

**STATE OF NEW HAMPSHIRE DEPARTMENT OF TRANSPORTATION
- INTER--DEPARTMENT COMMUNICATION -**

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FROM: William R. Lambert
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SUBJECT: Digitally Printed Traffic Signs

TO: Michael T. O'Donnell
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Memorandum

In recent years, fabrication of traffic signs using digital printing methods has increased, with material vendors, sign shops, and contractors promoting the digital printing systems as a more cost-effective means of sign manufacture. Digital printing offers fabricators the benefits of improved efficiencies that include streamlining the process to manufacture signs, saving space in the sign shop, decreasing the labor requirements, reducing waste, and minimizing the investment in material inventory. In a low-bid project delivery environment, the cost benefits of these efficiencies can be passed along to the agencies.

It is important to recognize that the costs to fabricate traffic signs are only a fraction of the cost to replace or install a new sign. In addition to the fabrication process, the effort also includes the substrate, hardware, delivery of the sign to the project site, mobilization of workers and equipment (sometimes including a crane), police details and other traffic control, and the labor to actually install the sign. In addition, there are costs associated with removing signs if it is a replacement effort, and constructing foundations and supports for new signs. In consideration of these costs, the vast overall inventory of signs on the roadway network, and the significance in size, cost, and functionality of larger signs on freeways and other high-volume arterials, it is important that the vendor products and fabrication methods involving digital printing be carefully considered before being implemented on a widespread basis.

Vendors of sign materials have developed methods of fabrication that involve a specified procedure, typically requiring that the fabricator utilize the vendor's digital printer, ink, sheeting, and overlay film and require the fabricator to follow only that vendor's procedure. Many vendors offer training, warranties, and a program of certification to assure that their procedure is understood and is being followed. These offerings also help the vendor in processing warranty claims.

In reviewing vendor information, we are confident that following state of the art digital printing processes developed by major sign material vendors, also executed under a vendor-approved certification program, can produce a comparable product at the time of installation as compared to "traditional" methods such as cut-out copy, cut transparent overlay films, and screen printing. However, it is difficult even for subject matter experts to confirm that a roadside sign was fabricated under a specific vendor's process - usually a key provision of the warranty.

NHDOT has found that signs fabricated under traditional methods realize a service life of 15-20 years, which varies based on environmental conditions. For example, north-facing signs with less exposure to direct sunlight last longer in terms of color fading and retroreflectivity as compared to south-facing signs. Since vendor warranties often fall short of the 15-year mark, there is a level of risk imposed on the agency relative to the service life of digitally printed signs.

Relative to the long-term performance of digitally printed traffic signs, the inks are the component of greatest concern to us. The colors of a sign (other than white) are determined by the ink digitally placed on the white base sheeting. It is the performance of the ink that determines the long-term color performance of the sign including the contrast/legibility between text/legend and background. Warranty language can be vague relative to color performance, often offers subjective criteria to ascertain failure of the product, and can exclude color from the warranty terms entirely. When this is the case, it can be very difficult to advance a warranty claim with a vendor.

In addition to our concerns involving the warranty language relative to color, warranty periods are often less than the 15-year minimum service life of signs that NHDOT typically realizes with traditional methods of fabrication. While the vendor materials may not carry a 15-year warranty for the traditional methods either, our experience repeatedly confirms that a 15-year period is a reasonable minimum expectation for the service life of a traffic sign. To take an example, over a 50-year period NHDOT would expect a sign to be replaced 3 times. Assuming the digital colors performed within MUTCD specified parameters for 10 years, the signs would need to be replaced 5 times in that same 50-year period, dramatically increasing the cost over time to the agency. This underscores the responsibility of the NHDOT to administer public funds in a sound, well thought out manner.

Lastly on the topic of vendor warranties, it would typically be the vendor's materials and processes that are covered. Meaning that if there were a failure in the digital printing method (either a product or process-related defect), the vendor would refund the purchase price or replace the defective products. This would not likely include the substrate, hardware, delivery of the sign to the project site, mobilization of workers and equipment (sometimes including a crane), police details and other traffic control, or the labor to actually replace the failed sign.

Based on the uncertainty involving the long-term performance of digitally printed signs, subjective warranty criteria, and significant costs involved in providing labor and equipment to retrieve and replace failed signs, it is the decision of the Bureau of Traffic to exclude digitally printed traffic signs from our standard specifications. The cost differential between digitally printed and traditional methods is not significant enough to justify incurring the financial risk associated with the potentially diminished service life of digitally printed traffic signs.

However, with this being said, digitally printed signs may be added to the specification by the Bureau of Traffic on a case-by-case basis by amending the specification for a specific project or other effort. If such a project or effort is identified and deemed appropriate based on our internal review processes to allow digital printing, the specification must be revised to consider approval of specific, documented vendor procedures and fabricator certification criteria.