. A sealant is a material with adhesive properties that is used primarily to fill, seal, waterproof, or weatherproof gaps or joints between two surfaces. Often, adhesives and sealants share the same chemical type. For example, silicones are available both in adhesive and sealant formulations. There are hundreds of adhesives and sealants and thousands of different products.

Adhesives may be classified as structural and nonstructural. Structural adhesives, used in industrial assembly processes, maintain structural integrity of the product. Structural adhesives are synthetic adhesives that bond by a cross linking chemical reaction, rather than curing by solvent evaporation. The main types of structural adhesives are thermosetting adhesives and alloys of these with thermoplastic or elastomeric adhesives. Nonstructural adhesives, such as sealants and conductive adhesives, normally cannot withstand structural stress.

Sealants are used to prevent the passage of a liquid or gas between two surfaces, while being flexible and resistant to substrate movement. Generally, sealant products have low solvent levels, high concentrations of fillers, and are thick and nonpourable. High performance sealants are based on polymers of sulfides, silicones, and urethanes. Caulks, low performance sealants, are based on butyls, acrylics, and polyvinyl acetate polymers and are available in waterborne or solvent-borne formulations.

Many adhesive and sealant applications require the prior application of a primer. Primers are used to wet the surface of the substrate, improve the bondability of the adhesive or sealant to a poor substrate, and sometimes provide corrosion protection. Typically, primers are applied in very thin films. The most common type of primer is a one-part system in an organic solvent. Increasingly, thermosetting or two-part primers are being developed.

## **C. Adhesive and Sealant Emissions**

Adhesive and sealant VOC emissions result from evaporation of solvents during transfer, drying, surface preparation, and cleanup operations. These solvents are the media used to solubilize the adhesive or sealant material so that it can be applied. The solvent is also used to completely wet the surface to provide a stronger bond. In plastic pipe bonding, the solvent dissolves the polyvinyl chloride pipe and reacts with the pipe to form a bond. Solvents used to clean the surface before bonding and to clean the application equipment after bonding also contribute to VOC emissions.

The Committee estimates that in 1994, adhesive and sealant VOC emissions were 45 tons



#### RACT/BARCT Determination for Adhesives and Sealants

per day (t/d) statewide, 35 t/d of which are attributed to solvent-based products. The RACT/BARCT determination requires the use of low-VOC or low-vapor pressure materials or the use of equipment or procedures that will reduce VOC emissions.

Some adhesive products are formulated with exempt solvents which are not treated as VOCs. Among these exempt solvents are halogenated or partially halogenated carbon compounds such as methylene chloride and 1,1,1-trichloroethane. There is a potential for increased use of these solvents as the limits in this determination are implemented. However, because many of these compounds can cause toxic health effects or contribute to stratospheric ozone depletion or global warming, regulatory agencies are increasingly restricting their use. For example, the 1990 federal Clean Air Act amendments required that the production of 1,1,1-trichloroethane be terminated by 2002, a requirement that was accelerated to January 1996 by amendments to the Montreal Protocol adopted in November 1992. Also, in California, many districts have developed policies to regulate the use of compounds that are toxic or can contribute to stratospheric ozone depletion or to global warming. This determination does not address these impacts.

Finally, since the initial development of the proposed standards in this determination the United States Environmental Protection Agency (U.S. EPA) and the ARB have exempted acetone as a VOC. Districts adopting rules based on this RACT/BARCT determination will need to consider the new status of acetone and the impact of its exempt status on the VOC limits.

## **II. RACT and BARCT RECOMMENDATION**

The Committee recommends that the determination in Appendix A be defined as RACT/BARCT for adhesive and sealant emissions of VOCs. This determination is based largely on the South Coast, Bay Area and Ventura County adhesive and sealant rules and represents control technology that is available and cost-effective. Table 1 summarizes the requirements of the RACT/BARCT determination.

### **A. Overview of Requirements**

The determination contains VOC limits for various adhesive and sealant categories (refer to Table 1 or Appendix A for applicable limits). The VOC limits are expressed in terms of grams of VOC per liter (g/l) of adhesive, less water and exempt compounds. For aerosol adhesives, the VOC limits are expressed as percent VOC by weight.

There are six categories of VOC limits: (1) adhesives, (2) sealants, (3) adhesive primers, (4) sealant primers, (5) adhesives application onto substrate, and (6) aerosol adhesives. Categories one through four provide VOC limits for specific applications of adhesives, sealants, and primers. These applications address the specific concerns of industry for appropriate and achievable VOC limits. The necessity for these specific limits arises from the limited availability of adhesives that can meet specific performance criteria.

If an application is not listed under one of these four categories, the VOC limits in the fifth category (adhesives application onto substrate) would apply. Category five differs from the other four in that specific operations are not listed. The VOC limits are based on the type of substrate. For applications where two different substrates are being bonded, the higher VOC limit of the two would apply, unless specified otherwise.

The last category is aerosol adhesives. A percentage standard is specified because it is difficult to verify the quantity of VOC in an aerosol medium in terms of mass of VOC per volume of adhesive. District staffs have found that a mass percent standard for aerosol products is enforceable.

Assembly Bill (AB) 1849 (Ch. 766, Stats. of 1996) amended the Health and Safety Code to require, effective January 1, 1997, that the ARB's 75 percent VOC standard for aerosol adhesives apply statewide to the consumer, commercial, and industrial uses of aerosol adhesives. On that date, district rules limiting the VOC content, or emissions from, aerosol adhesives are null and void. AB 1849 also requires, on or before July 1, 2000, that the ARB prepare a study and conduct a public hearing on the need for, and feasibility of, establishing a more stringent standard or standards for aerosol adhesives. If the ARB finds that more stringent limits are expected to become feasible, a more stringent standard shall be adopted, at a minimum constituting BARCT unless the ARB determines that those measures are not achievable.

The ARB has amended the consumer products regulation (Title 17, California Code of

RACT/BARCT Determination for Adhesives and Sealants

Regulations, sections 94507-94517) to include the commercial and industrial use of aerosol adhesives, thereby providing a mechanism for statewide ARB implementation and enforcement of the 75 percent VOC limit. The ARB regulation also established a 25 percent VOC limit effective 1/1/2002.

After January 1, 1997, a district may adopt and enforce the ARB's 75 percent standard, or a subsequently adopted standard. On or after January 1, 2000, a district may adopt and enforce a rule setting a standard that is more stringent than the ARB's. The aerosol adhesive VOC limit in the RACT/BARCT determination is consistent with the ARB's regulation. Some districts may prefer to adopt and enforce the ARB's aerosol adhesive 75 percent VOC standard. However, districts should consider the ARB's technical assessment in determining whether a more stringent limit is appropriate.

**Table 1**  
**Adhesives and Sealants Application Operations**  
**RACT/BARCT Summary**

**Applicability**

Any person who supplies, sells, offers for sale, or uses adhesives, sealants, adhesive primers, or sealant primers.

**Requirements**

A. Standards

	<u>VOC LIMITS</u> (g/l)	<u>BARCT</u> <u>VOC LIMITS</u> (Effective 1/1/2000) (g/l)
(1) Adhesives:		
ABS welding	400	
Ceramic tile installation	130	
Computer diskette jacket manufacturing	850	
Contact Bond	540	250
Contact Bond-Specialty Substrates	540	400
		250* (effective 1/1/2001)
Cove base installation	150	
CPVC welding	490	
Indoor floor covering installation	150	
Metal to urethane/rubber molding or casting	850	250*
Multipurpose construction	200	
Nonmembrane roof installation/repair	300	
Other plastic cement welding	510	
Outdoor floor covering installation	250	

RACT/BARCT Determination for Adhesives and Sealants

PVC welding	510	
Single-ply roof membrane installation/repair	250	
Structural glazing	100	
Thin metal laminating	780	
Tire retread	100	
Perimeter bonded sheet vinyl flooring installation	660	
Waterproof Resorcinol Glue	170	
Sheet-Applied Rubber Lining Installation	850	250*

\* These are technology forcing standards. Technology forcing standards are standards which may not be met at the present time and have future effective dates. It is anticipated that adhesives technology will advance sufficiently to meet these standards by the time these standards go into effect.

**Table 1, Continued**  
**Adhesives and Sealants Application Operations**  
**RACT/BARCT Summary**

	<u>VOC LIMITS</u>	
		(g/l)
(2) Sealants:		
Architectural	250	
Marine deck		760
Nonmembrane roof installation/repair		300
Roadway		250
Single-ply roof membrane		450
Other		420
(3) Adhesive Primers:		
Automotive glass		700
Plastic cement welding		650
Single-ply roof membrane		250
Traffic marking tape	150	
Other		250
(4) Sealant Primers:		
Architectural		
- Non porous	250	
- Porous		775
Marine deck		760
Other		750
(5) Adhesives Application Onto Substrate: <sup>1</sup>		
Flexible vinyl		250
Fiberglass		200
Metal		30

<sup>1</sup> If an adhesive is used to bond dissimilar substrates together, the applicable substrate category with the highest VOC content shall be the limit for that operation.

RACT/BARCT Determination for Adhesives and Sealants

Porous material	120
Rubber	250
Other substrates	250

RACT/BARCT Determination for Adhesives and Sealants

B. Aerosol Adhesives

A person shall not use any aerosol adhesive unless the VOC content, including the propellant, does not exceed 75 percent by weight. Effective 1/1/2002, the VOC content of aerosol adhesives shall not exceed 25 percent by weight.<sup>2</sup>

C. Alternative Control Requirements

Add-on control systems with at least 85 percent overall control efficiency (capture and destruction efficiency), by weight.

D. Other Requirements

- Cleanup and Surface Preparation Solvents
- Storage of VOC Containing Material
- Compliance Statement
- Prohibition of Specification

E. Optional Requirements (To be adopted at the discretion of the district)

- Sales Prohibition

**Exemptions**

- Tire repair adhesives
- Undersea-based weapon systems
- Research and development
- Solvent welding operations for medical devices
- Plaque laminating operations
- Products or processes subject to other district rules
- Adhesives and sealants regulated by other categories of district rules
- Low-VOC products (less than 20 g/l)
- Low usage (less than 55 gallons per calendar year)
- Small source (not more than 200 pounds VOC emissions from adhesive operations per calendar year)
- Adhesives subject to the consumer products regulation (optional; for districts not adopting sales prohibition)
- Reserved for specific exemptions determined by the Air Pollution Control Officer (APCO) to be technologically infeasible or not cost-effective to retrofit
- Cyanoacrylate adhesives
- Adhesives which are sold or supplied by the manufacturer or suppliers in containers of eight fluid ounces or less, except plastic cement welding adhesives

**Recordkeeping Requirements**

- Monthly volume of each adhesive, sealant, primer and cleanup solvent used
- Material list (e.g., material name, manufacturer ID,

<sup>2</sup> The ARB will conduct a technology assessment required by the consumer products regulation by 7/1/2000 to determine the feasibility of the 25 percent VOC limit to be implemented on 1/1/2002.

RACT/BARCT Determination for Adhesives and Sealants

- application)  
Catalysts, reducers, or other components used and the mix
- ratio  
VOC or vapor pressure limit and actual content of material
- used  
Daily records for noncomplying material and key operating
- parameters when emission control equipment is used  
Maintain records for minimum of 2 years

**Test Methods**

- U.S. EPA Reference Test Method 24 or South Coast AQMD Method 304 for the determination of the VOC and solid content of all non-aerosol adhesives
- ASTM Test Method D4457-85 for the determination of exempt compounds
- The determination of the VOC content of aerosol adhesives shall be made using South Coast AQMD Method 305 or ARB Method 310
- South Coast AQMD Method 316A for the determination of the VOC content of any plastic cement adhesives or primers
- ASTM Method E260-91, D3792-79, and D2879-86 for the determination of the composite vapor pressure of organic compounds in cleaning materials
- U.S. EPA protocols for the determination of capture efficiency or a district capture efficiency determination method approvable by the U.S. EPA
- U.S. EPA Reference Test Method 25, 25A, 25B, or ARB Method 100 for the determination of control efficiency
- South Coast AQMD's "General Test Method for Determining Solvent Losses from Spray Gun Cleaning Systems" for the determination of the active and passive solvent losses from spray gun cleaning systems

Several adhesive and sealant applications and products are exempt from this determination: tire repair, assembly and manufacturing of undersea-based weapon systems, testing and evaluation associated with research and development, solvent welding operations for medical devices, plaque laminating operations, products or processes subject to other district rules, low-VOC products (less than 20 g/l), and adhesives subject to the ARB's consumer products regulation (optional; for districts not adopting the sales prohibition, as explained below in section D). Additionally, the determination provides an exemption for adhesive operations that use less than 55 gallons per calendar year of noncomplying adhesives, and for stationary sources that emit not more than 200 pounds of VOCs per year from adhesives operations. Any person claiming one of these latter two exemptions must maintain records that substantiate this claim.

The determination also includes an alternative compliance provision for using add-on

RACT/BARCT Determination for Adhesives and Sealants

control systems, such as carbon adsorption or incineration systems. If add-on control systems are used, they must achieve at least an 85 percent overall control efficiency (i.e., the product of the capture efficiency and the destruction efficiency must be at least 85 percent on a mass basis). The capture efficiency may be determined according to the U.S. EPA Technical Document, *Guidelines for Determining Capture Efficiency* (January 9, 1995), or a district capture efficiency determination method approved by the U.S. EPA.

Monthly usage records are required for all adhesives, sealants, primers, and solvents at a facility. All pertinent information must be available to determine compliance with the determination. For add-on control equipment, daily records are to be maintained of key operating parameters for the emission control equipment, including but not limited to hours of operation and maintenance activities.

U.S. EPA Test Method 24 or South Coast AQMD Method 304 is specified for determining the VOC and solids content of non-aerosol adhesives. South Coast AQMD Method 305 or ARB Method 310<sup>3</sup> is required for determining the VOC content of aerosol adhesives. South Coast AQMD Method 316A is required for determining the VOC content of plastic cement adhesives or primers.

## **B. RACT Limits**

The RACT VOC limits in the determination are found in existing district rules and have been determined to be achievable and cost-effective. In most cases, the adhesive and sealant industry is currently complying with these limits (refer to Table 1 or Appendix A for applicable limits).

The RACT/BARCT limit for contact bond adhesives reflects a recognition that these adhesives are used by a large variety of businesses with different bonding requirements. While the Committee believes that for the majority of applications waterborne contact adhesives are available which provide satisfactory performance, we recognize that there are situations in which they do not perform well or are not cost effective. The Committee recognized that for certain types of applications there may be a need to use solvent based adhesives with higher VOC levels to achieve the desired performance. The Committee has modified the VOC limit for general contact adhesives from 200 g/l to 540 g/l until 1/1/2000, at which time the limit will be 250 g/l. We also recognize that some district may choose to retain the 200 g/l standard in their district rules.

<sup>3</sup>The ARB Test Method 310 is being reviewed by the U.S. EPA but has not yet been approved.



### **C. BARCT Limits**

In addition to the RACT limits, the determination contains BARCT limits which may be optional according to a district's attainment status. Generally, BARCT limits are more stringent than RACT limits for the same source. As with the RACT limits, the VOC limits listed as BARCT are contained in district rules and in some cases, are already being implemented (refer to Table 1 or Appendix A for applicable limits).

Some BARCT limits are considered technology forcing: metal to urethane/rubber molding or casting, contact bond adhesive-special substrates, sheet-applied rubber linings, and aerosol adhesives. Technology forcing limits are limits that may not currently be met, but are based on anticipated technological developments that industry expects to be available in the near future. The Committee believes that adhesives technology will advance sufficiently to meet these limits by the future compliance date of January 1, 2000 (January 1, 2001 for contact bond adhesives for special substrates and aerosol adhesives).

The BARCT limits for contact bond adhesives-special substrates reflect recent developments in adhesive technology. Manufacturers are developing adhesives with higher solids content which would result in lower emissions when applied compared to the traditional solvent based adhesives. These products are solvent based and unlike the waterborne adhesives can be used with the special substrates. Currently, higher solids adhesive products meeting a 400 g/l VOC are available, although in limited quantities. In recognition, staff has delayed implementation of the 400 g/l limit until the year 2000. Manufacturers indicated that their objective is to eventually develop contact adhesives that will meet a 250 g/l VOC level. The Committee believes it is likely that these adhesives will become available by the year 2001. Therefore, the 250 g/l limit is identified as BARCT and is technology forcing for contact bond adhesives-special substrates.

Manufacturers requested an exemption from the VOC limits for retail contact bond adhesives subject to the flamability requirements in the Federal Hazardous Substances Act as codified in 16 CFR Section 1302 (FHSA). They state that the FHSA flamability requirements prevent them from using exempt solvents (e.g., acetone) because this lowers the flamability point below the FHSA requirements. They contend that without the use of exempt solvents, the only way to meet the VOC limits of the RACT/BARCT determination is to formulate the products using waterborne technology that is difficult for the typical retail customer to apply. Manufacturers have cited end user feedback as a basis for documenting customer dissatisfaction with the use of these products.

The Committee, in establishing the VOC limits for this adhesive category, acknowledges the manufacturers concerns over the use of these products. However, the Committee does not believe that an exemption for this category is warranted in the adhesives RACT/BARCT because products exist in the market place that do not have reported problems with application and performance. The Committee does recognize that these products may not be universally applicable and may encounter performance problems like those that have been identified by the

RACT/BARCT Determination for Adhesives and Sealants manufacturers.

Specifically, the Committee acknowledges that retail waterborne adhesives manufactured to meet the FHSA require more sophistication in application than VOC based products. The typical end user often lacks the knowledge and equipment necessary to successfully apply these products with satisfactory results. Therefore, districts are urged to evaluate their end user demographics and consider whether an exemption for quart and gallon containers of retail contact cement formulated to comply with the Federal Hazardous Substances Act is appropriate for their district.

As mentioned above, the ARB will perform a technical assessment to determine the feasibility of the 25 percent VOC limit for aerosol adhesives. During the development of the RACT/BARCT determination, the Committee received comments from manufacturers stating that the 25 percent VOC limit is not feasible and requesting that the 25 percent VOC limit be omitted from the RACT/BARCT determination. The Committee concluded that it is appropriate to retain the 25 VOC limit until the technical assessment is completed.

Because the availability of products to meet the technology forcing limits is uncertain, the Committee suggests that districts consider the options discussed in the *ARB-CAPCOA Suggested Control Measure for Architectural Coatings* (ARB, 1989, pp. 28-29), to address potential State Implementation Plan (SIP) conflicts with the U.S. EPA. These options are:

1. The districts adopt technology-forcing standards now, and address the issues later in the event complying adhesives and sealants are not available by the effective date.
2. The districts not adopt the technology-forcing standards into their rules, but consider their adoption later, as the effective date nears, in light of intervening technical developments.
3. The districts adopt the technology-forcing standards into their rules now, but specify that the emission reductions associated with the technology-forcing limits are to be used toward attainment of the state ambient air quality standards, and not the federal standards. Under this approach, the technology-forcing limits would not become part of the SIP.

#### **D. Prohibition of Sales**

The determination contains an optional prohibition of sales provision. The prohibition of sales provision disallows the sales of noncompliant adhesives and sealants within the boundary of a district. This provision does not apply to the substrate limits listed in section III.A.(5). The prohibition of sales provision may be necessary in some districts to address the difficulty of regulating area or non-permitted sources. With the exception of the South Coast AQMD, all of the districts with adhesives rules have adopted a sales prohibition.

Adhesive and sealant emission sources may be classified as point sources and area sources. Districts can regulate emissions from point sources through permit conditions. Thus,

#### RACT/BARCT Determination for Adhesives and Sealants

compliance with a rule's requirements can be effectively enforced. However, in some districts, over 90 percent of adhesive and sealant usage falls into the area source category (Ventura County APCD, June 8, 1993, p.5). The prohibition of sales provision encourages compliance by greatly reducing the availability of noncompliant adhesives and sealants within the district's boundary.

There are several exemptions to the sales prohibition requirements. Sales of noncompliant adhesives are allowed for use outside the district or to a user who has installed a district approved VOC add-on control device. A manufacturer is not considered liable for the sales of noncompliant adhesives if an accurate compliance statement was provided on the label and if the product was not sold directly to a user or a sales outlet within a district. A manufacturer is also not liable for products sold to an independent distributor that is not a subsidiary of or under the direct control of the manufacturer.

The ARB's consumer products regulation applies statewide to the sale of four categories of adhesives: aerosol adhesives, contact adhesives, construction and panel adhesives, and general purpose adhesives. With the exception of aerosol adhesives (see page 4), the consumer products regulation applies only to products sold in containers with a net weight of one pound or less, or a net volume of 16 fluid ounces or less. The same products sold in larger containers fall under district jurisdiction. Because there are VOC limits for aerosol adhesives, contact adhesives, and multipurpose construction adhesives (equivalent to construction and panel adhesives) in the RACT/BARCT determination, districts are provided two options to ensure that overlap does not occur: 1) they may adopt the optional sales prohibition, which specifically exempts adhesives, sealants, and adhesive and sealant primers sold in smaller containers, or 2) they may adopt the exemption in section IV.A.8, which references the consumer products regulation.

Manufacturers requested clarification on the concept of self certification as a means to comply with the sales prohibition. The Committee encourages districts adopting a sales prohibition to develop a mechanism by which those entities entitled to use noncompliant adhesives can obtain the necessary documentation to enable them to purchase those products. The Committee believes implementation issues such as self certification is best addressed at the district level.

### **III. CONTROL TECHNOLOGY**

Two options for controlling VOC emissions from industrial adhesives and sealants are reformulation of adhesives, sealants, and cleanup solvents, and the use of add-on control equipment. Reformulation is the most cost-effective control method for VOC emissions from adhesives and sealants. Reformulation requires either an increase in the solids content or replacement of VOCs with water or exempt solvents. The RACT VOC limits for adhesives and sealants are based on currently available products.

Low-VOC and water-based adhesives sometimes require additional drying time, additional equipment (e.g., drying or application equipment), and special technical requirements (e.g., performance specification). In addition, the low-VOC and water-based adhesives are occasionally not as durable as their original solvent-based formulations.

Although reformulation is more cost-effective, some facilities may choose to install add-on control equipment to continue using noncomplying products for specific performance standards. Carbon adsorption and incineration are the most commonly used control methods for organic emissions. Control equipment is required to meet an 85 percent overall control efficiency, which is the product of capture efficiency and destruction efficiency.

While both carbon adsorption and incineration systems achieve high control efficiencies, they require large capital investments and high operating costs. These expenses make it economically infeasible for small facilities to install add-on control equipment.

**IV. COST-EFFECTIVENESS**

**A. Cost of Compliant Adhesives and Sealants**

Staff expects that most facilities will use compliant, low-VOC or water-based adhesives and sealants to comply with the determination's requirements. Even before district adhesives rules were adopted, some facilities were already using water-based products to lower insurance premiums and cleanup costs and improve worker safety (Ventura County APCD, 1993, p. 11). The cost of compliant adhesives and sealants is usually higher than the cost of a similar high-VOC formulation. However, since water-based adhesives usually have greater coverage, the cost differential is narrower than the retail price alone suggests (see Table 2).

Table 2  
Comparison of Costs Between Water-based  
and Solvent-Based Adhesives

Adhesives	Type <sup>1</sup>	Price (\$/gal)	Coverage (sq.ft/gal)	Cost (cents/sq.ft)
DAP Weldwood Contact Cement <sup>2</sup>	W	22.54	450	5.0
DAP Weldwood Contact Cement <sup>2</sup>	S	17.86	140	12.7
Miracle Carpet Adhesives <sup>2</sup>	W	14.97	175	8.5
Roberts Carpet Adhesives <sup>2</sup>	S	13.93	148	9.4
Water-based Contact Adhesives <sup>3</sup>	W	19.35	421	4.6
Solvent-based Contact Adhesives <sup>3</sup>	S	13.31	308	4.3

<sup>1</sup>Adhesive type: W = Water-based; S = Solvent-based

<sup>2</sup>Based on staff's survey of Home Depot in Sacramento on January 20, 1994.

<sup>3</sup>Ventura County APCD Staff, 1993, p. 12.

The cost of using compliant adhesives and sealants is more involved than the difference in retail price. Usually, more drying time is required since there are few or no VOCs in the formulation, and the use of drying equipment may be necessary. The increased cost of compliant adhesives and sealants and drying equipment is offset somewhat due to decreased cleanup costs and insurance liability premiums. Ventura County APCD staff estimated the costs for a laminating shop to convert to water-based adhesives (Ventura County APCD, 1993, pp. 11-12). District staff determined that the annualized cost for the conversion was about \$2,300 for this facility with an annual use of 1,154 gallons of water-based adhesive.

**B. Cost of Add-On Control Technology**

Facilities may elect to comply with the determination's requirements by using add-on control equipment. Staff expects most users will not select this option due to the availability of compliant adhesives, especially those that will meet the RACT standards, and due to the high cost of installing and operating the control equipment. A cost estimate is presented here for comparative purposes.

In developing Rule 1168 and Rule 1136 (Wood Products Coatings), the South Coast AQMD provided cost estimates for add-on control equipment. The South Coast AQMD estimated the cost of installing and operating a carbon adsorption unit and an afterburner unit to be about \$30,000 per year (South Coast AQMD, 1989, pp. F1-F4) and \$380,000 per year (South Coast AQMD, 1988, pp. E3-E6, E23), respectively (in 1995 dollars).

**C. Cost-effectiveness**

As mentioned, the cost of complying with the determination reflects the cost of using alternative formulations of low-VOC or water-based adhesives, sealants, and cleanup products. Ventura County APCD staff determined that the cost-effectiveness of their adhesives rule ranges from a savings of \$0.53 per pound to a cost of \$1.16 per pound of VOC reduced (Ventura County APCD, 1996, p. 6). At a cost-effectiveness of \$4.50 to \$55.00 per pound of VOC reduced, the use of add-on control equipment to comply with the requirements of the determination will not be cost-effective for most sources, especially small businesses.

## **V. IMPACTS**

### **A. Economic Impacts**

Staff does not expect any negative economic impacts on the state's economy due to the adoption and implementation of this determination. As discussed, most adhesive and sealant manufacturers have already reformulated their products to comply with existing district adhesives and sealants rules. Since the manufacturers have absorbed the costs of reformulation, sharp increases in adhesive and sealant prices are not likely, especially for products required to meet the RACT VOC limits. Although water-borne products cost slightly more than solvent-borne products, water-borne products typically have a lower cost per square foot of coverage.

Based on surveys of retail outlets, the availability of compliant adhesives and sealants is adequate for most applications. The availability of specialty adhesives and sealants has increased as more districts have adopted and implemented adhesives and sealants rules and as enforcement has become more effective. The impact on consumers using products manufactured with adhesives and sealants will also be minimal. According to Bay Area AQMD staff, a number of businesses have indicated that they will try to absorb any increase in cost (Bay Area AQMD, 1992, p. 8).

### **B. Emission Reductions**

The ARB emission inventory estimates total industrial adhesive and sealant emissions in California to be about 45 tons per day (t/d). Solvent-based adhesive and sealant emissions are estimated to be about 35 t/d of VOC, and water-based adhesive and sealant emissions are about 10 t/d of VOC. The RACT/BARCT determination's focus is only on emissions from solvent-based adhesives and sealants, since their emission reduction potential is much greater than that of water-based products.

The emission reductions from adhesives and sealants would be achieved mainly due to the switch from high-VOC to low-VOC products rather than from the use of costly add-on control devices. Based on calculations by Ventura County APCD staff (Ventura Co. APCD, 1993, p. 9), the Committee estimate that emission reductions achieved by statewide compliance with the VOC limits in the RACT/BARCT determination will range from approximately 29 to 35 t/d. Of the reformulation options, the greatest emission reductions would be achieved by switching to 100 percent solid adhesives and sealants, followed by switching to water-based products. However, these options may not always be practical or possible. Emission reductions at the lower end of the range would be achieved by using low-VOC adhesives and sealants. The majority of the emission reductions will be achieved by existing district rules.

### **C. Socioeconomic Impacts**

The RACT/BARCT determination would directly affect facilities that use or sell adhesives. These facilities include wood product manufacturers, upholstery shops, adhesives

#### RACT/BARCT Determination for Adhesives and Sealants

retailers, and architectural trades, such as building construction, floor covering installation, and roof repair. However, the determination is not expected to have a negative impact on employment or the economy. Most affected facilities in California are already subject to existing district adhesives and sealants rules. In addition, the costs associated with the determination should not create significant financial impacts for the affected facilities. Capital expenditures exceeding \$5,000 are not expected. Most businesses can comply with the limits by using complying adhesives, which obviates the need for add-on controls.

#### **D. Other Impacts**

The Committee have identified no adverse environmental impacts associated with implementation of this determination with respect to global warming, plant and animal life, noise levels, light and glare, land use, and natural resources.



## VI. REFERENCES

1. Air Resources Board, *California Clean Air Act Guidance for Determination of Reasonably Available Control Technology and Best Available Retrofit Control Technology*, Sacramento, California, March 1990.
2. Air Resources Board, *ARB-CAPCOA Suggested Control Measure for Architectural Coatings*, Sacramento, California, July 1989.
3. Air Resources Board, *Determination of Reasonably Available Control Technology for Metal Parts and Products Coating Operations*, Sacramento, California, December 10, 1992.
4. Bay Area Air Quality Management District, *Staff Report - Regulation 8, Rule 51, Adhesive and Sealant Products*, San Francisco, California, October 1, 1992.
5. South Coast Air Quality Management District, *Staff Report - Rule 1168, Control of Volatile Organic Compound Emissions from Adhesive Application*, El Monte, California, March 1989.
6. South Coast Air Quality Management District, *Staff Report - Rule 1136, Wood Products Coatings*, El Monte, California, April 19, 1988.
7. Ventura County Air Pollution Control District, *Staff Report - Rule 74.20, Adhesives and Sealants*, Ventura, California, June 8, 1993.
8. Ventura County Air Pollution Control District, *Staff Report - Proposed Amendments to Rule 74.20, Adhesives and Sealants*, Ventura, California, October 16, 1996.
9. Bay Area Air Quality Management District, *Staff Report - Regulation 8, Rule 51, Adhesive and Sealant Products*, San Francisco, California, December 1997.
10. South Coast Air Quality Management District, *Draft Staff Report - Rule 1168, Control of Volatile Organic Compound Emissions from Adhesive Application*, December 12, 1997.

RACT/BARCT Determination for Adhesives and Sealants

**APPENDIX A**

**RACT/BARCT DETERMINATION FOR ADHESIVES AND SEALANTS**

## **RACT/BARCT DETERMINATION FOR ADHESIVES AND SEALANTS**

### **I. APPLICABILITY**

This determination (rule) is applicable to any person who supplies, sells, offers for sale, or uses adhesives, sealants, or adhesive or sealant primers.<sup>4</sup> All provisions in this determination (rule), unless otherwise indicated, shall become effective on (upon adoption date). All provisions are RACT unless otherwise specified as BARCT.

### **II. DEFINITIONS**

For the purpose of this determination (rule), the following definitions apply:

11. **ACRYLONITRILE-BUTADIENE-STYRENE (ABS) WELDING ADHESIVE** is any adhesive intended by the manufacturer to weld acrylonitrile-butadiene-styrene (ABS) pipe. ABS pipe is made by reacting monomers of acrylonitrile, butadiene, and styrene and is normally identified with an ABS marking.
- B. **ADHESIVE** is any substance that is used to bond one surface to another surface by attachment.
- C. **ADHESIVE PRIMER** is any product intended by the manufacturer to be applied to a substrate, prior to the application of an adhesive, to provide a bonding surface.
- D. **AEROSOL ADHESIVE** means an adhesive packaged as an aerosol product in which the spray mechanism is permanently housed in a nonrefillable can designed for hand-held application without the need for ancillary hoses or spray equipment.
- E. **ARCHITECTURAL SEALANT/PRIMER** is any sealant or sealant primer intended by the manufacturer to be applied to stationary structures, including mobile homes, and their appurtenances. Appurtenances to an architectural structure include, but are not limited to: hand railings, cabinets, bathroom and kitchen fixtures, fences, rain gutters and downspouts, and windows.
- F. **AUTOMOTIVE GLASS ADHESIVE PRIMER** is any adhesive primer intended by the manufacturer to be applied to automotive glass prior to installation with an adhesive/sealant. This primer improves adhesion to the pinch weld and blocks ultraviolet light.

<sup>4</sup> Adoption of the sales prohibition is at the discretion of the District.

- G. CERAMIC TILE INSTALLATION ADHESIVE is any adhesive intended by the manufacturer for the installation of ceramic tiles.
- H. CHLORINATED POLYVINYL CHLORIDE (CPVC) WELDING ADHESIVE is any adhesive intended by the manufacturer for the welding of CPVC plastic pipe. CPVC plastic is a polymer of the monomer that contains 67 percent chlorine and is normally identified with a CPVC marking.
- I. COMPUTER DISKETTE JACKET MANUFACTURING ADHESIVE is any adhesive intended by the manufacturer to glue the fold-over flaps to the body of a vinyl computer diskette jacket.
- J. CONTACT BOND ADHESIVE is any adhesive intended by the manufacturer to adhere to itself instantaneously upon contact. The adhesive is applied to both adherends and allowed to become dry, which develops a bond when the adherends are brought together without sustained pressure.
- K. CONTACT BOND ADHESIVE-SPECIAL SUBSTRATES is any contact adhesive that is intended by the manufacturer to be used for the bonding of nonporous substrates to each other, the bonding of decorative laminate in postforming application, or for the bonding of decorative laminate to metal, melamine-covered board, or curved surfaces, or when used to bond any substrate to metal, rubber, rigid plastic, or wood veneer not exceeding 1/16" in thickness.
- L. COVE BASE INSTALLATION ADHESIVE is any adhesive intended by the manufacturer for the installation of cove base (or wall base), which is generally made of vinyl or rubber, on a wall or vertical surface at floor level.
- M. CYANOACRYLATE ADHESIVE is an adhesive with a cyanoacrylate content of at least 95 percent by weight.
- N. DRY WALL INSTALLATION is the installation of gypsum dry wall to studs or solid surfaces using an adhesive formulated for that purpose.
- O. EXEMPT COMPOUND is any of the following compounds: carbon monoxide, carbon dioxide, carbonic acid, metallic carbides, metallic carbonates, ammonium carbonate, methane, methylene chloride (dichloromethane), 1,1,1-trichloroethane (methyl chloroform), trichlorofluoromethane (CFC-11), dichlorodifluoromethane (CFC-12), 1,1,2-trichloro- 1,2,2-trifluoroethane (CFC-113), 1,2-dichloro-1,1,2,2-tetrafluoroethane (CFC-114), chloropentafluoroethane (CFC-115), chloro-

RACT/BARCT Determination for Adhesives and Sealants

difluoromethane (HCFC-22), 1,1,1-trifluoro-2,2-dichloroethane (HCFC-123), 2-chloro-1,1,1,2-tetrafluoroethane (HCFC-124), 1,1-dichloro-1-fluoroethane (HCFC-141b), 1-chloro-1,1-difluoroethane (HCFC-142b), trifluoromethane (HFC-23), pentafluoroethane (HFC-125), 1,1,2,2-tetrafluoroethane (HFC-134), 1,1,1,2-tetrafluoroethane (HFC-134a), 1,1,1-trifluoroethane (HFC-143a), 1,1-difluoroethane (HFC-152a), cyclic, branched, or linear completely methylated siloxanes, acetone, ethane, parachlorobenzotrifluoride (1-chloro-4-trifluoro-methylbenzene), and the following classes of perfluorocarbons: (A) cyclic, branched, or linear, completely fluorinated alkanes; (B) cyclic, branched, or linear, completely fluorinated ethers with no unsaturations; (C) cyclic, branched, or linear, completely fluorinated tertiary amines with no unsaturations; and (D) sulfur- containing perfluorocarbons with no unsaturations and with the sulfur bonds to carbon and fluorine.

P. FLEXIBLE VINYL is nonrigid polyvinyl chloride plastic with at least five percent, by weight, of plasticizer content. A plasticizer is a material, such as a high boiling point organic solvent, that is incorporated into an adhesive to increase its flexibility, workability, or distensibility, and may be determined using ASTM Method E260-91 or from product formulation data.

Q. FIBERGLASS is fine filaments of glass.

R. GRAMS OF VOC PER LITER OF ADHESIVE, LESS WATER AND LESS EXEMPT COMPOUNDS is the weight of VOC per combined volume of VOC and adhesive solids, and can be calculated by the following equation:

Where:  $W_s$  = weight of volatile compounds, in grams

$W_w$  = weight of water, in grams

$W_e$  = weight of exempt compounds, in grams

$V_m$  = volume of material, in liters

$V_w$  = volume of water, in liters

$V_e$  = volume of exempt compounds, in liters

S. GRAMS OF VOC PER LITER OF MATERIAL is the weight of VOC per volume of material and can be calculated by the following equation:

Where:  $W_s$  = weight of volatile compounds, in grams

$W_w$  = weight of water, in grams

$W_e$  = weight of exempt compounds, in grams

$V_m$  = volume of material, in liters

T. INDOOR FLOOR COVERING INSTALLATION ADHESIVE is any adhesive intended by the manufacturer for the installation of wood flooring, carpet, resilient tile, vinyl tile, vinyl backed carpet, resilient sheet and roll, or artificial grass. Ceramic tile installation and the installation of perimeter bonded sheet flooring with vinyl backing onto a non-porous substrate, such as flexible vinyl are excluded from this category.

U. LAMINATE is a product made by bonding together two or more layers of material.

V. LOW-SOLIDS ADHESIVE, SEALANT, OR PRIMER is any product that contains 120 grams or less of solids per liter of material.

W. MARINE DECK SEALANT/SEALANT PRIMER is any sealant or sealant primer intended by the manufacturer to be applied to wooden marine decks.

X. METAL TO URETHANE/RUBBER MOLDING OR CASTING ADHESIVE is any adhesive intended by the manufacturer to bond metal to high density or elastomeric urethane or molded rubber materials, in heater molding or casting processes, to fabricate products such as rollers for computer printers or other paper handling equipment.

Y. MULTIPURPOSE CONSTRUCTION ADHESIVE is any adhesive intended by the manufacturer for the installation or repair of various construction materials, including but not limited to drywall, subfloor, panel, fiberglass reinforced plastic (FRP), ceiling tile, and acoustical tile.

Z. NONMEMBRANE ROOF INSTALLATION/REPAIR ADHESIVE is any adhesive intended by the manufacturer for the installation or repair of nonmembrane roofs and that is not intended for the installation of prefabricated single-ply flexible roofing membrane. This category includes plastic or asphalt roof cement, asphalt roof coatings, and cold application cement.

AA. OUTDOOR FLOOR COVERING INSTALLATION ADHESIVE is any adhesive intended by the manufacturer for the installation of floor covering that is not in an enclosure and is exposed to ambient weather conditions during normal use.

AB. PANEL INSTALLATION is the installation of plywood, pre-decorated hardboard (or tileboard), fiberglass reinforced plastic, and similar pre-decorated or non-decorated panels to studs or solid surfaces using an adhesive formulated for that purpose.

AC. PERCENT VOC BY WEIGHT is the ratio of the weight of the VOC to the weight of the material, expressed as a percentage of VOC by weight. The percent VOC by weight can be calculated as follows:

$$\text{Where: } W_v = \text{Weight of VOCs in grams} \\ W = \text{Weight of material in grams}$$

AD. PERIMETER BONDED SHEET FLOORING INSTALLATION is the installation of sheet flooring with vinyl backing onto a nonporous substrate using an adhesive design to be applied only to a strip of up to four inches wide around the perimeter of the sheet flooring.

AE. PLASTIC CEMENT WELDING ADHESIVE PRIMER is any primer intended by the manufacturer to prepare plastic substrates prior to bonding or welding.

AF. PLASTIC FOAM is a foam constructed of plastics.

AG. PLASTICS are various synthetic materials chemically formed by the polymerization of organic (carbon-based) substances.

AH. POLYVINYL CHLORIDE (PVC) WELDING ADHESIVE is any adhesive intended by the manufacturer for the welding of PVC plastic pipe. PVC plastic is a polymer of the chlorinated vinyl monomer that contains 57 percent chlorine and which is normally identified with a PVC marking.

AI. POROUS MATERIAL is a substance that has tiny openings, often microscopic, in which fluids may be absorbed or discharged. Such materials include but are not limited to wood, paper, and corrugated paperboard.

AJ. PROPELLANT is a fluid under pressure that expels the contents of a container when a valve is opened.

AK. ROADWAY SEALANT is any sealant intended by the manufacturer to be applied to public streets, highways, and other surfaces, including but not limited to curbs, berms, driveways, and parking lots.

RACT/BARCT Determination for Adhesives and Sealants

AL. RUBBER includes any natural or manmade rubber substrate, including but not limited to: styrene-butadiene rubber (SBR), polychloroprene (neoprene), butyl rubber, nitrile rubber, chlorosulfonated polyethylene (CSM), and ethylene propylene diene terpolymer (EPDM).

AM. SEALANT PRIMER is any product intended by the manufacturer to be applied to a substrate, prior to the application of a sealant, to enhance the bonding surface.

AN. SEALANT is any material with adhesive properties that is formulated primarily to fill, seal, waterproof, or weatherproof gaps or joints between two surfaces. Sealants include sealant primers and caulks.

AO. SHEET-APPLIED RUBBER INSTALLATION is sheet rubber lining applied to the interior walls of stationary tanks and rail cars.

AP. SINGLE-PLY ROOF MEMBRANE is single sheets of rubber, normally EPDM (ethylene-propylene diene terpolymer), that are applied in a single layer to a building roof (normally a flat roof).

AQ. SINGLE-PLY ROOF MEMBRANE INSTALLATION/REPAIR ADHESIVE is any adhesive intended by the manufacturer for the installation or repair of single-ply roof membrane. Installation includes, as a minimum, attaching the edge of the membrane to the edge of the roof and applying flashings to vents, pipes, and ducts that protrude through the membrane. Repair includes gluing the edges of tears together, attaching a patch over a hole, and reapplying flashings to vents, pipes, or ducts installed through the membrane.

AR. SINGLE-PLY ROOF MEMBRANE ADHESIVE PRIMER is any primer intended by the manufacturer to clean and promote adhesion of the single-ply roof membrane seams or splices prior to bonding.

AS. SINGLE-PLY ROOF MEMBRANE SEALANT is any sealant intended by the manufacturer to be applied to single-ply roof membrane.

AT. STRUCTURAL GLAZING ADHESIVE is any adhesive intended by the manufacturer to adhere glass, ceramic, metal, stone, or composite panels to exterior building frames.

AU. SUBFLOOR INSTALLATION is the installation of subflooring material over floor joists, including the construction of any load bearing joists. Subflooring is covered by a finish surface material.

AV. SURFACE PREPARATION SOLVENT is a solvent used in the cleaning of a substrate to remove dirt, oil, and other contaminants. This surface cleaning is typically done prior to the application of primers, adhesives, or sealants.

AW. THIN METAL LAMINATING ADHESIVE is any adhesive intended by the



RACT/BARCT Determination for Adhesives and Sealants

manufacturer to bond multiple layers of metal to metal or metal to plastic in the production of electronic or magnetic components in which the thickness of the bond line(s) is less than 0.25 mils.

AX. TIRE REPAIR is the expanding of a hole, tear, fissure, or blemish in a tire casing by grinding or gouging, applying adhesive, and filling the hole or crevice with rubber.

AY. TIRE RETREAD ADHESIVE is any adhesive intended by the manufacturer to be applied to the back of precure tread rubber and to the casing and cushion rubber. It may also be used to seal buffed tire casings to prevent oxidation while the tire is being prepared for a new tread.

AZ. TRAFFIC MARKING TAPE is preformed reflective film intended by the manufacturer to be applied to public streets, highways, and other surfaces, including but not limited to curbs, berms, driveways, and parking lots.

BA. TRAFFIC MARKING TAPE ADHESIVE PRIMER is any primer intended by the manufacturer to be applied to surfaces prior to installation of traffic marking tape.

BB. VOLATILE ORGANIC COMPOUND (VOC) is any compound containing at least one atom of carbon, excluding exempt compounds (see definition M).

BC. WATERPROOF RESORCINOL GLUE is a two-part resorcinol-resin-based adhesive designed for applications where the bond line must be resistant to conditions of continuous immersion in fresh or salt water.

**III. REQUIREMENTS**

A. Standards: A person shall not apply adhesives, sealants, or adhesive or sealant primers that have a VOC content (gram/liter [g/l], less water and exempt compounds) in excess of the following limits (for low-solids adhesives, sealants, or primers, the VOC content is based on a g/l of material basis):

	<u>VOC LIMITS</u> (g/l)	<u>BARCT</u> <u>VOC LIMITS</u> (Effective 1/1/2000) (g/l)
(1) Adhesives:		
ABS welding	400	
Ceramic tile installation	130	
Computer diskette jacket manufacturing	850	
Contact Bond	540	250
Contact Bond-Specialty Substrates	540	400
		250* (effective 1/1/2001)
Cove base installation	150	
CPVC welding	490	
Indoor floor covering installation	150	
Metal to urethane/rubber molding or casting	850	250*
Multipurpose construction	200	
Nonmembrane roof installation/repair	300	
Other plastic cement welding	510	
Outdoor floor covering installation	250	
PVC welding	510	
Single-ply roof membrane installation/repair	250	
Structural glazing	100	
Thin metal laminating	780	
Tire retread	100	
Perimeter bonded sheet vinyl flooring installation	660	
Waterproof Resorcinol Glue	170	
Sheet-Applied Rubber Installation	850	250*

\* These are technology forcing standards. Technology forcing standards are standards which may not be met at the present time and have future effective dates. It is anticipated that adhesives technology will advance sufficiently to meet these standards by the time these standards go into effect.

RACT/BARCT Determination for Adhesives and Sealants

	<u>VOC LIMITS</u>
	(g/l)
(2) Sealants:	
Architectural	250
Marine deck	760
Nonmembrane roof installation/repair	300
Roadway	250
Single-ply roof membrane	450
Other	420
(3) Adhesive Primers:	
Automotive glass	700
Plastic cement welding	650
Single-ply roof membrane	250
Traffic marking tape	150
Other	250
(4) Sealant Primers:	
Architectural	
- Non porous	250
- Porous	775
Marine deck	760
Other	750
(5) Adhesives Application Onto Substrate: <sup>5, 6</sup>	
Flexible vinyl	250
Fiberglass	200
Metal	30
Porous material	120
Rubber	250
Other substrates	250

<sup>5</sup> If an adhesive is used to bond dissimilar substrates together, the applicable substrate category with the highest VOC content shall be the limit for that operation.

<sup>6</sup> If an operator uses an adhesive or sealant subject to section III.A.(1), III.A.(2), III.A.(3), or section III.A.(4), the requirement in that section is applicable rather than that in section III.A.(5).

RACT/BARCT Determination for Adhesives and Sealants

B. Aerosol Adhesives: A person shall not use any aerosol adhesive unless the VOC content, including the propellant, does not exceed 75 percent by weight. Effective 1/1/2002, the VOC content of aerosol adhesives shall not exceed 25 percent by weight.<sup>7</sup>

C. Cleanup Solvent:

(1) No person shall use materials containing VOC for the removal of adhesives, sealants, or adhesive or sealant primers from surfaces, other than spray application equipment, unless the composite vapor pressure of the solvent used is less than 45 mm of Hg at 20°C.

(2) Spray application equipment: Either one of the following shall be used for cleaning, flushing or soaking of filters, flushing lines, pipes, pumps, and other parts of the application equipment:

(a) An enclosed cleaning system, or an equivalent cleaning system as determined by the test method referenced in section VI.I, or

(b) A solvent with a VOC content of 70 grams of VOC per liter of material, or less. Parts containing dried adhesive may be soaked in an organic solvent as long as the composite vapor pressure, excluding water and exempt compounds, of the solvent is 9.5 mm of Hg at 20°C or less and is kept in a closed container, which shall be closed except when depositing or removing parts or materials from the container.

D. Surface Preparation Solvent: No person shall use materials containing VOCs for surface preparation, except for single-ply roofing, unless the VOC content of the solvent is less than 70 g/l. The composite vapor pressure, excluding water and exempt compounds, of the surface preparation solvent used for single-ply roofing shall not exceed 45 mm of Hg at 20°C effective (date of adoption).

E. A person may comply with the provisions of subsections III.A, B, C, and D by using approved add-on air pollution control equipment, provided that:

(1) The VOC emissions from such operations and/or materials are reduced by at least 85 percent overall capture and destruction efficiency, by weight,

(2) Combustion temperature is continuously monitored when operating a thermal incinerator,

(3) Inlet and exhaust gas temperatures are continuously monitored when operating a catalytic incinerator,

(4) Control device efficiency is continuously monitored when operating a carbon adsorber or control device other than a thermal or catalytic incinerator, and

<sup>7</sup> The ARB will conduct a technology assessment by 7/1/2000 to determine the feasibility of the 25 percent VOC level to be implemented on 1/1/2002.

RACT/BARCT Determination for Adhesives and Sealants

(5) Written approval for such equipment, in the form of an Authority to Construct and a Permit to Operate, is received from the Executive Officer.

F. Storage of VOC Containing Materials: All VOC containing materials, including VOC-laden cloth or paper used in stripping cured adhesives, shall be stored or disposed in non-absorbent containers, which shall be closed except when depositing or removing materials from the container.

G. Prohibition of Sales:<sup>8</sup>

(1) Except as provided in subsections III.G.(3) and III.G.(4) after the specified effective dates, no person shall supply, sell, or offer for sale any adhesive, sealant, or adhesive or sealant primer which, at the time of sale, exceeds the corresponding VOC limit listed in subsections III.A.(1), (2), (3), or (4), and is defined under a product category in those subsections. This provision only applies to products that are supplied to or sold to persons within the District.

(2) Except as provided in subsections III.G.(3) and III.G.(4), no person shall supply, sell, or offer for sale, any aerosol adhesive which, at the time of sale, exceeds the VOC limits listed in subsection III.B. after the specified effective dates.

(3) The sales prohibition in subsections III.G.(1) and III.G.(2) shall not apply to any supplier or seller of any adhesive, sealant, or adhesive or sealant primer as follows:

(a) Any adhesive shipped outside of the District for use outside of the District.

(b) The sale of adhesives to a user who has installed a District permitted VOC add-on control device.

(4) The sales prohibition in subsections III.G.(1) and III.G.(2) shall not apply to any manufacturer of any adhesive, sealant, or adhesive or sealant primer if the manufacturer has provided the maximum VOC content per subsection III.H and if:

<sup>8</sup> Adoption of section III.G is at the discretion of the District.

RACT/BARCT Determination for Adhesives and Sealants

(a) The product was not sold directly to a user or a sales outlet located in the District, or

(b) The product was sold to an independent distributor that is not a subsidiary of, or under the direct control of, the manufacturer.

(5) The sales prohibition in subsections III.G.(1) and III.G.(2) shall not apply to the sale of any adhesive, sealant, or aerosol adhesive, except plastic cement welding adhesives, if:

(a) The product is sold in any container(s) having a capacity of 16 fluid ounces or less (net volume) or one pound or less (net weight); and

(b) The total net weight or volume of two or more containers packaged together must be equal to or less than one pound or 16 fluid ounces, respectively, to qualify for this exemption.

H. Compliance Statement Requirement: The manufacturer of any adhesive, sealant, or adhesive or sealant primer subject to this determination shall display the maximum VOC content as supplied, determined by the appropriate test method, on labels or containers. This designation shall display recommendations regarding thinning, reducing, or mixing with any other VOC containing material. This information shall include the maximum VOC content on an as-applied basis when used in accordance with the manufacturer's recommendations.

I. Prohibition of Specification: No person shall solicit, require for use, or specify the application of any adhesive, primer, or sealant if such use or application results in a violation of the provisions of this determination (rule). This prohibition shall apply to all written or oral contracts.

#### **IV. EXEMPTIONS**

A. The provisions of this determination (rule) shall not apply to the following:

(1) Adhesives used in tire repair operations, provided a label on the adhesive used states "For Tire Repair Only."

(2) Adhesives used in the assembly and manufacturing of undersea-based weapon systems.

(3) Adhesives, sealants, adhesive primers or sealant primers being tested or evaluated in any research and development, quality assurance, or analytical laboratory, provided that the following records are maintained and made available to District personnel for a period of at least two years:

(a) A list of all such materials used, which at a minimum includes the manufacturer's identification, the product category of the material or type of application, and the

RACT/BARCT Determination for Adhesives and Sealants  
VOC content of each material.

(b) Such records shall be retained in accordance with the provisions of section V of this determination (rule).

(4) Solvent welding operations used in the manufacturing of medical devices.

(5) Plaque laminating operations where adhesives are used to bond a clear, polyester acetate laminate to wood with lamination equipment installed prior to July 1, 1992. Any person seeking to claim this exemption shall notify the Executive Officer in writing that a complying adhesive is not available.

(6) Adhesives and sealants that are regulated by other District rules.

(7) Adhesives and sealants that contain less than 20 grams of VOC per liter of adhesive or sealant, less water and less exempt compounds, as applied.

(8) Adhesives that are subject to Title 17, California Code of Regulations, sections 94507-94517 (Consumer Products Regulations).<sup>9</sup>

(9) Cyanoacrylate adhesives.

(10) Adhesives, sealants, or adhesive or sealant primers, which are sold or supplied by the manufacturer or suppliers in containers of 16 fluid ounces or less, except plastic cement welding adhesives.

(11)\_\_\_[Reserved for specific exemptions determined by the APCO to be technologically infeasible or not cost-effective to retrofit].

B. The provisions of this determination (rule), except Section III.G (Prohibition of Sales), shall not apply if the total VOC emissions from all adhesives, sealants, adhesive primers and sealant primers applied at the stationary source<sup>10</sup> are less than 200 lb per calendar year (or an equivalent volume). Any person claiming this exemption shall record and maintain monthly operational records that can substantiate this claim.<sup>11</sup>

C. The provisions of section III.A, III.B, and III.C shall not apply to the use of any adhesive, sealant, or adhesive or sealant primer, or clean up solvents provided the total volume of noncomplying adhesives, sealants, primers, and cleanup solvents applied facility-wide does not exceed 55 gallons per calendar year. Any person seeking to claim this exemption shall notify the Executive Officer in writing, for each formulation, that a complying adhesive, sealant, primer, or

<sup>9</sup> Adoption of section IV.A.(8) is at the discretion of the District. If the District does not adopt the Prohibition of Sales (III.G), this exemption should be adopted.

<sup>10</sup> Stationary Source includes both point and area sources

<sup>11</sup> Adoption of section IV.B is at the discretion of the District.

RACT/BARCT Determination for Adhesives and Sealants

solvent is not available. Any person claiming this exemption shall record and maintain monthly operational records that can substantiate this claim.<sup>12</sup>

## **V. ADMINISTRATIVE REQUIREMENTS**

A. Recordkeeping - Any person subject to this determination (rule) shall:

(1) Maintain a current list of each adhesive, sealant, adhesive or sealant primer, and solvent in use and in storage. The file shall provide all of the data necessary to evaluate compliance and shall include, but not be limited to, the following information, as applicable:

(a) A data sheet or material list giving the material name, manufacturer identification, and material application.

(b) Any catalysts, reducers, or other components used and the mix ratio.

(c) The applicable VOC content limit or vapor pressure limit from section III and the actual VOC content, as applied, or vapor pressure of the adhesive, sealant, primer, or solvent.

(2) Maintain records of the monthly volume of each adhesive, sealant, primer, or solvent used.

(3) When compliance is achieved through the use of add-on control equipment, maintain records on a daily basis of key operating parameters for the emission control equipment, including, but not limited to:

(a) Hours of operation

(b) Routine and nonroutine maintenance

(c) The applicable information specified in section III.E.

(d) The daily volume of each noncompliant adhesive, sealant, primer, or solvent used.

(4) All records shall be maintained for at least two (2) years and shall be available for inspection.

## **VI. TEST METHODS**

A. The VOC and solids content of all nonaerosol adhesives, adhesive primers, and

<sup>12</sup> Adoption of section IV.C is at the discretion of the District. If the District adopts the Prohibition of Sales (III.G), this exemption should only be granted for the use of adhesives subject to section III.A.(5).



RACT/BARCT Determination for Adhesives and Sealants

cleaning solvents, except as specified in section VI.D., shall be determined using U.S. EPA Reference Method 24 (40 CFR Part 60, Appendix A) or South Coast AQMD Method 304.

B. Exempt organic compounds shall be determined using ASTM D4457-85. For exempt compounds where no reference test method is available, a facility requesting the exemption shall provide appropriate test methods approved by the Executive Officer and approvable by the U.S. EPA.

C. The VOC content of aerosol adhesives shall be determined using South Coast Test Method 305 or ARB Method 310<sup>13</sup>. The VOC content of aerosol adhesive primers shall be determined using ARB Method 310<sup>14</sup> or South Coast AQMD Method 305 for Aerosol Coatings.

D. The VOC content of any plastic welding cement adhesive or primer shall be determined using South Coast AQMD Method 316A.

E. The composite vapor pressure of organic compounds in cleaning materials shall be determined by quantifying the amount of each compound in the blend using gas chromatographic analysis (ASTM E 260-91) for organics and ASTM D3792-79 for water content, as applicable, and the following equation:

Where:

$P_{p_c}$  = VOC composite partial pressure at 20°C, in mm Hg.

$W_i$  = Weight of the "i"th VOC compound, in grams, as determined by ASTM E 260-91.

$W_w$  = Weight of water, in grams as determined by ASTM D 3792-86.

$W_e$  = Weight of the "i"th exempt compound, in grams, as determined by ASTM E 260-91.

$MW_i$  = Molecular weight of the "i"th VOC compound, in grams per g-mole, as given in chemical reference literature.

$MW_w$  = Molecular weight of water, 18 grams per g-mole.

$MW_e$  = Molecular weight of the "i"th exempt compound, in grams per g-mole, as given in chemical reference literature.

$V_{p_i}$  = Vapor pressure of the "i"th VOC compound at 20°C, in mm Hg, as determined by VI.F of this determination.

F. The vapor pressure of each single component compound may be determined from ASTM D2879-86 or may be obtained from a published source approved by the Executive Officer, such as the sources referenced in 40 CFR 52.741, or the most current edition of a published source, including, but not limited to: a) The Vapor Pressure of Pure Substances, Boublik, Fried, and Hala; Elsevier Scientific Publishing Company, New York; b) Perry's Chemical Engineer's Handbook, McGraw-Hill Book Company; c) CRC Handbook of Chemistry

<sup>13</sup>See footnote 14.

<sup>14</sup>EPA is currently reviewing ARB Test Method 310 but has not yet approved it.

RACT/BARCT Determination for Adhesives and Sealants

and Physics, Chemical Rubber Publishing Company; and d) Lange's Handbook of Chemistry, John Dean, editor, McGraw-Hill Book Company.

G. The measurement of capture efficiency of an emission control system shall be conducted and reported in accordance with the recently approved U.S. EPA Technical Document "*Guidelines for Determining Capture Efficiency*," issued January 9, 1995, or a district capture efficiency determination method approved by the U.S. EPA.

H. The measurement of control efficiency shall be in accordance with U.S. EPA Methods 25, 25A, 25B, or ARB Method 100.

I. The active and passive solvent losses from spray gun cleaning systems shall be determined using South Coast AQMD's "General Test Method for Determining Solvent Losses from Spray Gun Cleaning Systems," dated October 3, 1989. The test solvent for this determination shall be any lacquer thinner with a minimum vapor pressure of 105 mm of Hg at 20°C, and the minimum test temperature shall be 15°C.

RACT/BARCT Determination for Adhesives and Sealants

**APPENDIX B**

**DISTRICTS WITH ADOPTED ADHESIVES AND SEALANTS RULES**

RACT/BARCT Determination for Adhesives and Sealants

**DISTRICTS WITH ADOPTED OR PROPOSED  
ADHESIVES AND SEALANTS RULES**

(as of February 1998)

**Bay Area Air Quality Management District:**

Regulation 8, Rule 52 (Adopted November 18, 1992, latest revision January 7, 1998)

**El Dorado County Air Pollution Control District:**

Rule 236 (Adopted July 25, 1995)

**Placer County Air Pollution Control District:**

Rule 235 (Adopted June 8, 1995)

**Sacramento Metropolitan Air Quality Management District:**

Rule 460 (Adopted January 9, 1997)

**San Joaquin Valley Unified Air Quality Management District:**

Rule 4653 (Adopted March 17, 1994, currently being revised)

**South Coast Air Quality Management District:**

Rule 1168 (Adopted April 7, 1989, currently being revised)

**Ventura County Air Pollution Control District:**

Rule 74.20 (Adopted June 8, 1993)

**Yolo-Solano Air Quality Management District:**

Rule 2.33 (Adopted September 14, 1994)

**San Diego County Air Pollution Control District:**

Rule currently under development

**APPENDIX C**  
**COMMENTS AND RESPONSES**

**SUMMARY OF COMMENTS ON THE  
RACT/BARCT DETERMINATION FOR ADHESIVES AND SEALANTS**

**I. Comments submitted in response to August 19, 1993 mailout of draft Table of Standards and to materials presented at workshops held on September 30 and October 5, 1993.**

Comment 1: Air Quality Consultants, Inc. requested that an exemption be granted for nitrocellulose-base adhesive or that a higher VOC limit of 800 g/l be specified for this category. This adhesive, formulated in solution with acetone or in an alcohol/ether mixture, bonds by fusion welding and is used in the manufacture of combustible cartridge cases for military munitions. The extent to which the acetone solvent evaporates after application of the adhesive has not been determined. This is because there are very few sources and the flammable/explosive nature of the product makes it costly and dangerously difficult to design an appropriate test.

Response: There is only one known source that uses nitrocellulose-based adhesives in California. It is not practical to exempt this product statewide because of such limited and specific usage. We recognize that for certain applications, complying products may not be available. The districts should consider such applications on a case-by-case basis. We also note that acetone is now exempt from the definition of VOC.

Comment 2: An industry representative stated that a number of solvents contain a significant amount of combined oxygen in their formulation (e.g., 50 percent oxygen in methyl alcohol, 33 percent oxygen in ethyl alcohol, 20 percent oxygen in MEK, etc.). It was proposed that in the emission inventory calculation, the combined oxygen should be subtracted from the total solvent weight since oxygen is not an oxidant precursor. Inclusion of the combined oxygen in the emission inventory calculation would lead to an over-estimation of the actual emissions attributed to these solvents.

Response: Oxygen is a component of the solvent molecule. Because the entire molecule is considered an ozone precursor, rather than the individual atoms making up the molecule, we believe that combined oxygen should not be subtracted from the total solvent weight.

Comment 3: Courtaulds Aerospace proposed adding a new category "sealant primer" with a VOC limit of 700 g/l.

RACT/BARCT Determination for Adhesives and Sealants

Response: We have added the proposed category with a VOC limit of 750 g/l to section III.A.(4).

Comment 4: Courtaulds Aerospace also proposed changing the VOC limit for adhesive primer from 250 g/l to 450 g/l, since the former limit is not practical.

Response: We believe that the 250 g/l requirement is achievable based on discussions with industry. We recognize that for some special applications, complying products may not be available. The districts should consider such applications on a case-by-case basis.

Comment 5: Courtaulds Aerospace requested that industry be given the opportunity to test and comment on the feasibility of South Coast AQMD Method 316A once the test method is fully developed.

Response: Industry participated in an inter laboratory study of the proposed revised South Coast AQMD Method 316A. Results of this testing were used to revise the proposed limits for ABS, PVC, and CPVC welding cements.

Comment 6: DETCO proposed adding a new category of "deck seam primer" with a VOC limit of 760 g/l. The rationale for this request stems from the limited, but indispensable, quantity of this primer used in the application of two-component polysulfide caulks on the wooden decks of marine vessels. There is no known substitute and the primer is required to comply with military specifications.

Response: We have added the category "marine deck sealant primer" with a VOC limit of 760 g/l to section III.A.(4).

Comment 7: SPRI concurred with the proposed VOC limits for adhesives, sealants, and primers used in single ply roofing. However, they recommended that periodic meetings be arranged with SPRI to assess progress made regarding VOC limits.

Response: We encourage industry to inform us of their progress toward meeting the proposed VOC limits. Periodic meetings with industry are viewed as helpful and beneficial to the rule development process.

Comment 8: ACCO Industries proposed adding a new category "thin metal laminating" with a VOC limit of 780 g/l.

Response: We have added the proposed category and VOC limit to section III.A.(1).

Comment 9: ACCO Industries proposed adding exemptions for noncomplying adhesives for low usage or for products packaged in small containers.

Response: We have added a low usage provision, which is at the discretion of the district.

RACT/BARCT Determination for Adhesives and Sealants

Section IV.C exempts usage of less than 55 gallons of noncomplying products, applied facility-wide, per calendar year.

Comment 10: IRTA requested that the ARB staff ensure that regulatory development be uniform statewide and consistent with other states.

Response: The RACT/BARCT determination is intended to assist the districts in developing regulations to attain and maintain state and federal ambient air quality standards. The RACT/BARCT process is designed to minimize variations among the districts' rule requirements. In addition, the determination is intended to promote consistency of controls throughout the state for similar emissions sources within air basins with similar air quality attainment designations.

Comment 11: IRTA also requested that the ARB staff reevaluate the proposed VOC limits, particularly for wood product adhesives, in light of the upcoming ban on ozone-depleting substances (e.g., 1,1,1-TCA). Since many adhesives are currently formulated with ozone-depleting substances to comply with existing district rules, and because there are no alternatives that can be substituted universally, higher VOC limits must be allowed until viable substitutes become available.

Response: We believe that the proposed VOC limits are appropriate. For wood product adhesives, we agree with the commenter that the originally proposed VOC limit of 30 g/l was too low. Therefore, we have included these products in the porous materials category, with a VOC limit of 150 g/l. Based on discussions with industry, we believe that viable replacements that do not contain ozone-depleting substances will be available for other adhesives. Where replacements are not available, the districts have the option to examine possible exemptions on a case-by-case basis.

Comment 12: IRTA requested that the ARB staff be attentive to the promulgation of National Emissions Standards for Hazardous Air Pollutants (NESHAPs).

Response: The ARB staff is continuing to monitor NESHAPS development.

Comment 13: IRTA requested that the ARB staff coordinate with the districts regarding RACT requirements in district SIP revisions.

Response: The ARB staff reviews new and revised district rules before submitting them to the U.S. EPA for inclusion in the district's SIP revisions. The ARB staff advises the districts on deficiencies in the rules designed to meet the SIP requirements. This RACT/BARCT determination will assist the districts in developing rules that will satisfy their necessary SIP revisions.

Comment 14: IRTA recommended that ARB staff give priority to developing a RACT/BARCT determination for wood furniture coating operations. These operations use coatings, adhesives,



RACT/BARCT Determination for Adhesives and Sealants

and cleanup solvents that would be subject to future compliance dates in district rules and to NESHAPs. These compounds are also ozone-depleting substances.

Response: The U.S. EPA has published a NESHAP and issued a Control Techniques Guideline (CTG) for wood furniture coating operations. The NESHAP and CTG appear to provide an adequate technical basis for the determination of RACT and BARCT for these sources. Therefore, developing a RACT/BARCT determination for wood furniture coating operations is not a high priority.

Comment 15: IRTA also recommended that the ARB staff investigate individual applications of adhesives and sealants thoroughly prior to specifying broad limits.

Response: We believe the current limits are appropriate for the affected products and processes. This RACT/BARCT determination is the result of numerous contacts with both the suppliers and users of adhesives. Much consideration has been given to their needs and limitations. We have also held public workshops at various stages in the development of this determination to solicit comments, concerns, and possible improvements. In addition, much of this determination is based on existing district rules. These rules were researched extensively prior to their adoption and have been subsequently revised as needed to correct deficiencies. We have worked carefully with the districts' staffs in developing this determination, using their knowledge whenever possible.

Comment 16: IRTA also recommended that the ARB staff reevaluate both the definition and VOC limits for plastic foams and porous materials to avoid ambiguity, since plastic foams are porous materials.

Response: The VOC limits for porous materials and plastic foam are the same. Thus, they were combined into one adhesive category namely porous materials.

Comment 17: IRTA questioned the accuracy of the emission inventory presented by the ARB staff on both the total emissions (110 tons per year) and the contribution of water-based adhesives (almost 50 percent). They suggested that the inventory might be 110 tons per day and the emissions from water-based adhesives are much less than 50 percent of the total.

Response: In the February 1997 draft of the RACT/BARCT determination, we used the 1994 ARB emission inventory for adhesives, which is 45 tons per day. Emissions from water-based adhesives contribute 9 tons per day, or 20 percent, to the total adhesives emission inventory.

Comment 18: The W. W. Henry Company requested that the definition of VOC incorporate vapor pressure to clearly define volatile compounds. Such an approach is already used in the ARB consumer products regulation, which exempts compounds with a vapor pressure less than 0.1 mm Hg at 20<sup>0</sup> C, or which contain more than 12 atoms of carbon.

Response: The definition of VOC in the RACT/BARCT determination is consistent with that

RACT/BARCT Determination for Adhesives and Sealants  
used in district rules.

Comment 19: The W. W. Henry Company requested that the word "panel" be deleted from the "drywall and panel installation" product category since there already is a panel adhesive definition.

Response: "Drywall installation" and "panel installation" are now defined separately within the definition of the "multipurpose architectural" category.

Comment 20: The W. W. Henry Company requested the ARB staff to include two additional categories (outdoor floor covering installation and vinyl backed floor covering installation) since these two categories are considerably different from each other and from other categories. They indicated that the South Coast AQMD rule currently provides different limits for these two product categories.

Response: We have added the category "outdoor floor covering installation" to section III.A.1. However, a category for vinyl backed floor covering products was not added because low-VOC floor covering products are available that will adhere to vinyl backed floor covering.

Comment 21: IPS Corporation requested harmonization of the VOC limits, test methods, and implementation dates among the state's air districts as well as the ARB's VOC regulation.

Response: See response to comment 10.

Comment 22: IPS Corporation recommended the adoption of South Coast AQMD Method 316A by rulemaking bodies throughout the state.

Response: Each district adopting the RACT/BARCT determination or using it as the basis for amending their rule would also adopt South Coast AQMD Method 316A.

Comment 23: IPS Corporation requested that the ARB revise the consumer products regulation and create a specific category for solvent cements and primers for plastic welding.

Response: We recently surveyed this category to determine the feasibility of developing standards for the consumer use of these products. The survey results showed that the emission reductions from regulating solvent cements and primers as consumer products would be marginal. We are not currently planning to include these categories in the consumer products regulation.

Comment 24: Beckman recommended a change in the language that exempts small users (section IV.C). The suggested language reads as follows: specify only a 55 gallon per year limit for the facility (removing the less than 10 gallons per year per stationary source).

Response: We have deleted the phrase "less than 10 gallons per year per stationary source."

RACT/BARCT Determination for Adhesives and Sealants

Comment 25: C.G. Boyd & Associates, Inc. stated that there are too many changes in rules, making compliance more difficult. Industry cannot keep making engineering changes each time a rule becomes more stringent and they cannot keep making costly label changes.

Response: See response to comment 10.

Comment 26: G.A. Huber Co. requested that the ARB staff consider the needs of the low volume users of these adhesives until water-based, low-VOC alternatives can be developed.

Response: See response to comment 9.

Comment 27: G.A. Huber Co. requested that the ARB staff include in section III a product designation for molded rubber and elastomeric polyurethane products with a recommended VOC limit of 850 g/l. Alternatively, section IV.A could specify an exemption for molded rubber and elastomeric polyurethane products.

Response: We have added the proposed category and VOC limit to section III.A.(1).

Comment 28: Oatey endorsed the limits set in the draft proposal for these products, with the exception of the BARCT VOC limit of 450 g/l for plastic cement welding primers. Oatey has no knowledge of any technology available for a primer which meets this limit.

Response: We have deleted the BARCT VOC limit of 450 g/l for plastic cement welding primers.

Comment 29: Oatey also indicated that the ARB staff should clarify the relationship of this proposal to the existing consumer products regulation, which does not specifically address cements and primers for plastic welding. They requested that the consumer products regulation be modified to recognize this class of unique products and that limits consistent with the draft RACT/BARCT proposal be instituted.

Response: See response to comment 23.

Comment 30: National Aerosol Products Co. indicated that there is a wide variety of aerosol adhesives, each formulated for a specific use. Each type must be addressed separately, as with nonaerosol adhesives. It is not possible to have one VOC limit for all aerosol adhesives.

Response: Based on conversations with industry, we believe that low VOC aerosol replacements may be available by the compliance date. We recognize that there are unique aerosol products that may not meet the low VOC requirements. For those instances where replacements are not available, districts have the option to examine possible exemptions on a case-by-case basis.

RACT/BARCT Determination for Adhesives and Sealants

Comment 31: National Aerosol Products Co. stated that the proposed July 1, 1995 effective date for the BARCT limit is not realistic for all aerosol products.

Response: We have changed the effective date to January 1, 2002, to be consistent with the ARB's Consumer Products Regulation.

Comment 32: 3M requested that the 25 percent by weight aerosol adhesive limit not be designated as BARCT because there is no assurance that 3M or any other adhesive manufacturer will be able to meet the standard by 1995. 3M also requested that a footnote be added to the effect that the standard is technology forcing and depends on anticipated technological breakthroughs.

Response: See response to Comment 31. We have added a footnote indicating that the 25 percent limit is technology-forcing.

Comment 33: "Another Tired Small Company" indicated that there are too many and too frequent changes in the rules and regulations. Also, they stated that the rule changes are occurring prior to the development and proven effectiveness of technology--both in chemical composition and materials handling in a practical manner.

Response: See response to comment 10. The RACT/BARCT determination acknowledges that the BARCT standards are technology-forcing and provides districts with options regarding their adoption.

Comment 34: Dames & Moore, representing Trus Jois Macmillan, stated that they cannot comply with the VOC content limit for wood (substrate) of 30 g/l.

Response: We have deleted the VOC limit of 30 g/l for wood products and have included wood as a porous material with a VOC limit of 150 g/l.

Comment 35: TREMCO stated that a 250 g/l VOC requirement for their architectural sealant primer is not feasible today.

Response: This particular product is considered a low-solid VOC sealant primer and therefore meets the VOC limit.

Comment 36: Advanced Polymer Coatings, Inc. questioned whether their caulk (sealant), which has a VOC limit of 397 g/l, would meet the sealant standard. The product is used in secondary containment areas, usually in chemical plants and fuel storage areas, and is chemically resistant.

Response: If the caulk is intended for architectural applications, such as secondary containment or storage tanks, the VOC limit is 250 g/l. There are low VOC products available, such as fluorosilicone, for secondary container and fuel storage tank applications.

RACT/BARCT Determination for Adhesives and Sealants

**II. Comments Submitted in Response to the February 27, 1997 Proposal, the August 19, 1997, Public Workshop and the January 8, 1998, Public Workshop on the Proposed RACT/BARCT Determination for Adhesives and Sealants**

Comment 1: The definition of aerosol adhesive in the draft determination is inconsistent with both the Consumer Products Regulation and AB 1849. [Chemical Specialties Manufacturers Association]

Response: The Committee modified the definition of aerosol adhesives (Section II.(D)) to be consistent with California state law (Consumer Products regulations). Additionally, we have modified the footnote in Section III.B to clarify that the Air Resources Board (ARB) will conduct a technical assessment by 7/1/2000 on the feasibility of achieving the 25% VOC limit by the 1/1/2002 deadline. The Committee will also expand the discussion in the staff report, as appropriate.

Comment 2: The ARB should delete the 25% VOC limit for aerosol adhesives applicable in the year 2002. The limit can not be met by the year 2002. [3M]

Response: We believe it is appropriate to keep the 25% VOC limit for aerosol adhesives, in the RACT/BARCT determination (effective 1/1/2002) to make the determination consistent with the provisions for “Aerosol Adhesives” in the consumer products regulations. We have noted in the staff report that the ARB will conduct a technical assessment by 7/1/2000 on the feasibility of achieving the 25% VOC limit by the 1/1/2002 deadline as required by the consumer products regulation. Districts can then modify their rules, if appropriate, to reflect the findings of the technical assessment.

Comment 3: The references to “disposable and hand-held” should be deleted from the aerosol adhesives definition. STA-PUT believes that aerosol adhesives should be defined as “pressurized systems that use propellant to dispense product”. (STA-PUT)

Response: The definition in the RACT/BARCT determination is consistent with the definition in the ARB consumer product regulations. The definition contains the reference to “disposable and hand-held” which is consistent with existing district rules.

Comment 4: CARB should maintain parallel non-consumer aerosol adhesive VOC standards in the RACT/BARCT as are established in the statewide CARB standard after the July 1, 2000 study is complete. [Wilsonart]

Response:\_\_\_The RACT/BARCT determination will be reevaluated after the ARB technical assessment is completed, if appropriate.

Comment 5: CARB should create a separate category or provide an exemption for contact adhesives used in laminating certain materials including bonding of plastic, rubber, or unprimed metal to plastic, rubber, or unprimed metal, laminate to melamine cover board, decorative

RACT/BARCT Determination for Adhesives and Sealants

metallic laminates to metal surfaces, and laminates to any surface when using certain post forming equipment. ARB should establish a 540 g/l VOC limit for contact adhesives used in these applications. Manufacturers stated that contact adhesives meeting the 200 g/l VOC limit do not perform well in these applications.[3M, Wilsonart, DAP]

Response: See response to Comment 6.

Comment 6: At previous discussions and at the workshop on January 8, 1998, manufacturers indicated that a separate category is needed for contact adhesives used in laminating certain materials including bonding of plastic, rubber, or unprimed metal to plastic, rubber, or unprimed metal, laminate to melamine-covered board, decorative metallic laminates to metal surfaces, and laminates to any surface when using certain post forming equipment. Manufacturers stated that waterborne adhesives do not perform well in these applications and requested that a 540 g/l VOC limit be established for contact adhesives used in these applications and a 400 g/l effective 1/1/2000. Manufacturers stated that they are working to develop adhesive products to meet a 250 g/l VOC level. However, there is some uncertainty as to the feasibility and time frame by which such products would become commercially available.

Further, manufacturers indicated that the general contact adhesives limit of 200 g/l being proposed, which requires the use of waterborne technologies, is too restrictive. They stated that waterborne adhesives don't work for many smaller shops and under certain conditions. Manufacturers are developing "solvent based" adhesives with higher solids content which would result in lower emissions when applied compared to the traditional solvent based adhesives. They requested that the RACT/BARCT implement a VOC limit of 540 g/l for general contact adhesives until the year 2000, at which time the VOC limit will be 250 g/l. [NPCA, 3M, Wilsonart]

Response: The Committee concluded that a 400 g/l VOC solvent is feasible, however, because of production concerns, the Committee decided to delay implementation of the 400 g/l limit until the year 2000. Therefore, the Committee has added a 540 g/l limit for special substrates effective through 12/31/1999 in Section III.(A)(1). On 1/1/2000 the VOC limit decreases to 400 g/l. Manufacturers indicated that their objective is to eventually develop solvent based contact adhesives that will meet a 250 g/l limit. The Committee believes there is a reasonable chance that these adhesives will become available by the year 2002. Therefore, the Committee identified the 250 g/l limit as BARCT and technology forcing. Beginning on January 1, 2002, the VOC limit for contact adhesives for special substrates will be 250 g/l.

While the Committee believes that, for the majority of applications, waterborne contact adhesives are available which provide satisfactory performance, we recognize that there are situations in which they do not perform well or are not cost effective to use. The Committee recognized that for certain facilities it is not cost effective to install the necessary equipment to make waterborne adhesives work well. The Committee has modified the VOC limit for general contact

RACT/BARCT Determination for Adhesives and Sealants

adhesives from 200 g/l to 540 g/l until 1/1/200, at which time the limit will be 250 g/l. This will provide manufacturers additional time to develop adhesives that will work in those situations where traditional waterborne adhesives may not work.

The Committee recognizes that some districts have implemented VOC limits lower than the 540 g/l for general contact adhesives. Under the RACT/BARCT guidance, districts have the option to be more restrictive than the RACT/BARCT may choose to retain the lower limits in their district rules.

Comment 7: \_\_Contact adhesives intended for retail consumers must comply with the requirements in the Federal Hazardous Substances Act as codified in 16 Code of Federal Regulations, Section 1302. Because of these requirements, some exempt solvents such as acetone can not be used in the product's formulation. These products are sold in containers of 128 fluid ounces or less (1 gallon or less) in the retail market. In order to comply with the VOC limits in existing district rules, manufacturers have to use waterborne formulations. Some manufacturers have complained that waterborne adhesive products don't work well in the consumer sector because the users either don't have the equipment or skill necessary to achieve good results. Manufacturers requested that products formulated to comply with the Federal Hazardous Substances Act be exempt from the requirements in the RACT/BARCT. [DAP, NPCA]

Response: The Adhesives RACT/BARCT Committee is not proposing a general exemption for retail solvent-based contact adhesives, except for products sold in pint containers or smaller. Individual Air Districts may include this exemption, as has been done by the Bay Area and Sacramento Districts, but will have to justify it to the Air Resources Board by an inventory analysis. Other Districts, such as Ventura, have been regulating the retail contact adhesives for several years because it is a significant part of their adhesive emissions inventory.

The Committee is not proposing this exemption because complying waterborne contact adhesives are available and are able to perform (i.e. bond) in an acceptable manner. These products are available in two types: acrylic and neoprene. The following manufacturers have been providing complying waterborne products: DAP, Macklanburg-Duncan, MACCO, 3M, Parabond, Elmer's, ACE, Lokweld, Borden, Pratt & Lambert, Para-Chem, Stabond, W.F. Taylor, Swift Adhesives, and Wilsonart. According to comments from industry at the January 8, 1998, workshop, these products perform well in the laboratory. The Committee acknowledges that the complying products are not as user-friendly to apply as the solvent-based contact adhesives. However, we believe that motivated consumers will take the time to make these products work. They will be rewarded with not having to breathe harmful vapors and the use of water for easy cleanup. For very special needs, consumers may still purchase solvent-based contact adhesives in pint containers. The inconvenience and price premium should discourage the general use of these products.



We have mainly heard negative comments from one manufacturer (DAP) regarding this issue. On the other hand, another large manufacturer (Macklanburg-Duncan) has told us that they are pleased with their waterborne retail contact adhesive and claim that it performs very well in the field. Based on the foregoing analysis, we believe that a statewide exemption is not warranted at this time.

Comment 8: Asphalt primers are intended for both metal (non-porous) and masonry (porous) substrates. The proposed VOC limit for single-ply roofing primer is restrictive and singles out one type of single-ply roofing product for use in California. We recommend one of the following: a) change the proposed Single-Ply Roofing primer to 500 g/l or b) establish a new category for Modified Bitumen Membrane Primers and set the VOC limit at 500 g/l. [Siplast, Roof Coatings Manufacturers Association]

Response: The Committee evaluated the information provided by industry and concluded that the requested VOC limit is appropriate. The Committee has added a new category in Section III.A(4) for Modified Bitumen Membrane Sealant Primers with a VOC limit set at 500 g/l. A definition for Modified Bitumen Sealant Primer and for Bituminous Materials have also been added in Section (II).Z and (II).AA.

Comment 9: The adhesive category for “indoor floor covering installation” needs to be revised to exclude adhesives used to install perimeter bonded sheet flooring with vinyl backing onto a flexible vinyl substrate. The BARCT VOC limit for certain adhesives used in “flexible vinyl to flexible vinyl” applications is unsupported and should be eliminated. [RFCI]

The category in section III.A.(1) Indoor Floor Covering Installation should be modified to read “Indoor floor covering installation onto porous substrates or installation of felt backed floor covering”. Section III.A.(5) Flexible vinyl to flexible vinyl--the VOC limit should remain at 660 g/l. The BARCT VOC limit of 250 g/l should be deleted. [Congoleum]

Response: After evaluating information submitted by Congoleum and RFCI ( including information on volume of the product used in California and price information), the Committee concluded that it is appropriate to establish a separate category for adhesives used in the installation of perimeter bonded flexible vinyl flooring. The VOC limit for this category is set a 660 g/l.

Comment 10: CARB should modify the sales prohibition exemptions for small containers and consumer products to cover not only adhesives, but adhesive primers, sealants and sealant primers (RFCI, 3M, Congoleum).

Response: The Committee has expanded the small container exemption in III.G.5 (Prohibition of Sales) which now covers all adhesives, sealants and primers. We have also

RACT/BARCT Determination for Adhesives and Sealants

clarified that “stationary source” referred to in IV.B (Exemptions) includes both point sources and area sources.

Comment 11: The draft RACT/BARCT does not appear to address aerosol adhesive, sealant, or adhesive, sealant primers or strippers. The ARB should include an exemption in the draft determination for use of small amounts of aerosol cleaners/strippers. A similar exemption has been adopted in the following district rules: South Coast AQMD Rule 1171; Sacramento Metropolitan AQMD Rule 460. Specifically a new section IV.D should be added:

*D. The provisions of Section III.C shall not apply to aerosol cleaners or aerosol strippers used on adhesives, sealants, or adhesive or sealant primers if the total quantity of aerosol cleaners and aerosol strippers used does not exceed a 160 fluid ounces per day.[3M]*

Response: After discussing this exemption with the South Coast and Sacramento Metropolitan AQMDs, the Committee concluded that the exemption is not warranted. However, the Committee will consider additional information that may be presented in support of the requested exemption.

Comment 12: Wilsonart can only support the sales prohibition option (Section III.G) if the provisions of Section G.4.b remain in the final RACT/BARCT determination. [Wilsonart]

Response: The provisions of Section G.4.b will remain in the final RACT/BARCT determination.

Comment 13: ARB should include an exemption for aerospace assemblies and components in the determination. [Lockheed Martin]

Response: Adhesive applications used in the aerospace industry are regulated by district aerospace rules. Section IV(6) addresses exempts adhesive applications covered under other district rules. The Committee has added language to the staff report to clarify that the adhesive determination does not apply to adhesives and sealants regulated by other district rules.

Comment 14: A VOC limit for cyanoacrylate adhesive and should be set a 1050 g/l. [Lockheed Martin]

Response: The Committee has added Section IV.(10) to exempt Cyanoacrylate adhesives from the RACT/BARCT requirements.

Comment 15: Definition VV for Thin Metal Laminating list the bond line to be less than 0.025 mils. This should read 0.25 mils. [EEMUS]

Response: The Committee modified the definition in Section II.VV for Thin Metal Laminating to read “... 0.25 mils.” The Committee is also deleting the 250 g/l BARCT VOC

RACT/BARCT Determination for Adhesives and Sealants  
limit for this category in Section III.A.(1).

Comment 16: The VOC limit for Thin Metal Laminating should remain at 780 g/l and not be reduced to 250 g/l. [EEMUS; VACCO]

Response: We are deleting the 250 g/l BARCT limit for this category. When a district develops a rule, it should assess if there has been any change in the Thin Metal Laminating adhesive technology to determine if a lower limit is appropriate.

Comment 17: CARB should create a specific allowance for the use of full air-atomized spray equipment for contact adhesives (as opposed to HVLP equipment). [Wilsonart]

Response: The RACT/BARCT determination does not address application methods at this time.

Comment 18: The ARB should add the Bay Area AQMD Test Method 35 and 36 for Aerosol Adhesives. [3M]

Response: Test Method 310 and the Bay Area AQMD's Test Methods 35 and 36 are similar. Thus, we believe that it is not necessary to add the Bay Area AQMD's Test Methods 35 and 36. Districts can reference other methods such as Test Method 35 and 36 if they determine them to be equivalent to Test Method 310.

Comment 19: Manufacturers requested a small use exemption of 10 gal/month (120 gal/yr). The determination contains an exemption level of 55 gal/yr. The request for a higher exemption level is based on results of a survey conducted by the Bay Area Air Quality Management District (AQMD) on the use of contact adhesives in the Bay Area AQMD.

Comment: Because air quality needs and source inventories vary from district to district, the Committee concluded that this issue would be best addressed by the individual districts. The 55 gal/year exemption level is partly based on established U.S. EPA policy. The Committee believes that districts are best able to justify a departure from the stated exemption level based on their specific source inventories. Therefore, the Committee is not proposing any changes to the exemption level.

Comment 20: Manufacturers suggested that the Committee consider changing the way the VOC content of adhesives and sealants is regulated. Currently, the VOC limits are expressed in a grams of VOC per liter of liquid. They suggested the Committee consider establishing a VOC limit based on a unit of work (grams of VOC per grams of solids applied on a surface). They stated that the current methodology treats all liquids the same and does not account for differences in the solids content of products. Typically, all manufacturers recommend a specified grams of solid per unit of surface area. Thus, it requires less volume of high solids product to the same work than with a lower solids product. Industry representatives will be providing additional information to the Committee.

Response: The Committee recognizes that the concept may have potential to improve VOC regulations. The Committee also recognizes that such approach would require a fundamental change in the way VOC regulations are currently structured. Therefore, it would require an extensive evaluation that can not be completed within the time frame of this determination. The Committee will work with industry to further evaluate the technical merits of this approach.

Comment 21: Questions have been raised as to how districts would enforce the prohibition of sale provisions in the determination. Specifically, how a distributor or manufacturer would determine that a customer is allowed to buy noncomplying products.

Response: The Committee believes that self certification is a mechanism that districts could use to implement this provision. This may consist of the customer providing a letter to the supplier stating that he/she is entitled to purchase noncomplying adhesive products under the district regulations. The supplier would retain the letter as proof of compliance.

Comment 22: Industry representatives requested that clarification be provided regarding exempt solvents in the determination of the vapor pressure of the solvent (mixture) in determining compliance with the surface preparation and cleanup solvent provisions. They requested that a clause similar to the Sacramento Metropolitan AQMD Rule 460, section 407 or Ventura's rule 74.20 be added. These provisions contain methodology that allows for the determination of composite vapor pressure of a solvent blend which considers only VOC solvents and is not adversely affected by the presence of high vapor pressure exempt solvents. Also, they requested that the Committee set the same VOC/composite vapor pressure limit for cleanup solvents and surface preparation.

Response: Exempt solvents are not included in the determination of composite vapor pressure. The Committee has included language specifying the calculation methodology to determine composite vapor pressure (consistent with the Sacramento AQMD Rule 460).

As to the request for the same limit for adhesive cleanup operations and surface preparation solvents, the Committee concluded that it is appropriate to have different limits. Adhesive cleanup operations and surface preparation have different performance requirements. Surface preparation generally can be accomplished with lower VOC solvents. The Committee concluded that the current proposed limits are appropriate. Similar limits have been in placed in the Sacramento rule 460 and Ventura's rule 74.20.

Regarding the equipment cleanup limits, the Committee, concluded that the current limits are appropriate, however, there is possibility that in some cases cleaners containing higher VOCs or vapor pressure may be required. Therefore, the Committee has modified exemption IV.B (low usage) to include cleanup solvents. This should address industry's concern while keeping the use of noncompliant solvent cleaners to a minimum.

Comment 23: Lord Chemical requested that the VOC limit for sheet-applied rubber lining be set at 850 g/l. Sheet-applied rubber linings are applied to the interior walls of tank (stationary and rail car). Adhesives are applied in a three step process prior to the application of rubber sheeting. The adhesives are cured in an autoclave when new tank lining are applied and steam cured in the field when tanks are repaired. Although waterborne adhesives have been developed, waterborne products do not work in all cases because two different curing processes are used and because of varying conditions in the field.

Response: The South Coast recently conducted an evaluation of the technology used in the sheet-applied rubber lining applications [South Coast Air Quality Management District, *Draft Staff Report - Rule 1168, Control of Volatile Organic Compound Emissions from Adhesive Application*, December 12, 1997]. Based on that review and comments received at the workshop, the Committee concluded the 250 g/l can not be met at this time. Thus, we added a new category for sheet-applied rubber linings with a VOC limit of 850 g/l applicable until 1/1/2000. Manufacturers are working on developing adhesive technology that will meet 250 g/l by the year 2000 and will address the application issues associated with waterborne adhesives that have been developed for this application. Because of the way these products are used, worker safety is one of the driving forces behind the development of lower VOC products. Lord Chemical has expressed its dedication to develop a 250 g/l VOC product by the year 2000. The Committee has set a technology forcing limit of 250 g/l limit effective on 1/1/2000 for this category.

Comment 24: Representatives from National Starch requested an exemption for adhesive products that are packaged in containers (syringes) smaller than two ounces(10 cc to 30 cc). Specifically, the adhesive products of concern are used in the manufacturing of electric and electronic components. These adhesives typically have low VOC and are kept at low temperatures until used. National Starch requested that an exemption similar to that found in South Coast AQMD be added to the RACT/BARCT determination.

Response: The Committee has added an exemption for adhesives sold or supplied in containers with a capacity of eight fluid ounces or less. This provision should address the concern that adhesives packaged in syringes or small tubes would be subject to the RACT/BARCT determination. Most of the adhesives in question are epoxy based and produce low emissions when used.

### **III. Summary of Comments on April 1998 Version of the Proposed Draft Determination for Adhesives and Sealants.**

Comment 1. The Committee should provide an exemption for contact adhesives formulated for the consumer market. [National Paints and Coatings Association (NPCA)]

Response: The Committee had previously considered this request (see Appendix C, Section II, Comment #7 and the Staff Report Page 12]. The Committee concluded that this exemption

RACT/BARCT Determination for Adhesives and Sealants

was not warranted because there are complying products available. The Committee acknowledged that there may be circumstances in a particular district which may justify granting such exemptions. Thus, the Committee believes this issue would be best addressed at the district level.

Comment 2. The proposed RACT/BARCT determination provides a 75 percent by weight VOC content standard, which drops to 25 percent effective January 1, 2002. The RACT/BARCT notes that the ARB will perform a technical assessment to determine the feasibility of the 25 percent VOC limit for aerosol adhesives. Although ARB indicated that it received comments from manufacturers stating that the 25 percent VOC limit is infeasible and requesting that the 25 percent VOC limit be omitted from the RACT/BARCT determination, it nevertheless decided to retain the 25 percent VOC limit until the technical assessment is completed. Industry again urges that the final RACT/BARCT determination not adopt such speculative limits. While these limits may be subject to extensive caveat, placing such numbers in a document cannot avoid creating the impression that they have a technical basis which industry does not believe exist. The final draft recommends that the districts consider several solutions to this problem, including refraining from adopting technology-forcing standards into their rules, and, rather, considering their adoption only as the effective date nears (which will permit consideration of intervening technical developments). Industry suggests that this advice is sound, and rather than occurring at the district level, should instead be incorporated in the final RACT/BARCT. [NPCA]

Response: The Committee has concluded that because the 25 percent standard is in the State regulation for aerosol adhesives as well as in several district rules that it is appropriate to keep the standard in the RACT/BARCT determination. The Committee has indicated in the RACT/BARCT determination that the ARB is required by State law to performed a technical assessment to determine the feasibility of the 25 percent VOC limit for aerosol adhesives. While the Committee agrees with the NPCA that the 25 percent limit appears not to be feasible at the present time, the technical assessment required by the consumer products regulation will provide a complete and thorough evaluation of the feasibility of meeting the limit. Districts who choose to include the 25 percent VOC limit in their rules, can modify their rules to reflect the findings of the ARB technical assessment once completed.

Comment 3. Industry is concerned about the change in the implementation date of the final limits for the category "Contact Bond-Specialty Substrates" from January 1, 2001 until January 1, 2002. Previous correspondence from the ARB had indicated an intention to make the final limit of 250 grams per liter effective in 2001. Because a significant number of companies who produce products in this category had expressed a strong preference for the earlier implementation date, we suggest that ARB revisit this issue and engage industry in a dialogue on this point to ensure that the final effective date best represents industry views on reasonably foreseeable technological advances. [NPCA]

Response: The Committee agrees with the commenter and will change the implementation

RACT/BARCT Determination for Adhesives and Sealants  
date to January 1, 2001.

Comment 4. Industry had previously requested that the RACT/BARCT determination be clarified insofar as it addresses the effect of exempt solvents on the determination of the vapor pressure of solvent mixtures (which is restricted by the surface preparation and cleanup solvent provisions). The ARB's response indicates that exempt solvents are not intended to be included in the calculation under the formula provided to calculate composite vapor pressures. While this appears to be the case, we note that in addressing the composite vapor pressure of cleanup solvents in the "Requirements" portion of the document, the words "...and exempt compounds" have been added, excluding exempt solvents from the composite vapor pressure calculation. However, similar language has not been added to the language addressing surface preparation solvents. Since it appears that the intent is to deal with exempt solvents in the same manner in both places, we suggest adding conforming language with respect to both solvent categories. [NPCA]

Response: The Committee agrees and has made the appropriate modifications.

Comment 5. The definition of "modified bitumen membrane sealant primer" needs to be changed. As currently written, the Roof Coating Manufacturers Association is not aware of any products that would meet the definition. The RCMA recommends that this category be defined as "BITUMINOUS PRIMER". [RCMA]

Response: After further evaluation and consideration of "BITUMINOUS PRIMERS" (asphalt primers) it is clear that these products are already regulated under the architectural coatings rules. Therefore, we are excluding the category from the determination. Asphalt primers (bituminous primers) are subject to a VOC limit of 250 g/l in the architectural coatings rules.

Comment 6. The San Diego Gas and Electric (SDG&E) requested the Committee establish a new category for a specialty product--liquid adhesive similar in nature to a sheet rubber lining installation adhesive (850 VOC limit) and a sealant primer (750 VOC limit). The liquid adhesive is used in construction, maintenance and repair of underground pressurized natural gas pipeline. It is part of the pipeline cathodic protection and inhibits rusting. It is brush applied to weld joints, allowed to get tacky, and is then wrapped with specialty pipe tape. The liquid adhesive chemically activates the bonding surface of the pipe tape so that the tape bonds to the pipe and forms a protective barrier. The liquid adhesive is an integral and irreplaceable component of the pipe wrap process. [SDG&E]

Response: It appears that the use of this adhesive product is very specialized. The Committee has concluded that given the timing of this comment it can not properly evaluate whether a category should be created for this product. The Committee believes Districts would be best able to address this issue on an individual basis when undertaking a rule making evaluation. Districts could address this product category either through the low use provisions in the RACT/BARCT, by creating a separate category for this product, or by providing an

RACT/BARCT Determination for Adhesives and Sealants  
exemption from the RACT/BARCT determination.

Comment 7. The exemption level should be changed from the currently proposed 8 fluid ounce to 16 fluid ounce. The current limit would create confusion for both industry and district enforcement personnel. The potential emission benefits gained from regulating adhesive and sealant products between 8 and 16 fluid ounces do not warrant the extra resources that would be required to make this provision enforceable. [San Diego Air Pollution Control District]

Response: The Committee has reevaluated this issue and decided to set the exemption level at 16 fluid ounces. This will avoid regulatory overlap between the State consumer products regulation and the district's adhesives rules. The Committee recognizes that some districts may wish to regulated products less than 16 fluid ounces if the specific situation in their area warrants such action.