

REDUCTIONS IN VOC LIMITS FOR COMMERCIAL ROOFING ADHESIVES AND SEALANTS; SCAQMD RULE 1168 UPDATE

BY JUSTIN BATES

Figure 1 – SCAQMD and the EPA strive to improve air quality by meeting the goals of the Clean Air Act.

HISTORY

Since the 1970s, the South Coast Air Quality Management District (SCAQMD) has been tasked with monitoring and improving the air quality of Orange County and portions of Los Angeles, San Bernardino, and Riverside Counties in California. A particular focus is reducing the concentrations of ground-level ozone to meet the Environmental Protection Agency's (EPA's) National Ambient Air Quality Standard (NAAQS).

It's worth noting that other air quality districts within California and across the U.S. (i.e., other California Air Quality Management Districts and the Ozone Transport Commission) look to SCAQMD's Rule 1168 for guidance when establishing their own VOC limits for adhesives and sealants. Thus, Rule 1168 is unique and important for adhesive and sealant manufacturers.

There are two types of ozone—stratospheric ozone and ground-level ozone. Stratospheric ozone is naturally occurring and is considered the "good ozone" since it absorbs a portion of the sun's harm-

ful ultraviolet radiation, preventing it from reaching the surface of the earth. Ground-level ozone has harmful effects to human health and the environment. Ground-level ozone is not naturally occurring, but forms due to the reaction of volatile organic compounds (VOCs) and nitrous oxides (NOx) in the presence of sunlight. By controlling sources of VOCs (in addition to NOx from combustion sources), SCAQMD can reduce the levels of ground-level ozone to meet the EPA's requirements (*Figure 1*).

SCAQMD regulates VOCs from a num-

ber of different industrial sources or applications through the implementation of over 90 rules. This includes the regulation of adhesives, sealants, and their respective primers via SCAQMD Rule 1168. Adopted in 1989, SCAQMD Rule 1168 has helped regulate VOC emissions of adhesives and sealants in the South Coast region for nearly 30 years. Rule 1168's VOC limits remained unchanged between 2005 and October 2017, when SCAQMD amended the rule reducing the VOC limits for a number of adhesive and sealant applications.

Category	VOC Limit (grams/liter)	
	Current VOC Limit	Proposed VOC Limit (1/1/2023)
Single-ply roof membrane adhesive	250	200 ^a
All other roof adhesives	250	200 ^a
Single-ply roof membrane sealant	450	250 ^a
All other roof sealants	300	250 ^a

a. Pending technology assessment conducted in 2022.

Table 1 – Summary of key changes to VOC limits impacting the commercial roofing industry.

REASONS FOR REDUCING VOC LIMITS

The EPA established the NAAQS for six criteria air pollutants, including ozone, per the 1970 Clean Air Act. The NAAQS are periodically reviewed, which may result in tightening of ground-level ozone limits. As the ozone limits are lowered, geographical regions (counties) may become non-compliant to the ozone standard, therefore becoming known as nonattainment areas. States must submit a State Implementation Plan (SIP) that will detail how each region/county will become compliant with the ground-level ozone standard, which the EPA must approve. States run the risk of having federal highway/transportation projects suspended or experiencing other penalties if they fail to reach attainment or fail to have their SIP approved.

In 2012, SCAQMD started their process to amend Rule 1168 by engaging manufacturers and the community through a series of public meetings. SCAQMD met opposition on a number of issues. Two key issues were resolved by 1) rejecting tertiary butyl acetate (TBAC) as an exempt solvent due to health concerns and 2) implementing reasonable reductions in VOC limits for applications where low VOC or water-based products did not meet performance requirements. Rule 1168 was officially amended October 6, 2017, with the goal of reducing VOC emissions by 1 ton per day by 2023.¹

SUMMARY OF CHANGES TO RULE 1168 IMPACTING COMMERCIAL ROOFING

The October 2017 amendment to Rule 1168 includes a number of changes to definitions and administrative requirements, but, most importantly, to VOC limits. A summary of key changes to VOC limits impacting the commercial roofing industry is included in *Table 1*. Most of the limits are pending a technology assessment and will not be implemented until 2023.

The technology assessment is a joint program between SCAQMD and manufacturers to assess the viability of products to meet proposed VOC limits. Manufacturers will present research and test data to SCAQMD to help determine the impact on cost and performance for a VOC-compliant adhesive or sealant. Based on the technology assessment, SCAQMD will have the option to accept the proposed VOC limit, modify it, or rescind it (*Figure 2*).

Key administrative changes include reporting VOC content on the label and submitting emission reports to SCAQMD

at specified intervals. Rule 1168 requires manufacturers to place VOC content on the label of each container, displayed in grams per liter (g/L), in addition to the date of manufacture. Per SCAQMD, it is acceptable to list the VOC as the maximum allowable VOC for the application or the maximum VOC anticipated for the product to account for process variation.²

Beginning September 1, 2019, manufacturers will also be required to submit a Quantity and Emissions Report (QER) that provides VOC, annual volumes, applicable

categories, etc., for all products sold within the South Coast District. These reports are due every three years through 2025, and every five years after that.

In addition, SCAQMD has changed the testing method requirements for some adhesives and sealants vs. the historical method, EPA Method 24. SCAQMD requires that nonreactive adhesives/sealants less than 150 g/L use a gas chromatography/mass spectrometry (GC/MS) method as defined in SCAQMD Method 313 or ASTM D6886. There are concerns that the GC/MS method



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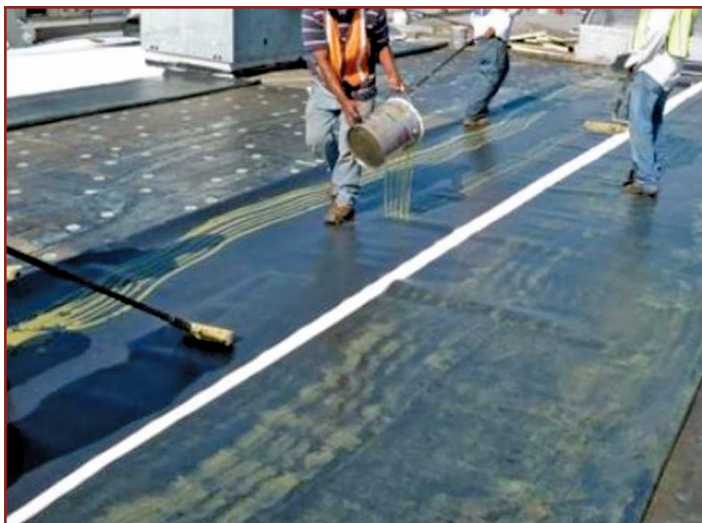


Figure 2 – Bonding adhesives can meet VOC requirements by using VOC-exempt solvents or water-based technologies.

will lead to higher measured VOCs due to the higher analysis temperatures.³ The higher temperatures could lead to decomposition of higher-molecular-weight materials that are nonvolatile with traditional methods.

POTENTIAL IMPACT TO COMMERCIAL ROOFING INDUSTRY

To achieve the required VOC limits, manufacturers will turn to solventless reactive systems, water-based systems, or VOC-exempt solvents—solvents that are not photochemically reactive and do not contribute to ozone formation. While these approaches are acceptable to meet VOC regulations, they each have limitations that could lead to increased cost, increased time to properly install, or a restricted roofing season due to temperature limitations.

Solventless reactive systems (e.g., polyurethanes) are either unreacted or partially reacted products that are applied in a liquid form and chemically cure with ambient moisture (one-part) or through the act of mixing two separate components (two-part). While these systems may not contain traditional solvents, they may have low-molecular-weight additives that will volatilize during testing and may contribute to the VOC. In addition, these types of adhesives are not substitutes for traditional single-ply bonding adhesives, and applications are limited to adhering board stock, SBS modified bitumen, or fleece-back membranes (Figure 3).

Water-based adhesives are typically limited to application temperatures of 40°F (4.4°C) and rising. However, there have been concerns of using water-based adhesives at temperatures less than 60°F (15.5°C) with dew points of 45°F (7°C) or higher.⁴ Water-based adhesives may have inconsistent performance if directly applied to con-

crete substrates that contain moisture (e.g., parapets). Often the membrane is laminated too

soon, trapping moisture, which can lead to improperly dried films or unadhered areas.

Low VOC adhesives may not have the application restrictions of water-based systems, but they typically have longer dry times versus traditional solvent-based adhesives. These longer dry times can lead to aesthetic defects (e.g., blisters) if the membrane is installed too soon. Low-VOC adhesives may also be more difficult to apply in an even coat when applied at temperatures below 60°F. Finally, low-VOC solvents may increase adhesive cost.

In short, low-VOC and water-based products may meet the VOC levels desired by SCAQMD or other air quality management districts, but they do not necessarily meet the requirements demanded for every commercial roofing application. Traditional solvent-based bonding adhesives have 20+ years of proven performance on a wide range of difficult-to-adhere-to membranes. It's important for regulatory agencies to work with manufacturers to understand these details to help set realistic VOC limits that allow products to meet environmental quality goals and the demands of the application. 

REFERENCES

1. *Certify the Final Environmental Assessment and Amend Rule 1168 – Adhesive and Sealant Applications*. South Coast Air Quality Management District, 6 Oct. 2017, [http://www.aqmd.gov/docs/default-source/Agendas/Governing-](http://www.aqmd.gov/docs/default-source/Agendas/Governing-Board/2017/2017-oct6-032.pdf?s-fvrsn=9)

Figure 3 – Two-part polyurethane adhesives are low VOC options for installing board stock or fleece-back membranes.



Board/2017/2017-oct6-032.pdf?s-fvrsn=9. Accessed November 11, 2018.

2. Ibid., pp 43.
3. David Darling. "SCAQMD Adopts New VOC Test Methods for AIM Coatings." *American Coatings Association*, April 24 2017. www.paint.org/scaqmd-test-methods/.
4. Zebonie Sukle and Todd Nathan. "Weather-Related Effects on Installation of Fully Adhered Single-Ply Systems." *Proceedings of the 30th Annual RCI International Convention & Trade Show*. March 11, 2015. rci-online.org/wp-content/uploads/2015-cts-sukle-nathan.pdf.



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