No two individuals will view or describe color exactly the same. Being able to discuss color based upon established color science principals and the use of color standards is paramount.

"The only way to validate color to what the human eyes sees is to review data from measurements taken during fabrication," said Brian Stiles, a Quality Engineer for Viracon, Inc.

The instruments Viracon uses to measure color are Konica Minolta CM-2600d Spectrophotometers.

"Our measurements with the Konica Minolta CM-2600d confirm that the color of the glass is well within the tolerances established for a particular product," said Stiles. "Being able to mathematically measure the color takes all the subjectivity out of quantifying the glass color with a universal understanding."

Viracon, based in Owatonna, Minnesota, also has facilities in Statesboro, Georgia, and St. George, Utah. An international company of Apogee Enterprises, Inc, Viracon fabricates architectural glass products, including tempered, laminated, insulating, silk-screened, and high-performance coatings.

Since 1970, when Viracon was established with 20 employees by founder James L. Martineau, the company has expanded its facilities to perform more glass fabricating processes at a single site than any other fabricator in the world.

For more than 2,500 architects and designers, Viracon is a prime single-source resource for not only fabrication, but for consulting and technical help as well.

"Viracon glass products have been used in seven of the ten tallest buildings in the world and in such prestigious buildings as Seven World Trade Center, New York City; Mandalay Bay Hotel, Las Vegas; Federal Express Headquarters, Memphis, TN; Taipei Financial Center, Taipei, Taiwan; Reebok Headquarters, Canton, MA; the Colorado Convention Center, Denver, CO; and Mt. Sinai Hospital, Miami Beach, FL," said Christine Shaffer, Marketing Manager, Viracon, Inc. "We have over 4,000 lines of published performance data for various glass configurations, but for the most part the glass is a custom specification. All Viracon production is built–to-order, for a specific application. Over 55 million square feet of glass moves through our largest plant in Owatonna each year."

"We have been using colorimeters and spectrophotometers for years to measure color," said Don Boutelle, Director of Quality Assurance. "In 2003 we decided to standardize on one manufacturer for both hand held and benchtop spectrophotometers for our Minnesota and Georgia plants and eventually for our Utah plant. After extensive evaluation we selected Konica Minolta instruments and have purchased 25 spectrophotometers over the years, a mix of CM-2600d portable and CM-3700d benchtop units. We also acquired Konica Minolta's SpectraMagic™ NX Quality Control software for simple pass/fail evaluations and trend analyses."

Raw glass is shipped to the three Viracon plants, where it is fabricated into various products.

"We measure the incoming raw materials to ensure the color is within our specifications," said Boutelle. We want to prevent raw materials with color issues from being introduced to the manufacturing lines. Incoming color inspections save us considerable time and money on the front end and we avoid having to scrap product on the back end. By measuring color throughout the manufacturing process, we ensure that our customers get what they ordered."

In addition to glass, other materials such as paint and silicone are measured as well.

"We roll-coat full coverage and silk-screen patterns and designs on glass and measure the paint color for consistency throughout the production run," said Brad Loch, Supervisor. "We also sputter coat optically thin layers of metal onto the glass to reduce thermal radiation and insulate using a silicone seal; all have to be up to specification for color."

During the manufacturing process, a Konica Minolta spectrophotometer is mounted on a robotic arm that can extend over the product to measure color on-line.

Konica Minolta's SpectraMagic™ NX Quality Control software stores color tolerances for various glass products.

"We make an ideal physical sample of the product, take a reading, and store the data in the software as a color target with tolerances," said Mike Schettler, Quality Engineer. "We can then take a reading of a production sample with a spectrophotometer and compare it to the standard. The Konica Minolta SpectraMagic™ NX software will convert the spectral data to color space values, for example, CIE L*a*b* (CIELAB)."

The program provides a pass/fail judgment and an assessment, such as too red or too blue.

"We perform a visual and numerical assessment in conjunction to determine if the color is a proper match. The software is among the best we've worked with for these purposes," said Stiles.

Schettler agrees, saying "The color software has been helpful in organizing and analyzing our color data. Some of the items that we like are the unlimited tag data fields, dynamic reports, and the way the targets can be grouped within the same file."

"Konica Minolta spectrophotometers have been durable and dependable," concluded Boutelle. "When service is required, the service time from start to finish is fast and complete. I would also like to note that Konica Minolta publications have assisted Viracon with a better understanding of color, specifically 'Precise Color Communication' and 'The Language of Light.' Konica Minolta publications and technical communications are helpful to us and we are looking forward to future publications."

So the next time you admire a building with beautiful glass where every window has a uniform color, chances are the glass was fabricated by Viracon, and Konica Minolta instruments played a pivotal role in ensuring the color is the same, pane to pane.

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