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Department of Transportation

Division of Design

Office of Geometric Design Standards

DESIGN CHECKLIST

FOR THE DEVELOPMENT OF GEOMETRIC PLANS

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DESIGN CHECKLIST

FOR THE DEVELOPMENT OF GEOMETRIC PLANS

DATE: _____

DIST-CO-RTE-PM/PM: _____

SOURCE No. - EA: _____

Description: _____

Engineer: _____

Disclaimer Statement

This checklist is **NOT** to be used as a substitute for the Highway Design Manual (HDM) and intentionally does not address all design policies, procedures, and standards (mandatory, advisory, procedural, permissive, etc.) discussed in the HDM.

INSTRUCTIONS:

- This checklist should be used during the development of the geometric plans for highway projects. To properly use this checklist for a project, the pages prior to this page are to be removed and this page is to be used as a cover sheet.
- This checklist is to be used in conjunction with the Sixth Edition of the Highway Design Manual (HDM), Design Information Bulletin (DIB) 77, DIB 79, and DIB 82.
- References to the pertinent HDM sections are shown in brackets following the question.
- The following abbreviations and format are used in this checklist - -
  M = Mandatory Design Standard; HDM Reference in bold text
  A = Advisory Design Standard; HDM Reference text in italics
- Some items in the checklist may not apply to every project.
- Questions in Section 1.1 answered with "no" require an explanation in the space below the question and, if deviations from mandatory or advisory standards result, the appropriate approvals are to be obtained and the engineering decisions documented appropriately.
- Design features or elements that deviate from mandatory standards require approval of the Chief, Division of Design. This approval authority has been delegated to the Design Coordinators, except those in Chapters 600 thru 670, which have been delegated to the Chief, Office of Pavement Design. [**M: Index 82.2(1)**]
- The authority to approve exceptions to advisory standards has been delegated to the District Directors. [*A: Index 82.2(2)*]
- The remaining design standards listed are permissive and engineering decisions related to them should be documented in the project history files.

1.0 Basic Design Criteria

These Design Standards and Criteria are to be established prior to Geometric Plan development.

1.1 Design Speed and Sight Distance Criteria [M: Topic 101 and Topic 201]

HDM Index 101.1 should be read before selecting a design speed. Design speed selection will affect sight distance, vertical alignment, horizontal alignment, and other requirements. Projects with multiple roadways will require multiple entries.

1)	Proposed Design Speed for project:	
2)	Minimum Design Speed for this type of facility (See Topic 101.2):	
3)	Design Speed of roadway segment prior to project:	
4)	Design Speed of roadway segment after project:	
5)	If an existing facility, what is the posted speed (mph)?	
6)	If an existing facility, what is the operational speed (85th percentile or some other observed value)?	
7)	Does the Design Speed meet or exceed the minimum Design Speed? [**M: Index 101.1**, **Index 101.2** and **Table 101.2**] and [*A: **Index 101.1***]	
8)	Does the Design Speed meet or exceed the posted and operational speeds?	
9)	Is the Design Speed within 10 mph of the roadway segments before and after the project?	
10)	Do the Design Coordinator, Design Reviewer, and District Traffic Unit concur with the selected design speed?	
11)	Has the Design Speed been discussed and concurred with by the Local Agency Representative on the Project Development Team (as applicable)?	
12)	Are the Design Speeds documented in an engineering report, such as a Project Study Report (PSR) or Project Report (PR)?	

1.2 Design Period (See Index 103.2)

1. What is the Design Period for this project?

   _____ years after construction completion; which is assumed to be 20__ __

   Note: Do not base solely on the year for which forecasted traffic is readily available.

2. If a period other than 20 years is selected (except for Safety, RRR, or operational improvement projects), have the following individuals concurred and approved?

   a. Design Coordinator

   b. District Director

3. The Design Year is _____ .

1.3 Design Capacity (See Index 102.1)

What Level of Service (LOS) is to be maintained over the Design Period? List the various highway facilities and their LOS below. State the basis for the selected value.

- Highway Facility (mainline, ramp, local road, etc.); Design Year / LOS

  a.

  b.

  c.

1.4 Pedestrian Facilities (See Index105)

1. Have suitable pedestrian facilities been provided for anticipated pedestrian demand that is based on existing and projected land uses?
2. Are these facilities fully accessible? (See Design Information Bulletin 82 for details.)
3. Where sidewalks are planned on overcrossing structures, has an area been provided for future sidewalks where they are not now warranted? (See Index 105.1(4))

1.5 Design Vehicle Selection (See Index 404.2)

In accordance with Index 404.2, determine which Design Vehicle is to be used as the basis of intersection design. The designer must first determine if each highway facility within the project is on the "National Network" created by the Surface Transportation Assistance Act (STAA) of 1982. Indicate one of the following:

STAA _____, California _____, Bus _____

1.6 Storm Water Management (See Index 110.2)

1. Have temporary and permanent storm water control measures been appropriately considered and/or incorporated into the project?
2. Has a Storm Water Data Report been prepared?
3. Have costs and right of way needs been addressed for the storm water best management practices?

1.7 Fencing

Have acquired access rights been controlled with fencing or other means?
[**M: Index 104.4** and **Index 701.2(1)**]

2.0 Geometric Design Criteria

These Design Standards and Criteria are to be incorporated into the Project's Design.

2.1 Vertical Alignment

1. Sight Distance Criteria:
   a. Is the project devoid of sustained downgrades steeper than 3% and longer than 1 mile? If not, has the Stopping Sight Distance been increased by 20%, and then, used to design the affected highway segment? [*A: Index 201.3*]
   b. Does each crest vertical curve provide the required Stopping Sight Distance? [**M: Index 201.1** and **Table 201.1**]; (Also See Index 201.4 and Figure 201.4)
   c. On two-lane highways, does each crest vertical curve provide adequate passing sight distance where it is economically feasible to obtain it? [**M: Index 201.1** and **Table 201.1**]
   d. At each sag in grade, does the length of vertical curve provide headlight sight distance? [**M Index 201.1** and **Table 201.1**]; (Also see Index 201.5 and Figure 201.5)
   e. If no, has lighting been considered as mitigation? (See Index 201.5)
   f. On freeways and expressways, is decision sight distance provided at lane drops and at off-ramp noses? [*A: Index 201.7*]
2. Grade Standards:
   a. Does the entire profile grade comply with the maximum grades specified in Table 204.3? [**M: Index 204.3**]
   b. Does the profile grade exceed the minimum grades of 0.5% for snow country and 0.3% at other locations? [*A: Index 204.3*]
   c. Do ramp grades comply with the maximum grades? [*A: Index 204.3* and *Index 504.2(5)*]
3. Vertical Curve Criteria:
   a. Do the lengths of the vertical curves equal or exceed:
      1) 10V, if the Design Speed is ≥40 mph and A is ≥ 2%? [*A: Index 204.4*]
      2) 200 feet, if design speeds are <40 mph or A is < 2%? [*A: Index 204.4*]
   b. On 2-lane highways, are the crest vertical curves less than ½ mile in length? (See Index 204.4)

4. Climbing Lane Requirements:
   a. If the profile grade has sustained upgrades exceeding 2% where the total rise exceeds 50 feet, has the need for a climbing lane been investigated? (See Index 204.5(2) and Figure 204.5)
   b. If determined to be necessary, has the Headquarters Traffic Liaison reviewed the design of the climbing lane? (See Index 204.5(3))
   c. Is decision sight distance (See Table 201.7) provided at climbing lane drops on freeways? [*A: Index 204.5(2)*]
5. Structure Grade Lines:
   a. Have the structure depth, falsework depth and vertical clearance requirements been provided for in the profile design? [**M: Index 204.8** and **Table 204.8**]
   b. Where grade lines are depressed under structures, has the sag been designed at a location to avoid conflicts between the structure footings and the drainage facilities? (See Index 204.8(3))
   c. Where the grade line on a bridge is constant or tangent, is the grade 0.3% or greater? (See Index 204.8(4))
   d. Where the grade line on a bridge includes a vertical curve, is there a fall of at least 0.05 foot per station and does the stated minimum grade (See Index 204.8(4)) extend for a length of no more than 100 feet?
   e. Is the falsework vertical clearance over open traffic lanes at least 15 feet? [**M: Index 204.8(5)**]
6. Local Roads:
   a. Do the local roads within the State Rights of Way with connections to freeways or expressways satisfy State highway design standards except for shoulder width? [**M: Index 204.1**]
   b. Do the local roads without connections to freeways or expressways satisfy AASHTO vertical alignment standards (or local standards that exceed AASHTO)? [**M: Index 204.1**]

2.2 Horizontal Alignment

1. Do all the curve radii exceed the minimum values listed in Table 203.2 for the appropriate Design Speed? [**M: Index 203.2** and **Table 203.2**]
2. Is the minimum Stopping Sight Distance provided at each horizontal curve? [**M: Index 203.1**]; Also, (See Figure 201.6) and [**M: Index 201.1** and **Table 201.1**]
3. If central angle is less than 10 degrees, is the curve length 800 feet or greater? (See Index 203.4)
4. Is the curve length on 2-lane roads between 500 feet and ½ mile? (See Index 203.4)
5. Where compound curves are necessary, is the shorter radius, R1, at least two-thirds the longer radius, R2 (when R1 < 1000 feet)? On one-way roads does the larger radius follow the smaller radius? [*A: Index 203.5*]

6. Is the intervening tangent between reversing curves long enough to accommodate the standard superelevation transition runoffs? [*A: Figure 202.5*] If not, is it at least long enough for the 6% maximum per100 feet rate of change? [*A: Index 203.6*] When feasible, is 400 feet of tangent length provided at a minimum? (See Index 203.6)
7. On freeways and expressways, is Decision Sight Distance provided at the lane drops and at the off-ramp noses? [*A: Index 201.7*]
8. For local facilities, within the State Rights of Way, with no connection to an access controlled facility, does the horizontal alignment conform to AASHTO standards [**M: Index 203.1**] or local agency standards that exceed AASHTO standards? [*A: Index 203.1*]
9. For freeways and expressways, are 5000-foot and 3000-foot minimum radius curves used on the mainline in rural and urban areas respectively? (See Index 203.2)

2.3 Alignment Consistency

1. Is the variance in Design Speed between successive curves less than 10 mph? (Applicable only when a curve's Design Speed is less than that speed "selected" for the project.) [*A: Index 203.3*]
2. Does each horizontal curve which is located at the end of a long tangent and/or steep downgrade meet or exceed the Design Speed of the previous curve? [*A: Index 203.3*]
3. Are the horizontal and vertical alignments coordinated such that the horizontal curves are not "hidden" behind crest vertical curves? (See Index 203.3)
4. Where horizontal and vertical curves are superimposed at sags in grade, or summits in mountainous or rolling terrain, is the Design Speed of the horizontal curve at least equal to the Design Speed of the vertical curve? If not, is the horizontal curve Design Speed no more than 10 mph less than the estimated or measured running speed of the approach roadway? [*A: Index 204.6*]

2.4 Superelevation

1. Has the superelevation rate specified in the Highway Design Manual been used for all horizontal curves? [**M: Table 202.2**]
2. Is a superelevation rate of 8% or less used where snow and ice conditions prevail, typically above elevations of 3000 feet? [**M: Table 202.2**]
3. On rural 2-lane roads, is the standard superelevation rate carried across the full width of the traveled way and shoulders, except on transitions? [*A: Index 202.2*]
4. Has adverse superelevation been avoided in;
   a. The gore area of exit ramps which "curve back" to parallel the mainline facility?
   b. Warping street or ramp surface areas for drainage? (See Index 202.3)
5. For undivided highways, has the axis of rotation been selected to improve perception of curves (i.e. on desert highways) and to avoid drainage pockets at superelevated highway sections (which usually occur in flat terrain)? (See Index 202.4(1))

6. Is the superelevation transition designed in accordance with the diagram and tabular data shown in Figure 202.5? [*A: Index 202.5(1)*]
7. Where standard superelevation transition is not attainable (restrictive situations), has the rate of change of the cross slope been limited to 6% per 100 feet? [*A: Index 202.5(3)*]
8. Have the profiles for the edge of traveled way and shoulders been plotted to identify irregularities resulting from the interaction of the super transition and the vertical alignment of the roadway? Have the irregularities been eliminated by introducing smooth curves? Have transitions located near grade sags and crests been checked for flat spots? (See Index 202.5 (1))
9. Does two-thirds of each superelevation runoff length occur on the tangent which precedes or follows the curve, and does one-third occur within the curve? [*A: Index 202.5(2)*]
10. Are the superelevation transitions for the project avoiding the bridges? (See Index 202.5(4))
11. Are the superelevation transitions for compound curves, if used on the project, designed in accordance with Figure 202.6? [*A: Index 202.6*]
12. Do the superelevation rates on the local streets and roads that are within the State Rights of Way, with or without connection to State facilities, conform to AASHTO standards [**M: Index 202.7**]; or, local agency standards that exceed AASHTO standards? [*A: Index 202.7*]
13. Are there horizontal curves, with radii of 10,000 feet or greater, where the combination of flat grades and superelevation transitions result in locations where surface water is allowed to concentrate on the pavement? (See Index 202.2 and Index 831.4 (5))

2.5 Geometric Cross Section

1. Basic Roadway Widths/Number of Lanes:
   a. Do the proposed number of lanes provide adequate capacity and LOS for the Design Hourly Volume based on the methodology discussed in Topic 102?
   b. For projects which include the construction or reconstruction of local streets and roads - -
      1) If the local facility is a Federal-aid route, does the proposed width conform to AASHTO standards? (See Index 308.1)
      2) If not a Federal-aid route, does the proposed cross section match the local agency standard, or the width of the adjoining (existing) section? (See Index 308.1)
      3) Has the State highway undercrossing span length been designed to accommodate the future requirements of the local facility? (See Index 208.1(2)(b))

4) Where a local facility crosses over or under a freeway or expressway, but has no connection to the State facility, does the minimum cross section conform to AASHTO standards or local agency standards?
[**M: Index 308.1**] and [*A: Index 308.1*]

   Is the minimum width of all 2-lane overcrossing structures at least 28 feet curb to curb? [**M: Index 308.1**]

5) Where a local facility crosses over, or under, a freeway or expressway and connects to the State facility, does the minimum cross section meet the standards for a conventional highway with the exception that the outside shoulder width shall match the approach roadway, but not be less than 4 feet?
[**M: Index 308.1**]

   At such locations, is the minimum width of the 2-lane overcrossing structure 40 feet curb to curb? [**M: Index 308.1**]

6) Are the shoulders at least 5 feet wide, if curbs with a 2-foot gutter pan are proposed? [*A: Index 308.1*]

2. Traffic Lane and Shoulder Widths and Cross Slopes:

   a. Are all basic motor vehicle lanes 12 feet wide? [**M: Index 301.1**]

   b. On new or reconstructed highways, is the traveled way cross slope 2%?
   [**M: Index 301.2 (a)**]

   c. On resurfacing and widening projects, is the traveled way cross slope between 1.5% and 3% and does it match the existing? [**M: Index 301.2(b)**]

   d. Is the maximum algebraic difference in cross slope - -

      1) 6% or less between adjacent lanes of opposing traffic for rehabilitation and widening projects? [*A: Index 301.2*]

      2) 4% or less between adjacent lanes of opposing traffic for new construction?
      [**M: Index 301.2**]

      3) 4% or less between same direction traffic lanes of divided roadbeds?
      [*A: Index 301.2*]

      4) 8% or less between the traveled way and shoulder? [*A: Index 301.2*]

   e. On resurfacing projects, has the entire paved shoulder and traveled way been resurfaced where bicycle traffic is not prohibited?
   [**M: Indices 625.1(1), 635.1(1), and 645.1**]

   f. Are the shoulder widths - -

      1) As specified in Table 302.1 provided? [**M: Index 302.1**]

      2) Consistent with the minimum widths required for bicycle usage?
      [**M: Index 1003.2** and **Index 1003.3**] and (See Index 303.2)

g. Do the shoulders to the right, on normal tangents, slope away from the traveled way at 2 to 5%? [**M: Index 302.2**]

For additional drainage capacity (See Index 307.2) - -

- 2-lane highways with 4 foot shoulders and dike, the cross slope may be increased to 7%.
- 2-lane highways with 2 foot shoulders and without dike; use 2% cross slope. If dikes are used, the cross slope may be increased to 9%.

h. On divided cross sections, do the shoulders to the left slope - -

- In the plane of the traveled way when the median is paved? [**M: Index 302.2**]
- At 2% away from the traveled way when the median is depressed? [**M: Index 302.2**]
- At 2% away from the traveled way for separate roadways? [**M: Index 302.2**]

i. Do the lane drops and the lane width reductions for the through lanes have a minimum length of WV [*A: Index 206.3*]

3. Median Standards:

a. Are the minimum median widths provided, based on facility and land use? [**M: Index 305.1**] and [*A: Index 305.1*]

b. Has the median width been selected to provide the standard shoulder width and horizontal clearance to overcrossing structure columns? [**M: Table 302.1** and **Index 309.1(3)**]

c. Is the use of curb in the median in compliance with the restrictions of Topic 303 and Index 405.5(1)? [*A: Index 303.1* and *Table 303.1*]

d. Do the median openings comply with requirements in Index 405.5?

4. Bridges and Grade Separations (Also see Section 2.5.1.b of this DIB):

a. At a minimum, does the clear width of each bridge equal the width of the approach roadway (traveled way and paved shoulders)? [**M: Index 208.1**]

b. Where a bridge is constructed on a 2-lane highway to replace an existing bridge, is the clear width at least 32 feet when the ADT is less than 400 vehicles or 40 feet when the ADT is greater than 400 vehicles? [**M: Index 208.1(1)(a)**]

c. Where the approach shoulder width is less than 4 feet, is the minimum offset on each side 4 feet? [**M: Index 208.1(1)(b)**]

d. Is the cross slope on all of the structures the same as that of the roadway that approaches them? [**M: Index 208.2**, **Index 301.2**, and **Index 302.2**]

e. Are the bridge medians 36 feet wide or less decked over? [*A: Index 208.3*]

f. If the surrounding land use, both existing and future, indicates the need for sidewalks on the bridges, are they provided? (See Index 208.4)

g. Are embankment end slopes at open ended structures no steeper than 1½:1? (See Index 208.5)

h. Has protective screening been provided along new overcrossing structure sidewalks in urban areas? [*A: Index 208.10(2)*]

5. Side (Cut & Fill) Slopes:

   a. Have slopes steeper than 4:1 been approved by the District Landscape Architect? (See Index 304.1 (b))

   b. Has the District Stormwater Coordinator concurred with the project's erosion control plans? (See Index 304.1 (b))

   c. Have slopes steeper than 2:1 been approved by District Maintenance? (See Index 304.1 (c))

   d. On new construction, widening, or other slope modifications, are embankment slopes 4:1 or flatter? [*A: Index 304.1(a)*]

   e. Is a uniform catch point of at least 18 feet used in light grading areas where normal slopes catch less than 18 feet from the edge of shoulder? [*A: Index 304.1*]

   f. Where appropriate, has snow removal been considered in slope design? (See Index 304.1)

   g. Is there a minimum clearance of at least 10 feet between all of the right of way lines and the catch points for the cut/fill slopes (See Index 304.2 for specific conditions)? When feasible, is 15 feet provided?

   h. Is all slope benching and cut widening designed in accordance with Index 304.3 and the Geotechnical Design Report? (See Indices 113.1, 304.1(c), and 304.3)

   i. Have the contour grading plans been prepared? Are the slopes rounded? (See Index 304.4)

   j. Are "steps" designed into the cut slopes to encourage revegetation from native plants? (See Index 304.5)

6. Frontage Roads:

   a. For urban areas - -

      1) Is the cross slope between adjacent lanes of opposing traffic 6% or less for rehabilitation and widening projects? [*A: Index 301.2*]

      2) Is the cross slope between adjacent lanes of opposing traffic 4% for new construction? [**M: Index 301.2**]

      3) Is the width of outer separation (See Figure 307.4) at least 26 feet? [*A: Index 310.2*]

      4) Is the minimum paved width of two 12-foot lanes with 4 foot outside shoulders provided? [**M: Index 310.1**]

   b. For rural areas - -

      1) Is the minimum paved width of 24 feet provided? [**M: Index 310.1**]

      2) Is the width of outer separation at least 40 feet, or 26 feet if in mountainous terrain? [*A: Index 310.2*]

7. Right of Way:
   a. If the project requires right of way acquisition, have future project needs and the ability to meet all design standards, without exceptions, been taken into consideration during the establishment of the new right of way lines for this project?
   b. Have stormwater storage and treatment features been incorporated into the project? Are they within the right of way?
8. Clearances:
   a. Horizontal - -
      1) Have all fixed objects within the Clear Recovery Zone (CRZ) been eliminated, moved, shielded, or redesigned to be made yielding? [*A: Index 309.1*]
      2) Has the minimum horizontal clearance (i.e., standard shoulder width, but not less than 4 feet) been provided to fixed objects, either shielded or unshielded, within the CRZ? [**M: Index 309.1** and **Index 1102.2**]
      3) Have the horizontal Stopping Sight Distance requirements been met where it is planned to use the minimum horizontal clearance to barriers, walls, or cut slopes? [**M: Index 309.1(1)**]
      4) Where Noise Barriers are located 15 feet or less from the ETW, has the Noise Barrier been placed on a safety shape barrier? [**M: Index 1102.2**]
      5) In areas without curbs, has safety shaped barrier face been incorporated into any retaining, pier, or abutment wall that is 15 feet or less from the edge of traveled way? [*A: Index 309.1*]
      6) For bridge deck widening projects, has the District Permit Engineer provided the minimum width of roadway openings between temporary K-rail? (See Index 309.1(3))
      7) Have approach railings been provided at ends of bridge railings exposed to approach traffic? [**M: Index 208.10(7)**]
   b. Vertical - -
      1) Is the minimum vertical clearance for all major structures provided? [**M: Index 309.2(1)** and **Index 309.5(1)**]
      2) Is the vertical clearance to pedestrian overcrossings 2 feet greater than the standard clearance provided for major structures on the facility? [**M: Index 309.2(2)**]
      3) Do all sign structures have a minimum vertical clearance of 18 feet? [**M: Index 309.2(2)**]
      4) If the project is on the Rural Interstate and Single Routing in Urban Areas subset of the Interstate Highway System, are minimum vertical clearances provided [**M: Index 309.2(3)** and **Figure 309.2**] or has the Federal Highway Administration (FHWA) reviewed and the Military Traffic Management Command Traffic Engineering Agency (MTMCTEA) approval been obtained?

5) If Federal-aid funding is to be used, are all structures within the Federal-aid participation limits? (See Index 309.2(5))

6) Are all the vertical clearances a minimum of 23 feet over Railroad facilities that handle freight cars? [*A: Index 309.5(1)*]

7) If the existing vertical clearance is to be modified, has the Regional Permit Manager been involved in the decision? (See Indices 309.2(4) and 204.8(5))

c. Tunnels - -

Have the minimum horizontal and vertical clearances been provided? [**M: Index 309.1**, **Index 309.2**, and **Index 309.3**] and [*A: Index 309.1*]

d. Elevated Structures - -

Have the minimum lateral clearances between highway structures and buildings or other highway structures been provided? [**M: Index 309.4**]

e. Falsework - -

1) Has Table 204.8 been used to determine the traffic opening widths needed through the falsework? [*A: Index 204.8(5)***]

** Requires District Director's approval and Design Coordinator's concurrence.

2) Where temporary K-rail is used to protect the falsework, has space (2 feet minimum) been provided for its deflection? (See Index 204.8(5))

3) Has a minimum vertical clearance of 15 feet been provided for the falsework? [**M: Index 204.8(5)**]

f. Airway - Highway - -

1) When construction is planned near an Airport or Heliport (civil or military), have the clearance requirements been met or exceeded? (See Topic 207)

2) If applicable, have the procedures for submitting the clearance data been followed? (See Index 207.3)

g. Railroad - -

1) Have the Public Utilities Commission (PUC) clearances between railroads and grade separated or parallel highway structures been provided? [**M: Index 309.5**] and [*A: Index 309.5*]

2) If a Railroad is involved, or is in the vicinity of the project, has the Railroad and PUC granted project approval? (See Index 309.5(4))

2.6 At-Grade Intersections

1. Has the Design Year traffic data been developed from recent counts (for projects involving revisions to the existing intersection), or from traffic forecasts (for new intersections)? Has truck, pedestrian, and bicycle usage been taken into consideration during the development of the traffic data?

2. Based on accepted capacity analysis methodology, does each intersection provide adequate capacity to handle peak period traffic demands? ***

   *** **Note:** An operational analysis by the District Traffic Unit is required. The analysis method shown in Topic 406 is useful to approximate intersection capacity.

3. Upon review of each intersection, have the following geometric features been eliminated or minimized - -

   a. Inadequate Stopping and Corner Sight Distance?

   b. Steep grades?

   c. Inappropriate Traffic Control?

   d. Curves within the intersection?

4. Are skewed intersections greater than 75 degrees (90 degrees preferred)? [*A: Index 403.3*] and (See Figure 403.3)

5. Is striping used in lieu of curbs to delineate islands adjacent to high-speed traffic? (See Index 405.4(2))

6. If curbs must be used, have mountable types been considered? (See Index 405.4(2))

7. Truck Turn Templates:

   a. Has the STAA truck turn template been used in the design of all interchanges (i.e., ramp intersections) and intersections on the National Network and on routes leading to and from designated service and terminal routes? [*A: Index 404.3(2)*]

   b. Has the California truck turn template been used in the design of intersections not on the National Network? [*A: Index 404.3(3)*]

8. Sight Distance Requirements:

   a. Is Corner Sight Distance provided at each unsignalized public road intersection? [*A: Index 405.1(2)*]

   b. Where restrictive conditions exist at public road intersections, does the measured Corner Sight Distance equal or exceed the Stopping Sight Distance? **[M: Index 405.1(2)(b)]**

   c. During the determination of Corner Sight Distance, was a minimum of 10 feet plus the shoulder width of the major road, but not less than15 feet, used for driver setback? **[M: Index 405.1(2)(a)]**

   d. For private road intersections, does the measured Corner Sight Distance equal or exceed the Stopping Sight Distance? **[M: Index 405.1(2)(c)]**

   e. At intersections where a State highway route turns or crosses another State highway, is Decision Sight Distance provided? [*A: Index 405.1(3)*]

   f. Where grades exceed 3% and are longer than 1 mile, and there are high truck volumes on the crossroad, or where the intersection is skewed, was consideration given to increasing the Corner Sight Distance values? (See Index 405.1(2)(a))

9. Channelization:
   a. Has the District Traffic Unit determined, or concurred with, the need for a separate left-turn lane? (See Index 405.2(1))
   b. Have double left-turn lanes been considered at signalized intersections on multilane highways where the left-turn demand exceeds 300 vehicles per hour? (See Index 405.2(3))
   c. Are both single and double left-turn lanes at least 12 feet wide each? **[M: Index 405.2(2)(a)]**
   d. Do the approach taper and deceleration lane designs meet or exceed the minimum lengths recommended (See Figure 405.2A and Table 405.2B)? Has storage length been considered (See Indices 405.2(2)(d) and 405.2(2)(e))? Reduced lengths (See Figures 405.2B and 2C) may be acceptable in urban areas where constraints exist, speeds are moderate, and traffic volumes are relatively low.
   e. Has the District Traffic Unit determined, or concurred with, the need for a two-way left-turn lane (TWLTL)? Is the lane 14 feet wide but not less than 12 feet wide? **[M: Index 405.2(4)]**
   f. Does the design for all of the right-turn lanes satisfy the same requirements discussed above in 9a and 9d for left-turn lanes?
   g. Are the right-turn lanes at least 12 feet wide? Is the shoulder width adjacent to any right-turn lane at least 4 feet? **[M: Index 405.3(2)(a)]**
   h. At the off-ramp terminals, are "free" right turns avoided? If not, is an acceleration lane provided, a minimum of 200 feet in length, or a lane addition provided on the local street, and no left turn movements within 400 feet? [*A: Index 504.3(3)*] and (See Index 405.3(3))
   i. Do traffic islands conform to the guidance in Index 405.4?
10. Is curb use consistent with the Design Speed and location of the facility? [*A: Index 303.1* and *Table 303.1*]

    Where Design Speeds are greater than35 mph in urbanized areas with curbed medians, are 2 foot left shoulders provided? **[M: Table 302.1, Note 4]**
11. Are median openings spaced at least 1,600 feet apart? Have median openings within 300 feet of an access opening or street intersection been shifted to be directly opposite such intersections? [*A: Index 104.5* and *Index 405.5 (2)*]
12. Have emergency passageways been located where Decision Sight Distance is available? [*A: Index 405.5*]
13. On expressways - -
    Are access openings spaced at least ½-mile from either public road intersections or other private road access openings that are wider than 30 feet? [*A: Index 205.1*] Is Stopping Sight Distance provided? **[M: Index 205.1]**
14. Do urban driveway designs meet the width, spacing, and surfacing requirements of Design Information Bulletin 82, the District's permit drawings, and the construction details of the Standard Plans?

15. For driveways on frontage roads or on rural highways, do the proposed driveway widths accommodate the turning radius of the Design Vehicle for the driveway? (See Index 205.4 and Topic 407)

    Has the District Encroachment Permit Unit been consulted with and provided comments on the driveway(s) construction details and their consistency with City or County design standards, as appropriate? (See Index 205.4)

16. On signal installation projects, on two-lane highways, where widening is needed for adequate operation of the intersection, have the minimum design requirements of Figure 405.9 been met or exceeded? (See Index 405.9)

17. Does the intersection design take into account the non-motorized travelers that will be using the facility and their safety? Have the needs of the pedestrians and bicyclists been determined and balanced with the interests of the motorized travelers? (See Indices 401.5 and 401.6)

18. Curb Ramps:

    a. To comply with the Americans with Disabilities Act (ADA), all new or altered pedestrian facilities (See DIB 82) are to comply with ADA standards. Does the project comply with DIB 82? (See Index 105.3)

    b. For new construction, are two ramps proposed at each corner? [*A: Index 105.4(2)*]

    c. Are ramps and/or curb openings provided at midblock crosswalks and where pedestrians cross curbed channelization or median islands? (See Index 105.4(2))

19. Do public road intersections comply with Figure 405.7? Has the proper corner radii been selected? (See Indices 405.7 and 405.8)

2.7 Interchange Design Criteria

1. Are the minimum Interchange (I/C) spacing requirements satisfied by the design? **[M: Index 501.3 and DIB 77]**

2. Has the FHWA been requested to conceptually approve new I/Cs and modifications to existing I/Cs on the Interstate highway system? (See Project Development Procedures Manual Chapter 27 - Article 5 and DIB 77)

3. Are all traffic movements provided for at each proposed local street I/C so as to minimize the possibility of wrong-way movements? In other words, have isolated ramps and partial interchanges been avoided? [*A: Index 502.2*]

4. At Freeway-to-Freeway (F-F) I/Cs, does the sign route (and major traffic volume) move to the left? (See Index 502.3(1))

5. Have F-F I/Cs been reviewed to determine if any turning movements are so minimal that they need not be provided for? If such movements are identified, have they been discussed with the Design Reviewer, Design Coordinator, and Traffic Liaison? (See Index 502.3(2)(c))

6. Do all loop connectors have radii in the range of 150 feet to 200 feet as measured to the left edge of traveled way (ETW) of the outer most lane of multilane facilities? (See Index 502.3(2)(e))

7. Do all direct connectors have minimum radius of 850 feet? A radius of at least 1,150 feet is desirable. (See Index 502.3(2)(e))
8. Has each I/C design been reviewed by the Design Reviewer, Design Coordinator, and Traffic Liaison? (See Index 503.2)
9. Has Decision Sight Distance been provided at all Freeway exits and branch connectors? [*A: Index 504.2(4)(a)*]

   Has the minimum Decision Sight Distance of 600 feet been provided at secondary exits on Collector-Distributor (C-D) roads? [*A: Index 504.2(4)(a)*]
10. Is the maximum ramp profile grade 8% or less? A maximum grade of 9% is allowed on descending entrance ramps (except loops) and ascending exit ramps. The 1% steeper grade should be avoided on descending loops.
    (See Index 504.2(5)) and [*A: Index 204.3*]
11. Is the maximum profile grade on F-F direct connections 6%? [*A: Index 504.4(3)*]
12. Is the vertical curve beyond the nose of each freeway exit designed to provide a minimum 50 mph Stopping Sight Distance? [*A: Index 504.2(5)(a)*]
13. Does the on-ramp profile approximately parallel the mainline profile for at least 100 feet prior to the inlet nose to provide visibility that facilitates merging?
    (See Index 504.2(5)(b))
14. For ascending off-ramps joining a crossroad, if the ramp ends in a crest vertical curve, does the last 50 feet of ramp have a profile grade of 5% or less? [*A: Index 504.2(5)(a)*]
15. For descending off-ramps, is the sag vertical curve length at the ramp terminal at least 100 feet? [*A: Index 504.2(5)(a)*]
16. At overcrossing I/Cs, do all the ramps intersect the crossroad where the profile grade is 4% or less? [*A: Index 504.3(3)*]
17. For left-turn maneuvers from an off-ramp at unsignalized ramp intersections, is the 7½ second sight distance criteria shown in Figure 504.3J provided?
    [*A: Index 504.3(3)*]
18. Is a minimum of 400 feet (500 feet is preferred) provided between each ramp intersection and the adjacent local street intersection? [**M: Index 504.3(3)**] and [*A: Index 504.3(3)*]
19. At freeway entrances and exits, is 5% the maximum algebraic difference in pavement cross slope between adjacent traffic lanes, or between a traffic lane and the adjacent gore area? [*A: Index 504.2(5)*]
20. Where ramps have a curve radii less than 300 feet with a central angle greater than 60 degrees, have they been widened for trucks in accordance with Table 504.3A?
    [**M: Index 504.3(1)(b)**]
21. Does each Freeway entrance and exit ramp, excluding HOV "drop" ramps, connect to the right of through traffic? HOV "drop" ramps may enter and exit the Freeway from the median. [**M: Index 504.2(1)**]

22. Does each entrance and exit design conform to the requirements of Figures 504.2A and 504.2B (single lane), and Figure 504.3L (two lane entrances and exits), and/or Figure 504.4 (diverging branch connections)?
[**M: Index 903.5(1)** and **Index 904.3(1)**] and [*A: Index 504.2(2)* and *Index 107.1*]

23. Has the need for an auxiliary lane to facilitate the merging of trucks been considered where the physical and traffic conditions cited in Index 504.2(5)(b) are present?
[*A: Index 504.2(5)(b)*]

24. Where a cut slope restricts the standard Decision Sight Distance to an exit ramp, and cut widening is not feasible, has an auxiliary lane been provided in advance of the exit?
[*A: Index 504.2(3)*]

25. Has a Design Speed of 50 mph been provided at the exit nose of ramps or branch connections? [*A: Index 504.2(4)(a)*]

26. Prior to the first curve of a Freeway exit, has the standard deceleration length, "DL," been provided in accordance with Figure 504.2B? Has "DL" been provided for the first curve after the exit from a C-D road? [**M: Index 504.2(2)**] and [*A: Index 504.2(2)*]

27. Where exit ramps are preceded by or located on sustained and significant downgrades, has additional "DL" distance been provided (See AASHTO Policy on Geometric Design of Highways and Streets (Green Book) – 2001 4th Edition; page 848)?
(See Index 504.2(2))

28. If the exit nose is located downstream of the 23 feet dimension, is the maximum paved width between the mainline and ramp shoulder edges 20 feet? [*A: Index 504.2(2)*]

29. Is the Design Speed at the inlet nose consistent with the approach alignment? For branch connections, or diamond ramps with a high-speed alignment, is the Design Speed at the inlet nose at least 50 mph? [*A: Index 504.2(4)(b)*]

30. Is the Design Speed on each branch connection a minimum of 50 mph?
[*A: Index 504.4(2)*]

31. Regardless of the horizontal curve radius used, does the vertical alignment of each branch connection provide a Stopping Sight Distance consistent with the speeds of the approaching vehicles? [*A: Index 504.4(2)*]

32. Does the design for each ramp terminus provide for a minimum Design Speed of 25 mph?
[*A: Index 504.3(1)(a)*]

    When a "through" movement is provided at the ramp terminus, is the ramp Design Speed at least equal to the Design Speed of the facility for which the through move is provided? [*A: Index 504.3(1)(a)*]

33. On a single lane ramp where additional lanes are provided near the entrance ramp intersection, is the lane drop accomplished over a distance equal to WV? Is the lane dropped on the right? [*A: Index 504.3(5)*]

34. Where the length of any single-lane ramp exceeds 1,000 feet, has widening to two lanes to permit passing been considered? [*A: Index 504.3(5)*]

35. Excluding ramp metering retrofit projects, is the lane drop taper on a two-lane entrance ramp equal to 50:1? (See Index 504.2(2)) and [*A: Figure 504.3L*]

36. Where Design Year traffic volumes exceed 1,500 equivalent passenger cars per hour, has a two-lane exit ramp been provided? [*A: Index 504.3(6)*]
37. Has a 1,300-foot length of auxiliary lane been provided prior to each two-lane exit ramp? [*A: Index 504.3(6)*]
38. Where the Design Year volumes range between 900 to 1500 vehicles per hour (vph), has a single lane exit been designed with provisions for the addition of a second lane and a standard auxiliary lane? [*A: Index 504.3(6)*]
39. Is there at least 1,000 feet between successive on-ramps, or if less than 1,000 feet, is there an auxiliary lane between the ramps which is carried beyond the second entrance ramp? [*A: Index 504.3(9)*]
40. Is there at least 1,000 feet between successive exit ramps from Freeways and Expressways? Also, is there at least 600 feet between successive exit ramps from C-D roads? [*A: Index 504.3(10)*]
41. Are curbs avoided on the high side of ramps or in exit ramp gore areas? (See Index 504.3(11))
42. On Freeway-to-Freeway connectors:
    a. Where the Design Hourly Volume (DHV) exceeds 1,500 equivalent passenger cars per hour (pcph), has more than one lane been provided? [*A: Index 504.4(6)*]
    b. Where the DHV ranges between 900 and 1,500 pcph, has a single lane been proposed with provisions for additional lanes? [*A: Index 504.4(5)*]
    c. Have single lane connectors that are longer than 1,000 feet been widened to two lanes with a minimum of 5-foot shoulders to facilitate passing? [*A: Index 504.4(5)*]
    d. Are the lengths of all lane drop tapers not less than WV? [*A: Index 504.4(7)*]
43. Are merging and diverging branch connections designed in accordance with Figures 504.3L and 504.4, respectively? [*A: Index 504.4(6)*]
44. At all branch merges, has a 2,500 foot length of auxiliary lane been provided beyond the merge of one lane of the inlet? [*A: Index 504.4(6)*]
45. At a diverging branch connection (See Figure 504.4), has a 2,500-foot length of auxiliary lane been provided in advance of the exit? [*A: Index 504.4(6)*]
46. Where the weaving distance between successive entrance and exit ramps is less than 2,000 feet (See Figure 504.2A), has an auxiliary lane been provided between these ramps? [*A: Index 504.5*]
47. Have the basic number of lanes been maintained through each local I/C? [*A: Index 504.6*]
48. Where a reduction in mainline traffic volume is sufficient to warrant a decrease in the basic number of lanes, is the lane drop located beyond the influence of the I/C, at least ½-mile from nearest inlet or exit nose, and does the lane drop occur on the right lane on a tangent with a straight or sag profile? (See Index 504.6)

49. Have the weaving sections:
    a. In urban areas been designed for LOS C-D? [*A: Index 504.7*]
    b. In rural areas been designed for LOS B-C? [*A: Index 504.7*]
50. On mainline Freeway lanes, is the weaving length defined in Figures 504.2A and 504.2B at least 1,600 feet? And has an additional 1,000 feet been added for each additional lane to be crossed by weaving vehicles? [*A: Index 504.7*]
51. Has ramp metering been discussed with the District Traffic Unit? (See Index 504.3(2))
52. Where multi-lane ramps are metered, is the lane drop taper past the meter limit line:
    a. 50 to 1 or greater?
    b. 30 to 1 or greater? [*A: Index 504.3(2)(d)*]
    c. 15 to 1 or greater? **[M: Index 504.3(2)(b)]**
53. Have access rights been acquired along I/C ramps to their junction with the nearest public road? At these junctions, does the access control extend at least 50 feet beyond the end of the curb return, ramp radius, or taper? **[M: Index 504.8]**
54. For new construction, does the access control extend 100 feet beyond the end of curb return or ramp radius in urban areas and 300 feet in rural areas, or as far as necessary to ensure that entry onto the facility does not impair operational characteristics? [*A: Index 504.8*]

    Does Freeway fencing or equivalent access controls extend to the limit of legal access control? [*A: Index 701.2(1)*]
55. Have access rights been acquired on the opposite side of the local road from ramp terminals? [*A: Index 504.8*]

2.8 Utilities

1. Do the existing utility facilities that are to remain, or are to be relocated in access controlled Freeways and Expressways: Have a formal exception granted from the Chief of the Headquarters Division of Design for any existing or proposed longitudinal or facility encroachments (for example: poles, aerial lines, manholes, vaults, pull boxes, etc.)?
2. Do all utilities within the project limits comply with the "Policy on High and Low Risk Underground Utility Facilities within the Highway Right of Way" (See the Project Development Procedures Manual - Appendix LL)? If not, has a formal exception been granted from the Chief of the Headquarters Division of Design for variances to the High and Low Risk Underground Utilities Policy?
3. Before a project can be certified as Ready to List (RTL) for advertising, the Project Engineer must certify that the project conforms to the "Policy on High and Low Risk Underground Facilities within Highway Rights of Way"; has the "Project Engineer's Certification of Utility Facilities" been completed?
   (See the Project Development Procedures Manual - Appendix LL)