

Sign Shop and Stock Management

Sign shop and stock management are very important aspects to assure proper signing, reflectivity levels, sign life, and availability in emergency situations. The sign shop must maintain an adequate supply of signs, determine sizes and material types, provide proper storage areas, fabricate signs in emergency situations, and work within budget constraints. Sign shops vary from agency to agency based on population, number of road miles, types of roadways, political structures, and numerous other factors.

The following is a discussion of some basic methods of sign fabrication, storage, and sign inventory management. As mentioned, a sign shop can vary greatly. However, the same goals are true for all: to provide signs that meet today's *MUTCD* standards, are cost-effective for the agency, achieve long life on the roadway, and most important, provide a safe driving environment for the motorist.

The following list contains basic items to consider in the operation of a sign shop:

- Is the method of sign fabrication and storage cost-effective?
- Are personnel available for the planned method of sign fabrication?
- Can the agency support the level of sign fabrication?
- How much storage and space will be required with the process?
- What peripheral materials and supplies are required?
- Are there any environmental concerns with the process?
- Are there any safety concerns involved?
- What will the final product accomplish?

Sign Materials

To understand the basics of sign shop and stock management, we must consider the different materials used in sign fabrication. Signs are available in a variety of materials for their

various parts. These include the retroreflective sheeting (background), the legend (foreground), and the substrate on which the sign is placed. Further discussion of sign materials can be found in the article "Signs" (C1) in this manual.

Substrate. The substrate gives a sign rigidity and can be made from various materials including steel, aluminum, wood, and several types of plastics. Each material has advantages and disadvantages.

Sheeting Material. The sheeting material covers the substrate and is typically the background color of the sign. Some signs are designed with reverse colors so that the actual sheeting material becomes the letter material when an extra film or silk screen ink covers the remainder of the sign. These are known as "reversed" signs.



**Standard foreground and background
(not a standard sign)**



**Reversed background using white sheeting and
green film**

Sheeting material is available in different levels of retroreflectivity and quality. Retroreflectivity is what makes light return from the sign to the driver and is especially important for night driving. See “Signs” (C1) in this manual for different levels of retroreflectivity and possible uses.

Legend. The legend of the sign transfers the information from the sign to the motorist. Legends can be words or symbols. Established standards for symbols and word messages should be followed when fabricating or purchasing signs. Do not use nonstandard signs or symbols. Chapter 1A of the *MUTCD* contains lists of acceptable and unacceptable abbreviations for use on signs.

A publication of the Federal Highway Administration, *Standard Highway Signs*, shows the proper design details of roadway signs. The manual also provides information on the proper dimensions for lettering and sign sizes for



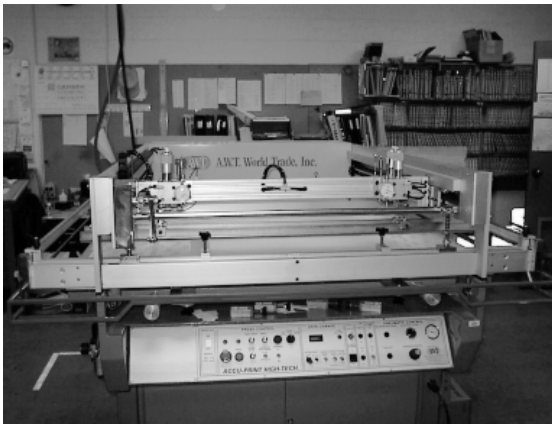
Automated sheeting installation unit

different types of roadway environments. See “Signs” (C1) for more information.

The legend on a sign can be produced by several methods. The method used is dependent on the equipment the agency owns, the quantity of signs needed, the size of the sign, and the urgency with which the sign is needed. The table below lists several methods for producing sign legends.

Sign legend production methods

Method	Typical Use	Equipment Required	Advantages/Disadvantages
Hand Layout	Emergency signs, street name signs	Precut letters	Minimal investment, stocked letters deteriorate, slow process, small quantities only
Die Cutting	Emergency signs, street name signs	Dies, press	Considerable investment, limited by different die sets, considerable storage for die sets, little material waste
Computer Cutter/Plotter	Emergency signs, everyday use signs, street name signs	Computer and software, cutter/plotter, “clean room”	Highly flexible, make almost any type of sign, considerable material waste, high cost for warning/regulatory
Silk Screening	Bulk sign production	Silk screen area, cleaning facility, UV screen burner, drying racks	Lowest cost per sign, considerable initial investment, equipment and clean up areas, fumes and flammable materials



Automated silk screen machine



Assortment of cutting dies



Computerized cutter/plotter unit

Shop and Stock Management

The larger the agency, the more complex shop and stock management becomes as many more types of materials and signs are needed. Smaller jurisdictions typically require fewer signs and consequently can utilize simpler stocking methods and storage areas.

Generally, smaller agencies may not produce any signs, buying them from an outside source instead. Therefore, the only portion of the product that requires inventory or management is that of signs and supports. However, a large facility must manage inventories of blank substrates, sheeting materials, cutting films, silk screen inks and cleaners, highly complex equipment, and computer systems, in addition to the finished signs.

A very small agency could conceivably stock all signs in a sign truck. However, small agencies may not have a truck dedicated to traffic control, so storage in racks may be necessary.

Storage racks can be designed in many shapes and sizes. Some racks use dividers for groups of signs; others use individual supports for each sign. Individual supports for each sign work well for small signs but are not always practical for larger signs. Whatever type of storage system is used, be sure the rack is strong enough to support the total weight of the signs. Even if an individual sign is not heavy, several hundred signs can weigh several thousand pounds. In addition, be sure the surface of the signs will be protected in the storage system. Signs stored together should be protected with slip sheets or other protective coverings.



Typical sign storage unit

Stocking and Fabrication Practices

Small Agencies. A small agency, such as a small town, has no more than a few hundred

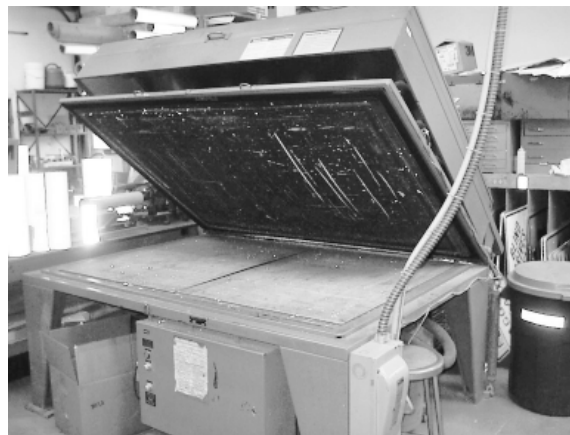
signs. In this situation, all signs will be purchased, because fabrication is not practical. However, it would be good practice to keep enough signs in storage to replace signs that have been knocked down, vandalized, or removed. Critical signs to have in storage are Stop, Yield, and any warning signs that may be critical. Another way of maintaining signs in a very small community is to contract with either a vendor or larger political subdivision, such as the county. This practice eliminates the need for stocking materials.

If an agency chooses to maintain and install its own signs, the agency should remember the following guidelines:

- Install signs that meet *MUTCD* standards.
- Use retroreflective sheeting where required.
- Avoid specialty signs, such as Children at Play.
- Keep only enough signs in the inventory to address emergencies.
- Store signs in an area where they will be protected from abrasion, dust, excessive heat, and sunlight.

Medium Agencies. This category includes cities with population up to 5,000 and counties of average size. An agency in this category may have a thousand or more signs under its jurisdiction and staff in charge of signs and other local functions. These agencies would stock enough signs to replace those that are fading or have been knocked down, vandalized, or removed.

Again, as with the small jurisdictions, an agency of medium size may find that fabrication is not practical. However, if the agency wishes to fabricate a few specialty signs each year such as No Parking signs, a small assortment of precut letters applied with either a vacuum-heat activation machine or a small roller press may be practical. (Note: The vacuum-heat activation machines are becoming obsolete as most signs are now made with pressure sensitive legends and lettering.)



Typical vacuum/heat sheeting applicator

If precut lettering is used, small cabinets or boxes should be used to store the letters. The stock of letters must be rotated as the letters have a limited shelf life. Use “first in, first out” inventory practices to keep stock fresh. The local agency can order completed signs with borders, but no legend, which results in greater efficiency if only a few signs are needed.

Medium-Large Agencies. This category includes 5,000 to 50,000 populations. Agencies of this size usually have at least one person assigned to sign maintenance full-time. On the higher end of the scale, an agency may have several full-time sign personnel, including one in charge of fabricating and/or maintaining the sign inventory stock.

Agencies of this size may maintain from 1,000 to 20,000 signs. Assuming that the average sign lasts for ten years, an agency with 20,000 signs will replace approximately 2,000 signs per year for maintenance purposes alone. With additional sign revisions, work zones, new streets, knockdowns, vandalism, and stolen signs, replacements could increase to about 3,000 signs per year. This number is significant and a reasonable stock of signs must be maintained to have signs available when needed. At 3,000 signs per year, an average of 60 new signs could be required every week.

A major concern for an agency of this size is maintaining adequate sign stocks and the flexibility to make specialty signs as needed. All signs can be purchased from an outside source. However, a larger agency will continuously require specialty signs. With enough planning, an agency could order even the specialty signs from a vendor that can guarantee delivery of the signs within a day or two. However, for most cities and counties, this method is not practical.

Many agencies are now using a combination of stocking standard signs made by an outside vendor and having a system such as a computerized cutter/plotter to make specialty signs and/or street name signs. Some agencies in this population group may elect to make all signs. However, total sign fabrication requires extensive materials and equipment. Three levels at which a sign shop can be stocked are listed in the following table.

Sign shop options

Equipment	Completed Signs/ Sign Types	Substrates/Sheeting	Legend Material
Level 1			
-	All warning and regulatory	Aluminum with high-intensity sheeting	-
Small squeeze roller system	Specialty parking, information, etc.	Completed aluminum sign blank with engineer grade sheeting	Precut letters
Level 2			
-	Common warning and regulatory signs	Aluminum with high-intensity sheeting	-
Squeeze roller system	Specialty parking, information, etc.	Completed aluminum sign blank with engineer grade sheeting; small amount of high intensity for specialty signs	Die-cut letters
Level 3			
-	Stop and Yield signs	Aluminum with high-intensity or diamond-grade sheeting	-
Pressure roller unit with air cylinders	Completed aluminum blanks with sheeting	Aluminum blanks in standard sizes; engineer grade, high-intensity and diamond-grade in all standard colors	-
Computerized cutter/plotter	Street names, specialty, regulatory, and warning signs	-	Electro-cutting film

Large Metropolitan Agencies. The practices of large metropolitan facilities can also vary greatly. However, as the total number of signs and particularly specialty signs increase, flexibility and productivity become key factors. Standard signs can be computer-generated but are typically produced by silk-screening. Silk-screening provides very high production rates and quality. However, silk-screening requires a considerable investment in equipment and involves many environmental concerns. The process should be undertaken only after considering these factors. Please refer to comments on “nesting” in the article “Signs” (C1) in this manual.

Storage of Materials and Completed Signs

As noted previously, the size of the agency influences the level of sign production. With each added method of sign fabrication, additional storage is needed for sign materials and equipment. A large facility will require storage for sign blanks, sheeting, silk screen inks, electro-cutting films, transfer tapes, and many different types of application equipment. Storage space must be a factor whenever a process for sign production is considered. See the illustrations on the next page for examples of storage systems.

Sign fabrication considerations

Equipment	Completed Signs/Sign Types	Substrates/Sheeting	Legend Material
-	Stop and Yield	Aluminum with high intensity or diamond grade sheeting	-
Pressure roller with air cylinders	Completed aluminum blanks with sheeting	Aluminum blanks in standard sizes; engineer grade, high-intensity and diamond-grade in all standard colors	-
Computerized cutter/plotter system	Street names, specialty, regulatory, warning	Aluminum or plastic for special signs	Electro-cutting film, rubyolith film
Silk screens, UV developer, dark room, production unit, drying racks	Warning, regulatory, and street name	Aluminum with engineer-grade, high-intensity, or diamond-grade sheeting	Screen inks
Automated sheeting applicator	-	Aluminum with any of the different sheeting types	-



Storage for rolls of sheeting material



Sign separators in storage truck

**Note: When storage requires supports on top and bottom similar to this vehicle rack, use plastic rather than wood for dividers. Plastic does not swell like wood and tends to have fewer problems with breakage and splintering.



Storage for sign blanks



Small sign truck

Note sign storage cabinet in front of box



Truck storage compartment for completed signs



Sign storage cabinets on medium-sized truck

(This page is blank.)