25.3.1 Design Process

In the dynamic trailblazer design process, the designer must follow several steps to ensure successful implementation and proper operational capabilities. Some of these steps, such as power and communication requirements, must be addressed early in the design process and not after design for the proposed location has been completed. Each of these steps is detailed further in subsequent sections of this chapter.

1. Collect initial data required for the proposed dynamic trailblazer design location (see 25.1.2)
2. Establish corridor operations plan for proposed trailblazer deployment (see 25.1.2.1)
3. Assign Name to Dynamic Trailblazer Device (see 25.2.1)
4. Determine the location of the dynamic trailblazer assemblies and controller cabinet. (see 25.3.1 and 25.3.2)
5. Begin the process to establish electrical service for the proposed location with the local power company. This should be done early in the design process to establish an acceptable electrical service location.
6. Prepare the underground infrastructure, including conduit and pullboxes (see 25.3.3)
7. Perform cable routing to provide hardwire interconnection between the controller cabinet and trailblazer devices such as signals, electrical service, etc. (see 25.3.4)
8. Determine the communications medium used for the proposed location (see 25.5.3)
9. Revisit steps 3 through 8 until final design is complete
10. Coordinate and conduct outreach with local agencies surrounding the proposed corridor.
11. Determine the construction details, special provisions, and standard specification bid items need for the proposed design along with those that need to be modified and created to provide a complete construction plan (see 25.5.4 and appendix 70)

25.3.2 Site Design and Equipment Placement

When the initial data collection and corridor operations plan is complete, the site design and equipment placement can be performed. Typically, two separate static route markers are placed on an approach to the intersection. Dynamic trailblazer assembly placement follows this static sign placement methodology. Per approach, one assembly is placed upstream of the intersection, with a second assembly placed at the intersection. This placement is indicated in Figure 25.1-2, with photo examples of each placement shown in Figure 25.3-1 and Figure 25.3-12.

Figure 25.3-1: Trailblazer Placement at Intersection

Figure 25.3-2: Trailblazer Placement Upstream of Intersection

25.3.2.1 Assembly Layout and Housing

Dynamic trailblazer assemblies consist of three components: a static route marker sign, an electronic "BYPASS" blank-out sign, and an electronic sign which has directional arrows that change dependent upon the current condition of operation in the corridor. An example of a dynamic trailblazer assembly is shown in Figure 25.3-3.

Housing design will vary dependent on size and type of assembly under consideration.

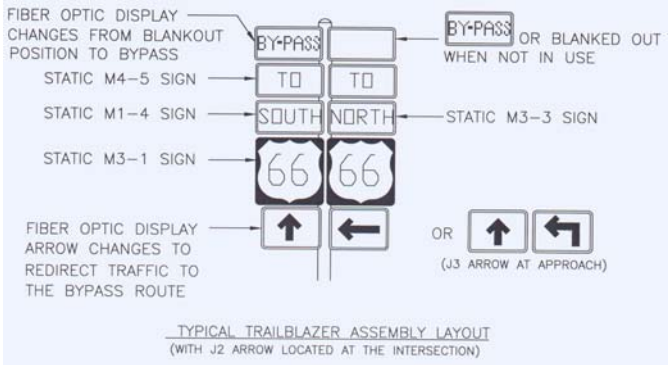

Figure 25.3-3: Dynamic Trailblazer Assembly Layout

It is important that the following site design issues be taken into account when placing the trailblazer assemblies:

- **Existing Utilities** - Using the utility information gathered under the data collection step of the design process, **proper clearance between the pole foundation (base) and existing utilities must be maintained.** It is important to note that standard utility locate tolerances are +/- 18-inches from the located paint mark.
- **Clearance** - A minimum of 18-inches must be maintained from the vertical plane of the existing curb and the closest portion of the sign assembly. In addition, if placing the assembly between existing curb and sidewalk, clearance of the sidewalk must also be maintained. In narrow installation areas, a mounting configuration as shown in Figure 25.3-4 can be used.
- **Existing Signal Displays** - Clear line-of-sight on traffic signal displays must also be maintained when placing these assemblies. It is very important that the designer carefully review this issue, since it may not be evident initially that the placement of the trailblazer assembly will occlude the traffic signal display. This issue is important not only for the intersection placement, but also for the upstream placement.
- **Existing Pole Mounting** - When mounting trailblazer assemblies to existing poles (as shown previously in Figure 25.3-1), a thorough structural review must be conducted. This review **must be coordinated through the Region Structural Engineer**.

Figure 25.3-4: Alternate Mounting Configuration in Narrow Clearance Areas

25.3.3 Cabinet Placement

The placement of the controller cabinet includes the following:

- Distance between the controller cabinet and the trailblazer.
- Accessibility for maintenance vehicles whenever possible.
- Safety of the cabinet location.
- Grades.

The slope of the terrain for cabinet placement must be no steeper than 4:1. Placement of the cabinet on 3:1 slopes or steeper require grading provisions to provide a level area around the cabinet.

Pole Mount Cabinets may be used if a controller cabinet size or capability is not needed. These cabinets are mounted directly to the pole. The pole mount cabinet has enough space to house electric service, a video encoder, and other communication equipment. Conduit is run from the bottom of the pole mount cabinet to the nearest pullbox or vault.

25.3.4 Underground Infrastructure

When the controller cabinet and trailblazer assemblies have been placed, the underground conduit infrastructure can be designed. Issues to keep in mind when designing the dynamic trailblazer conduit infrastructure include:

- Conduit Size - 3-Inch conduit is typically used for sign cables, since a) cost savings between 3-inch and smaller diameter conduits is minimal, and b) 3-inch conduit may provide for greater future expansion depending on the number of cables and % fill of the conduit. 2-inch conduit **must be used** when entering electrical service (meter) pedestals.
- Conduit Fill - The size and number of conduits along a run is dependent on percentage of fill as established by the National Electric Code (NEC). For new conduit installation, the percent fill must not exceed 31%. For installation of cable in existing conduit, 40% of the available area may be used.
- Pull Box Spacing - Pull boxes should be spaced approximately 200 feet apart. If
- Directional Bore - For conduit installation across paved areas, two methods of installation can be used, open-cut or directional bore. Open-cut conduit is strongly discouraged (and at times prohibited) due to new pavement conditions and roadway integrity. When designing **directional bore crossings**, consideration must be given to the installation process. When directionally drilling (bore), an auger is sent first underneath the pavement between two points, and then pulled back with the assembled conduit. In consideration of this, conduit must be assembled and laid out prior to being pulled back. In order to perform this task, adequate room must be available to “lay out” the conduit.

25.3.5 Cable Routing

Cable routing for dynamic trailblazers involves the connection of all equipment to the controller cabinet, including the signs and electrical service electrical service. Other devices such as cameras (see Chapter 15) may be added to a dynamic trail blazer site and require cable routing as described in their respective chapters. The size and type of service conductors to the sign are largely dependent on the sign requirements and distance from the power source (cabinet). If running communication cable in the same conduit system as the service conductors or power distribution wires, these should not be mixed together in the same conduit.