PCA Portland Cement Association

CONCRETE *Information*

White Concrete: New Avenues of Safety

Municipalities around the country are discovering a real benefit from white cement concrete—it makes roads and streets safer. Used for curbs, median strips, planters, and railroad crossings, brightly colored and white surfaces not only improve pedestrian and driver safety, these simple structures can also beautify the streetscape.

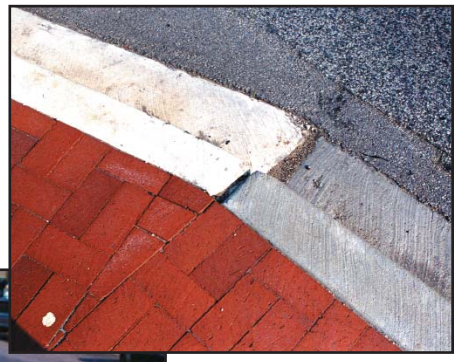
A Great White North

On Chicago's near north side, Department of Transportation officials revamped a section of North Avenue from Wells Street to Larrabee Avenue. They chose white curbs along this busy stretch of road, with white concrete nosings at median terminations, red brick crosswalks throughout, and concrete planters down the median.

This was one of the first times white cement concrete was specified for a city street project. North Avenue is four traffic lanes wide, with parking on both sides and a combined median/turning lane down the center. Because the street is wide and heavily used, crossing can be dangerous. The white curbs are readily seen by pedestrians and drivers alike, so they improve safety and help route traffic. (See Figure 1.) In one location there is a section of gray cement concrete curb adjacent to white cement concrete curb where you can see a marked difference in visibility. (See Figures 2 and 3.)

Figure 1. The bright white curbs are eye catching, and like pavement markings, help direct traffic. *(70158)*

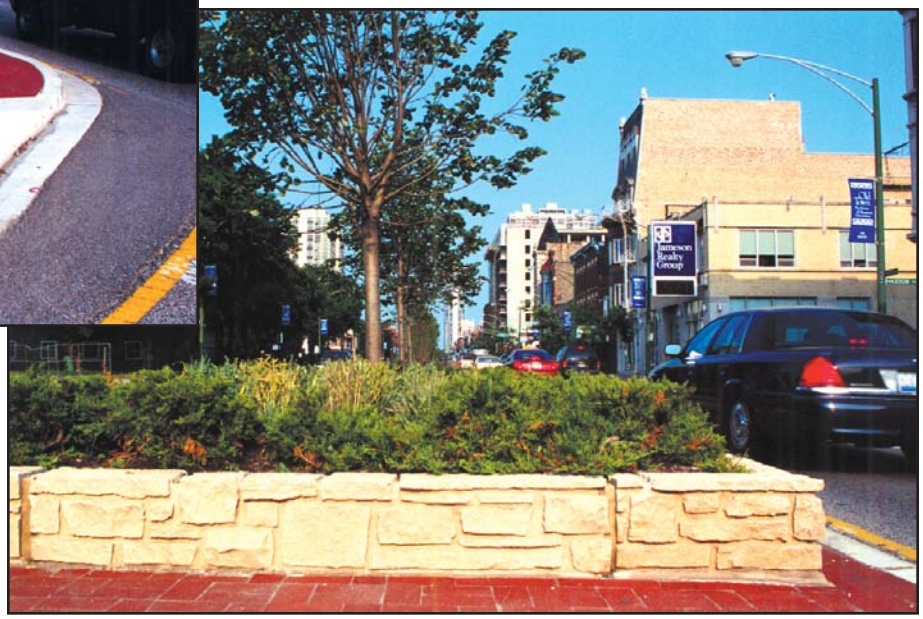
The median is composed of white concrete curbs and nosings, red bricks, and in-ground concrete planter boxes. The white nosings have rumble strips cast into them for added safety. (See Figure 4.) Within the median, concrete planters hold flowers, plants, and trees, creating an appealing environment for residents and businesses alike. Walls of the concrete containers, cast against patterned form liners, resemble cut limestone. The precast planters—a light buff color—are attractive and even add a bit of historic character to the area. (See Figure 5.) White cement concrete provides a neutral tinting base to achieve the right color for an authentic appearance. Decorative concrete is a cost-effective alternative to natural stone materials, which in most cases are too costly for city budgets.



Figures 2 and 3. The difference between white and gray concrete can be pronounced, as seen here in a close-up of adjacent curbs of the two different colored materials. Seen from a distance, the white curb catches the eye while the gray one blends in with its surroundings. *(70159, 70160)*

Figure 4. White concrete nosings channel traffic at the ends of median strips. Even with scuff marks and debris from the street, the bright white color shines through. *(70161)*

Figure 5. Concrete can simulate natural stone materials easily, as seen here on median planters that add character to this city street. *(70162)*



The Yellow Roads of Texas

Roads lined with yellow curbs are appearing in parts of Texas. Drivers can't miss the brightly colored segments, which is exactly what traffic safety engineers want. The low maintenance, passive traffic protection is a simple safety solution.

Figure 6. Yellow curbs on these Texas roads are easy to see and require very little maintenance. *(70163)*

Unlike painted curbs and walks that need regular maintenance, pigmented concrete color does not fade, chip, or peel. Even edges or corners that get damaged show no difference in color. On the other hand, painted curbs and walks start to look bad with age. (See Figures 7 and 8.) In addition, where painted surfaces often become slippery when wet, colored concrete provides traction in wet or dry conditions and poses no slipping hazard.

On Track with Colored Concrete

Another application where white and colored concrete offer substantial safety through improved visibility is railroad crossings. Too often, dark materials are used near tracks. Even during the day these hard-to-see surfaces create potential tripping hazards. Brightly colored concrete, however, not only increases visibility and decreases shadows, it visually calls attention to the tracks and crossing area, even from a distance. (See Figure 9.)

Figures 7 and 8. Painted walks and curbs eventually need to be repainted. This chipped and peeling yellow paint decreases a property's appearance, be it an adjacent building or a city street. *(70164, 70165)*

Figure 9. Railroad tracks that cross at grade are very dangerous. Any means of improving visibility, such as constructing crossings with white concrete, can increase safety. *(70166)*

Traffic Safety: A Solution

White and colored concrete for traffic curbs and medians can effectively improve roadway safety by calling attention to roadway hazards and traffic control devices. In addition, concrete is affordable, easy to install, requires little maintenance, and has a long life.

Certain locations are traditionally dangerous, such as wide streets, intersections, expressway ramp entrances and exits, and bridges. These areas can be problematic for drivers in poorly lit or rainy conditions. However, every structure within the right-of-way can be made more visible if built of white or colored concrete, which provides a higher degree of reflectivity than darker materials, especially at night and when wet.

In addition to improving roadway safety, white or colored concrete appurtenances can be used to beautify neighborhoods and traffic corridors as well.

Figure 10. White portland cement is the key ingredient to making white and colored concrete. For maximum brightness, white or other light-colored fine and coarse aggregates should be used. *(69636)*

Unlike paint, white cement provides permanent color to concrete curbs and medians and reduces the need for maintenance. This saves money and reduces disruption to traffic, satisfying taxpayers and drivers.

Building in Benefits

Concrete made with white cement offers maximum brightness. White cement is a hydraulic cement that conforms to ASTM C 150 and contains a very small quantity of iron oxide (less than 0.50% by mass), which is the compound that imparts the characteristic gray color to portland cement.

Concrete color is added with pigments. Yellow is an effective color choice for traffic safety curbs, but other colors may be desirable. No matter what color is chosen, pigment should meet ASTM C 979 criteria, and the quantity is generally limited to no more than 6% by mass of cement. In most cases, much smaller additions of pigment are sufficient.

White or colored concrete can be batched and mixed in clean truck mixers. It is important that the mixing equipment be clean, as gray concrete might contaminate the color. By planning these projects for the start of the day, when the truck is still clean from the day before, an extra cleaning step is saved. In general, special aggregate is not needed to produce white cement concrete, but light-colored materials are preferable when available. Storage

Figure 11. Pigments for concrete are available in almost every hue. Choose vivid colors to improve safety, or pick up color cues from other items in the streetscape, like buildings, to add architectural interest to the setting. *(70167)*

areas can be arranged to prevent color contamination of cements, pigments, and aggregates.

White or colored concrete is placed and finished like gray concrete. With entrained air, a hard steel trowel finish is not recommended, but rather, a uniform appearance and a non-slip surface can be achieved with a minimum of tooling accompanied by a broom finish. Curing should be started immediately following finishing. Because plastic sheets and water curing can result in uneven color, the best option may be color-matched curing compounds, which are available from some pigment manufacturers.

Go to **www.cement.org/white** for additional resources related to white cement concrete.

Figure 12. Standard placing and finishing techniques are used for white cement concrete, though attention to clean tools and other equipment should be exercised. *(70168)*

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An organization of cement companies to improve and extend the uses of portland cement and concrete through market development, engineering, research, education, and public affairs work.

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