cept. Showing clearly why a site was selected and how it will be used is essential at public hearings and other presentations. A well-rendered concept plan as will be highly useful both in oral presentations and for publication purposes. The concept plan is a good means of conveying design development to readers of environmental documents and project design reports.

D. Environmental Documentation

The *National Environmental Policy Act* and its implementing regulations require that development of a federally funded project include consideration of environmental impacts, consideration of alternatives, and their documentation in an environmental document. Level of environmental documentation is determined by the extent of the impacts. There are three types of environmental documents:

Environmental Impact Statement (EIS). Projects having significant environmental impacts require a draft EIS and a final EIS.

Categorical Exclusion (CE). A project determined clearly to have no significant environmental impacts can be processed as a CE. Documentation may have to demonstrate that no significant environmental impacts will result from project construction.

Environmental Assessment/Finding of No Significant Impact (EA/FONSI). Projects where the significance of environmental impacts is unclear require preparation of an EA to determine the appropriate environmental document required. If the EA identifies no significant environmental impacts, the final environmental document is a FONSI. If significant impacts are identified, both a draft EIS and final EIS must be prepared.

It is anticipated that most rest-area projects will be processed as categorical exclusions, although for some an EA/FONSI may be necessary if level of impacts is unclear without further study and coordination. Public-hearing requirements must also be met at both the state and federal levels. FHWA approval of the CE, FONSI, or final EIS constitutes environmental and location approval of the proposed project, after which survey and final design can begin.

CHAPTER 4

Design: Site Development and Details

A. Aesthetics

The underlying principle of highway design is that form expresses its function of moving people and goods safely and quickly between two points. Designers also agree that the highway should have a pleasing appearance. Ideally, these two principles should be united, but often they are not. Rest areas, as part of overall highway design, should express their functions as well as have a pleasing appearance. These are places where travelers stop along highways, where other functions of the road can also be revealed, such as geographic or economic gateways. They provide opportunities to showcase and clarify functions and attributes not easily presented along a linear highway. They can be subtle, inconspicuous attributes of the highway or commanding, significant statements of regional interest (Figure 20).

Does the state or region have or want a unique identity or signature? Should each rest area be unique or should all be similar? The same basic layout and design may be appropriate for all sites in a particular state or region to assure traveler recognition. Others may desire specific designs to characterize particular locations, creating a sense of place. Visual aspects of the site should to be considered when starting design. Is it to be an inconspicuous highway element, blending harmoniously into the roadside, or should it stand out and invite visitors to stop and consider the locale? Are structures to be hidden from nearby properties and approaching mainline vehicles, or should structures and lighting stand out from the approaching viewshed? These decisions depend on policies of the transportation agency, commitment to tourism, and preferences of local policymakers in determining function and form of a rest-area system.

FIGURE 20. Example of regional rest-area design (Photo Courtesy of Minnesota Department of Transportation).

What happens in the rest area? Are police present? Has it a role as a tourist information/regional gateway? Where are lawnmowers and snowplows stored? Is a lottery being promoted? Are fishing and hunting licenses dispensed here? Functions may dictate look of structures or site layout. If scenic or natural uniqueness of a region is to be celebrated or explained, then a conspicuous rest-area site and building(s) may be strongly emphasized within the indigenous landscape and architecture. Site and structures may be designed to conform so well with the landscape that they do not appear as separate entities. Selection of materials and appurtenances will affect rest-area aesthetics. Wood versus concrete, high-mast lighting versus pedestrian-scale fixtures, native vegetation versus non-native ornamentals, all play roles in a site's look and feel.

B. Site Development

Through good design, site features can be arranged to support and augment pedestrian activities. Rest areas are not collections of roads, ramps, parking areas, and buildings, but rather systems of structures, surfaces, spaces, activities, and details. H. M. Rubenstein in his *Guide to Site and Environmental Planning* (1969) defines the designer's role as "organizing vehicular and pedestrian circulation, developing a visual form and materials concept, readjusting the existing landform by design grading, providing proper drainage, and finally developing the construction details necessary to carry out the project." When these design elements are combined in the design process, the public will recognize their experience as pleasant and positive.

1. Geometrics of Entry and Exit Ramps

Traffic should be directed from or into the mainline according to typical ramp terminal designs used at freeway interchanges and as shown in the current version of the "Green Book". Both tapered and parallel designs are applicable (Figure 21). Ramp terminals should be developed on tangent sections of mainline highways for safety and operational reasons. Developing ramp terminals connecting to a mainline curve to the right is an acceptable design feature. However, ramp terminals adjoining a mainline curve to the left should be avoided. Also, terminals should be properly spaced in relation to nearby interchanges.

FIGURE 21a. Tapered ramp design.

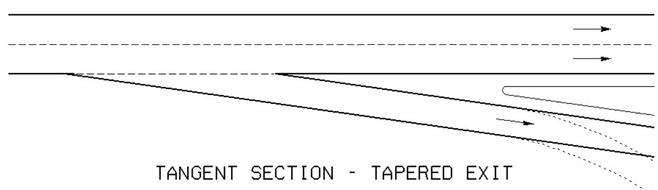
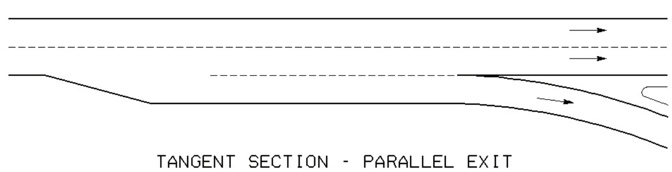


FIGURE 21b. Parallel-type ramp design.



Adequate sight distance should be provided along the mainline to the gore nose of an exit ramp terminal. This affords time for travelers to decide whether to exit to the rest area and to make necessary lane changes. To improve safety and traffic operations at exit/entrance ramp terminals, full-pavement depth stabilized shoulders should be located adjoining these terminals pavements.

Entrance ramp terminals and the ramp layout beyond the terminal should be designed to provide sufficient separation between the mainline traveled way and on-site parking. This distance will discourage motorists from stopping on the mainline and walking over to the rest-area facilities. A minimum buffer width of 10 m (30 ft) and desirable separation of 50 m (150 ft) are recommended.

Ramp layout beyond the entrance ramp terminal may be on a tangent section, on a set of compound curves, or on a set of reverse curves. Specific ramp design depends on the proposed layout of parking areas and the amount of right-of-way available within the rest area. When using compound or reverse curves, the second curve should be designed as flat as possible. In both these situations, the most desirable design for the second curve is to provide a curved alignment requiring only a normal cross slope for drainage and no superelevation. Avoiding superelevation eliminates the potential problem of excessive crossover crown and rollovers where the entrance ramp splits into separate roads for cars and trucks.

With entrance ramp layout, sufficient distance must be provided between the gore nose of the entrance ramp terminal and the point where the ramp splits into two separate roads. This distance is important as it allows drivers to decelerate comfortably from mainline highway speeds to desirable lower speeds within the site. Providing sufficient distance also allows proper use of advance guide signs along the entrance ramp telling drivers which road to take before the ramp splits.

2. Grading and Drainage

Grading involves working with topography in developing a site to allow construction and adequate drainage for entrance/exit ramps, parking areas, structures, and pedestrian facilities. Grading can be highly effective in creating interesting variations within use areas that are both pleasant to experience and functional. The design goal is to take maximum advantage of existing topographic features, and minimize grading impact on environmentally sensitive areas. Grading should reflect site topography, accentuate landforms, or provide smooth transitions between existing and proposed topographic features. Site grading can also assist drainage. Runoff should be directed away from pedestrian walkways and use areas. Site grading and landscaping can be cost-effective, low-maintenance tools to direct runoff without appearing unnatural. Slopes that will appear comfortable should be in the range of 1:4 or flatter, and changes in elevation should be gradual. In certain situations, crisp mounds along walkways can reinforce circulation patterns. These landforms may have 1:3 slopes or steeper. The designer should be guided by site topography and the design concept originally developed for the site. Good judgment and understanding of the site will dictate the final form of site grading.

Movement of earth can have significant impact on visual perception of the site. With well-conceived site grading, spaces and views can be defined to control what the motorist and pedestrian may see. Views can be screened and landforms used to give a visitor a sense of direction. Two common techniques of developing detailed grading plans are the cross-section and contour methods. To ensure that proposed grading is sensitive to site conditions, the contour method is recommended in developing grading and drainage plans. Contour grading is the best way to depict patterns and special features for a site. This method helps to best visualize existing and proposed landforms in three-dimensional perspective.

Drainage ditches are important elements of the grading design process. Where hydraulically possible, ditch depths should be 1.5 m (5 ft) or less. Shallow ditches simplify blending them into existing landforms, and prevent them from becoming visually obtrusive. Construction of drainage ditches within the major-use area should be avoided. Instead, subsurface-drainage systems, such as catch basins and drainage pipes, are recommended to control water flow within both major-use areas and curbed parking lots. Initial construction for a subsurface system can be costly, but compared with the free use of unobstructed space and free access across the site without ditches, these costs are reasonable.

In addition to drainage structures, other drainage and erosion-control measures should be considered, including riprap, sediment ponds, and special drop structures. Where heavy hydraulic flows are anticipated, riprap is often required. When used, negative visual effects of riprap should also be considered. An effort should be made to harmonize riprap with its environment by varying stone size, planting trees and shrubs within the riprap, or topsoiling and seeding portions of the riprap with grasses. All these techniques have been used successfully in rest areas. Use of drop inlets and sediment ponds is less common. These features should be incorporated into the overall design concept. Architecturally, drop structures should be consistent with other structures on the site. Ponds should blend with detail grading around the rest area.

Curbs and gutters are often used in parking lots. Parking-lot pavement should be sloped so it drains away from walkway access and from parking spaces established for persons with disabilities.

Because grading and drainage require removal of vegetation, the designer should carefully consider erosion control as part of grading design. Earthwork may require permits, such as a National Pollution Discharge Elimination System permit. AASHTO's *Highway Drainage Guidelines* (2000) provides guidance that should be considered during rest-area planning and development. These guidelines are not meant to override any state or local requirements, especially if those are more stringent.

3. Parking Layout and Paving Design

Parking lots should be only as large as required by design calculations while also providing a logical circulation pattern. Separate lots should be provided for trucks, with appropriate access and circulation patterns. Oversized lots can confuse motorists and appear harsh and uninviting as drivers approach buildings. Where scale of a lot is very large or linear, landscaped parking bays and islands should be considered to soften the expanse of pavement and reduce its visual impact. Some examples of different site layouts are shown in Figures 22, 23, and 24.

FIGURE 22. **Parking layout.**

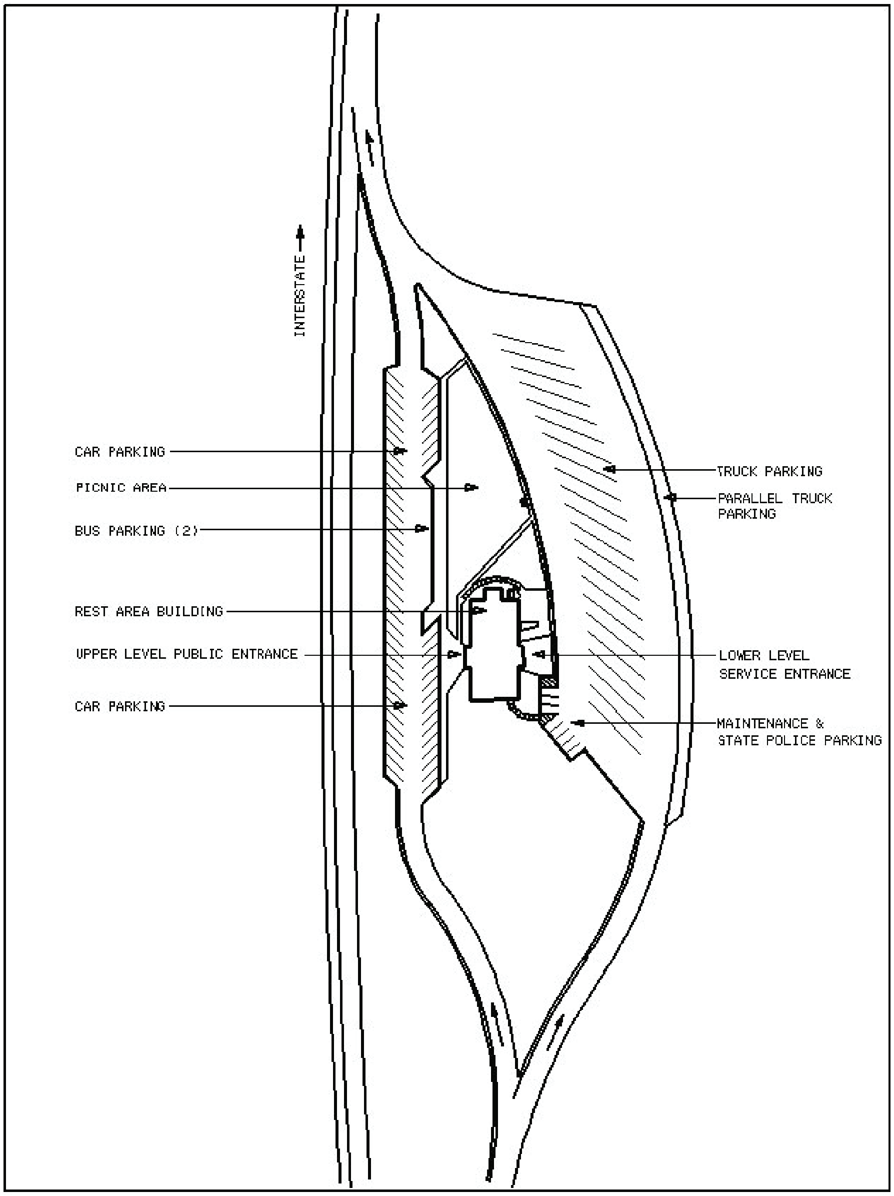


FIGURE 23. **Parking layout.**