

**Appendix A: Design Checklist for the Development of Geometric Plans**  
 (For use in the Planning and Design of State Highway Improvement Projects)

**NOTES:**

1. *Design features or elements which deviate from mandatory standards require approval of the Highway Standards and Strategy Manager.*
2. *Items with a "no" answer need written justification.*
3. *(M) - Mandatory Standards*
4. *(A) - Advisory Standards*

**1. BASIC DESIGN CRITERIA:** Standards and Policies which must be established prior to geometric plan development.

**1.1 Design Speed and Sight Distance Criteria**

1.1.1 Design Speed and corresponding sight distances for the highway facilities within the project limits:

Route/Street Description	Design Speed (km/h)	Stopping SD (m)	Decision SD (m)	Corner SD (m)
(a) Motorway	_____	_____	_____	_____
(b) Expressway	_____	_____	_____	_____
(c) Two-lane State Highway	_____	_____	_____	_____
(d) Local road	_____	_____	_____	_____

1.1.2 Have these design speeds been agreed by:

- (a) Project Development Coordinator and Geometrician
- (b) Local Agency representative (when applicable)

1.1.3 Are these design speeds documented in an engineering report or in the project file?

**1.2 Design Period**

1.2.1 What is the Design Period for this project? \_\_\_\_\_ years (do not base solely on the year for which forecasted traffic is readily available)

- (a) If a period other than 25 years (except safety, rehabilitation, or operational improvement projects), is selected, have the following approved it?
  - (1) Project Manager
  - (2) Regional Manager
  - (3) National SH Manager
- (b) The Design Year is \_\_\_\_\_

### 1.3 Design Capacity

1.3.1 What Level of Service (LOS) is to be maintained over the design period? (List the various highway facilities and LOS below)

Facility (mainline, ramp, local road)	Design Year	LOS
(a) _____	_____	_____
(b) _____	_____	_____
(c) _____	_____	_____

### 1.4 Clear Recovery Zone

Based on the recommended widths in Section 6, anticipated traffic volumes, operating speeds, terrain, and costs, specify the recovery zone (CRZ) for each different type of facility affected by the project:

Facility	CRZ
(a) Motorways/Expressways	_____
(b) Ramps past gore area	_____
(c) Conventional two-lane highways (no kerbs)	_____
(d) Conventional two-lane highways (with kerbs)	_____

For lengthy projects, CRZ widths may change with terrain; specify section limits if different values are appropriate.

### 1.5 Design Vehicle Selection

Which design vehicle is to be used as the basis of intersection design? Indicate one of the following:

B-train \_\_\_\_\_, SU truck \_\_\_\_\_, Bus \_\_\_\_\_

## 2. GEOMETRIC DESIGN CRITERIA: Design standards and policies to be incorporated into project plans.

### 2.1 Vertical Alignment

#### 2.1.1 Sight Distance Criteria

- (a) Does the project have any sustained downgrades steeper than 3% and longer than 2 km? If so has the Stopping Sight Distance used to design the affected highway segment been increased by the appropriate amount? Y/N (M)
- (b) Does each crest vertical curve provide the required Stopping Sight Distance? Y/N (M)  
If no, has the extent of any no-overtaking lines been defined? Y/N (A)
- (c) On two-lane highways, does each crest vertical curve provide adequate passing sight distance? Y/N (M)
- (d) At each grade sag, does the length of vertical curve provide headlight sight distance? Y/N (M)
- (e) If no, has lighting been considered as mitigation? Y/N (A)
- (f) On motorways and expressways, is decision sight distance provided at lane drops and at off-ramp noses? Y/N (A)

**2.1.2 Grade Standards**

- (a) Do all the profile grades comply with the maximums specified in Table 5.2? Y/N (M)
- (b) Do profile grades exceed the minimums of 0.5% for snow country and 0.3% at other locations? Y/N (A)
- (c) Do ramp grades comply with the maximums stated in NAASRA? Y/N (A)

**2.1.3 Vertical Curve Criteria**

- (a) Do the lengths of vertical curves exceed:
  - (1) The lengths required for sight distance requirements? Y/N (M)
  - (2) The lengths required for appearance requirements? Y/N (A)
  - (3) The lengths required for occupant ride comfort requirements? Y/N (A)
- (b) On two-lane two-way highways, are crest vertical curves less than 1 km in length? Y/N (A)

**2.1.4 Climbing Lane Requirements**

- (a) Is the profile devoid of sustained upgrades exceeding 3% where the total rise exceeds 15 m? Y/N
- (b) If no, has the need for a climbing lane been investigated? Y/N
- (c) If determined to be necessary, has the HO Traffic Operations Manager reviewed the design of the climbing lane? Y/N
- (d) Is adequate acceleration/merge distance provided at climbing lane drops on motorways and expressways? Y/N (A)

**2.1.5 Structure Grade Lines**

- (a) Have structure depth, falsework depth and vertical clearance requirements been considered in profile design? Y/N (M)
- (b) Where grade lines are depressed under structures, has the sag been located to avoid conflicts between structure footings and drainage facilities? Y/N
- (c) Where the grade line on bridges is constant or tangent, is it 0.3% or greater? Y/N
- (d) Where the grade line on a bridge includes a vertical curve, is there a fall of at least 10 mm per 20 m and does the stated minimum extend for a length of no more than 30 m? Y/N
- (e) Is the vertical falsework clearance over the traffic lanes at least 4.6 m? Y/N (M)

**2.2 Horizontal Alignment**

- 2.2.1**
  - (a) Do all curve radii exceed the minimum values listed in Table 2.9 and 2.10 for the appropriate design speed? Y/N (M)
  - (b) Are the Unit Chord values shown for all transition curves? Y/N
- 2.2.2** Is the minimum Stopping Sight Distance provided at each horizontal curve? Y/N (M)
- 2.2.3** If the central angle is less than 10 degrees, is the curve length 240 m or greater? Y/N
- 2.2.4** Is the curve length on two-lane two-way roads between 150 m and 800 m? Y/N

- 2.2.5** Where compound curves are necessary, is the shorter radius, R1, at least two thirds the longer radius, R2, when  $R1 < 300$  m? Y/N (A)
- 2.2.6** (a) Is the intervening tangent between reverse curves long enough to accommodate standard superelevation transition runoffs? Y/N (A)  
(b) Is it at least long enough for a 4% maximum per 20 m rate of change? Y/N (A)  
(c) When feasible, is a minimum 120 m tangent provided? Y/N
- 2.2.7** On motorways and expressways, is driver eye height to road surface sight distance provided at lane drops and at off-ramp noses? Y/N (M)
- 2.2.8** (a) For local facilities within the State Highway right of way with no connection to an access controlled facility, does the horizontal alignment conform to Transit standards? Y/N (M)  
(b) If the local agency standards exceed Transit standards, do the local standards prevail? Y/N (A)
- 2.2.9** For motorways and expressways, are a minimum of 1500 m and 900 m radius curves used in rural and urban areas respectively? Y/N

### 2.3 Alignment Consistency

- 2.3.1** (1) Is the variance in design speed between successive curves less than 10 km/h? (applicable only when a curve's design speed is less than the speed environment or the constant design speed selected for the project) Y/N (A)  
(2) If yes, is it less than 15 km/h? Y/N (M)
- 2.3.2** 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? Y/N (A)
- 2.3.3** Are the horizontal and vertical alignments co-ordinated such that horizontal curves are not hidden behind crest vertical curves? Y/N
- 2.3.4** (a) Where horizontal and vertical curves are superimposed at grade sags or summits in mountainous or rolling terrain, is the design speed of the horizontal curve at least equal to the vertical curve's design speed? Y/N  
(b) Is the horizontal curve design speed no more than 10 km/h less than the estimated or measured running speed of the approach roadway? Y/N (A)

### 2.4 Superelevation

- 2.4.1** For all horizontal curves, have superelevation rates obtained from Figures 4.15, 4.16 or 4.17 been used? Y/N (M)
- 2.4.2** Is a superelevation rate of 8% or less used where snow and ice conditions prevail, typically above elevations of 900 m? Y/N (M)

- 2.4.3 On rural two-lane two-way roads, is the standard superelevation rate carried across the full width of the travelled way and shoulders, except on transitions? Y/N (A)
- 2.4.4 Has adverse superelevation been avoided in:
  - (a) The gore area of exit ramps which "curve back" to parallel the mainline facility? Y/N
  - (b) Warping street or ramp surface areas for drainage? Y/N (A)
- 2.4.5 For undivided highways, has the axis of rotation been selected to improve perception of curves (ie. roads in flat terrain) and to avoid drainage pockets on superelevated sections (which usually occur in flat terrain conditions)? Y/N
- 2.4.6 Is the superelevation transition designed in accordance with the requirements of Section 4.6? Y/N (M)
- 2.4.7 Where standard superelevation transition is not attainable (restrictive situations), has the rate of change of the cross slope been limited to 4% per 20 m? Y/N (A)
- 2.4.8 Have the profiles for edge of travelled way and shoulders been plotted to identify irregularities resulting from the interaction of the super transition and the vertical alignment of the roadway? Y/N  
 Have the irregularities been eliminated by introducing smooth curves? Y/N
- 2.4.9 Does two-thirds of each superelevation runoff length occur on the tangent which precedes or follows a circular curve, and does one-third occur within the curve? Y/N (A)
- 2.4.10 Can superelevation transition on bridges be avoided? Y/N
- 2.4.11 Is the superelevation transition for compound curves designed in accordance with Section 4.6.3 (f)? Y/N (A)
- 2.4.12 (a) Do superelevation rates of local streets and roads which are within the State Highway right of way (with or without connection to State Highway facilities) conform to Transit standards? Y/N (M)  
 (b) If the local agency standards exceed Transit standards, do the local standards prevail? Y/N (A)

## **2.5 Geometric Cross Section**

### **2.5.1 Basic Roadway Widths/Number of Lanes**

- (a) Does the proposed number of lanes provide adequate capacity and LOS for the design hourly volume based on the methodology discussed in Section 6? Y/N
- (b) For projects which include the construction or reconstruction of local streets and roads:
  - (1) If the local facility is a Transfund financially assisted route, does the proposed width conform to Transit standards? Y/N
  - (2) If not a Transfund financially assisted route, does the proposed cross section match the local agency standard or the width of the adjoining (existing) section? Y/N
  - (3) Has the State Highway undercrossing span length been designed to accommodate the future requirements of the local facility? Y/N

- (4) Where a local facility crosses over or under a motorway or expressway, but has no connection to the State Highway facility, does the minimum cross section conform to Transit standards? Y/N (M)  
Is the minimum width of a two-lane overcrossing structure at least 8.2 m kerb to kerb? Y/N (M)
- (5) (1) Where a local facility crosses over or under a motorway or expressway and connects to the State Highway facility, does the minimum cross section meet the standards for a conventional highway with the exception that the outside shoulder width should match the approach roadway, but must not be less than 1.2 m? Y/N (M)
- (2) Where bicycle use is expected are shoulders at least 1.5 m wide? Y/N (A)
- (3) Is the minimum width of a two-lane overcrossing structure 12.0 m kerb to kerb? Y/N (M)

### 2.5.2 Traffic Lane and Shoulder Widths, and Cross Slopes

- (a) Are all lanes at least 3.5 m wide? Y/N (M)
- (b) On new or reconstructed highways, is the travelled way crossfall 3%? Y/N (M)
- (c) On resurfacing and widening projects, is the travelled way crossfall between 2.5% and 3% and does it match the existing crossfall? Y/N (M)
- (d) Is the maximum algebraic difference in cross slope:
- (1) 6% or less between adjacent lanes of opposing traffic for rehabilitation and widening projects? Y/N (A)
- (2) 6% or less between adjacent lanes of opposing traffic for new construction? Y/N (M)
- (3) 4% or less between same direction traffic lanes of dual carriageway roads? Y/N (A)
- (4) 8% or less between the travelled way and shoulder? Y/N (A)
- (e) Are the shoulder widths specified in Section 6.4 provided? Y/N (M)
- (f) Do shoulders to the left (on normal tangents) slope away from the travelled way at 5%? Y/N (M)
- (g) For additional drainage capacity:
- (1) Two-lane two-way highways with 1.5 m kerbed shoulders - slope may be increased to 7%. Y/N
- (2) Two-lane highways with 0.75 m shoulders without kerbs, use 2% slope. With kerbs, slope may be increased to 9%.
- (h) Do shoulders to the right (on dual carriageway cross sections) slope:
- (1) in the plane of the travelled way when the median is paved? Y/N (M)
- (2) at a maximum of 1 in 10 away from the travelled way when the median is depressed? Y/N (M)
- (3) in the plane of the travelled way when future widening will utilise median shoulders? Y/N (M)
- (4) at a maximum of 1 in 10 away from the travelled way for separate roadways? Y/N (M)
- (i) Do through lane drops and lane width reductions have a minimum length of  $2/3WV$ ? Y/N (A)

### 2.5.3 Median Standards

- (a) Are the minimum median widths provided, based on facility and land use? Y/N (A or M)
- (b) Has the median width been selected to provide standard shoulder width and horizontal clearance to overcrossing structure piers? Y/N (M)
- (c) Is kerb use in the median in compliance with the restrictions of ??? Y/N
- (d) Do median openings comply with requirements in ???? Y/N

**2.5.4 Bridges and Grade Separations [see also Section 2.5 (1) (b) above]**

- (a) Does the clear width of each bridge at minimum equal the width of the approach roadway (travelled way and paved shoulders)? Y/N (M)
- (b) Where bridges are constructed on two-lane two-way state highways to replace existing bridges, is the clear width at least 10.5 m? Y/N (A)
- (c) Where the approach shoulder width is < 1.2 m is the minimum offset on each side 1.2 m? Y/N (M)
- (d) Is the cross slope across the structure the same as that of the approach roadway? Y/N
- (e) Have bridge medians 10.8 m wide or less been decked? Y/N (A)
- (f) Are footpaths on bridges justified by pedestrian traffic? Y/N
- (g) Are embankment end slopes at open end structures no steeper than 1:1.5? Y/N
- (h) Has protective screening been included in the design along new overcrossing structure footpaths in urban areas? Y/N

**2.5.5 Side (Cut & Fill) slopes**

- (a) Have the following been considered in slope design:
  - (1) Compliance with the Project Geotechnical Report recommendations? Y/N
  - (2) Ease and cost of long-term maintenance? Y/N
  - (3) Appearance (aesthetics)? Y/N
  - (4) Traffic Safety? Y/N

NOTE: Slopes 1:3 or flatter generally do not require safety barriers.
- (b) (1) Are cut and fill slopes on motorways and expressways 1:2 or flatter? Y/N
- (2) On other highway facilities 1:1.5 or flatter? Y/N
- (c) Is a uniform catch point of at least 5.5 m used in light grading where normal slopes catch less than 5.5 m from the edge of seal? Y/N (A)
- (d) Where appropriate, has snow removal been considered in slope design? Y/N
- (e) Is a minimum clearance of at least 3 m provided between the right of way line and the catch point of a cut/fill slope? Y/N
- When feasible, is 5 m provided? Y/N
- (f) Are slope benches and cut widening designed in accordance with the Project Geotechnical Report? Y/N
- (g) (1) Have contour grading plans been prepared? Y/N
- (2) Have slopes been "rounded"? Y/N
- (h) Have "steps" been designed into cut slopes to encourage re-vegetation from adjacent plants? Y/N

**2.5.6 Frontage Roads**

- (a) In urban areas:
  - (1) Is the cross slope between adjacent lanes of opposing traffic 6% or less for rehabilitation and widening projects? Y/N (A)
  - (2) Is the cross slope between adjacent lanes of opposing traffic 4% for new construction? Y/N (M)
  - (3) Is the width of outer separation at least 8 m? Y/N (A)
  - (4) Is the minimum paved width of two 3.5 m lanes with 1.5 m outside shoulders provided? Y/N (M)

**(b) In rural areas:**

- (1) Is the minimum paved width of 7.0 m provided? Y/N (M)
- (2) Is the width of outer separation at least 12 m ? Y/N (A)

**2.5.7 Road Reserve**

- (a) When a project requires property acquisition, have future needs and current standards been considered in the establishment of ultimate road reserve needs? Y/N

**2.5.8 Clearances****(a) Horizontal**

- (1) Have all fixed objects within the clear recovery zone (CRZ) been eliminated, moved, shielded, or redesigned to be made yielding as specified in Section 7? Y/N (A)
- (2) Has the minimum horizontal clearance (ie. standard shoulder width, but not less than 1.2 m) been provided to fixed objects, either shielded or unshielded, within the CRZ? Y/N (M)
- (3) Have horizontal SSD requirements been met where it is planned to use the minimum horizontal clearance to barriers, walls, or cut slopes? Y/N (M)
- (4) When located 4.5 m or less from the edge of the travelled way has the noise barrier been placed on a safety shape barrier? Y/N (M)
- (5) In areas without kerbs, has safety shape barrier face been specified when any retaining, pier, or abutment wall is less than 4.6m from edge of the travelled way ? Y/N (A)

**(b) Vertical**

- (1) Are the minimum vertical clearances to major structures provided as specified? Y/N (M)
- (2) Is the vertical clearance to pedestrian over crossings 0.5 m greater than the clearance provided for standard major structures on the facility? Y/N (M)
- (3) Do all sign structures have a minimum vertical clearance of 5.5 m? Y/N (M)
- (4) Do vertical clearances over railway facilities have a minimum clearance of *(to be checked)* m? Y/N (A)
- (5) Has the Regional Manager been involved in the decision to modify existing vertical clearance? Y/N

**(c) Tunnels**

- (1) Have the minimum horizontal and vertical clearances specified in *(to be determined)* been provided? Y/N (A & M)

**(d) Elevated Structures**

- (1) Have the minimum lateral clearances between highway structures and buildings or other highway structures been provided? Y/N (M)

**(e) Falsework**

- (1) Has a minimum vertical clearance of 4.6 m been provided for falsework? Y/N (M)

**(f) Airway - Highway**

- (1) When construction is planned near an airport or heliport (civil or military), have the clearance requirements of the airport authority or owner been met or exceeded? Y/N
- (2) If applicable, have the procedures for the submittal of clearance data been followed? Y/N

**(g) Railway**

- (1) Have the established clearances between railways and grade separation or parallel highway structures been provided? Y/N



- (2) If a railway is involved, or is in the vicinity of a project, has the railway company granted project approval? Y/N

## 2.6 At-Grade Intersections

- 2.6.1** (a) Has design year traffic data been developed from recent counts (for projects involving revisions to existing intersections), or from traffic forecasts (for new intersections)? Y/N
- (b) Has truck, pedestrian, and bicycle traffic been considered in development of traffic data? Y/N
- 2.6.2** (a) Based on accepted capacity analysis methodology, does each intersection provide adequate capacity to handle peak period traffic demands? Y/N
- (b) Has critical lane analysis for each intersections been completed? Y/N
- 2.6.3** Upon review of each intersection, have the following geometric features been eliminated or minimized?
- (a) Inadequate stopping and corner sight distance. Y/N
- (b) Steep grades Y/N
- (c) Inappropriate traffic control. Y/N
- (c) Presence of curves within intersections. Y/N
- 2.6.4** Are skewed intersections greater than 60 degrees (75 degrees is preferred) variance from a right angle? Y/N (A)
- 2.6.5** Is road marking used in lieu of kerbs to delineate islands adjacent to high-speed traffic? Y/N
- 2.6.6** If kerbing must be used, have mountable types been considered? Y/N
- 2.6.7 Turning Vehicle Templates**
- (a) Has an appropriate design vehicle turning path template been used in the design of all interchanges, ie. ramp intersections and on routes leading to and from designated service and access points? Y/N (A)
- (b) Has an appropriate design vehicle turning path template been used in the design of all other intersections? Y/N (A)
- 2.6.8 Sight Distance Requirements**
- (a) Is approach sight distance provided at each unsignalised public road intersection? Y/N (A)
- (b) Where restrictive conditions exist at public road intersections, does the measured corner sight distance equal or exceed the SSD? Y/N (M)
- (c) In the determination of corner sight distance, is a minimum of 3 m plus the shoulder width of the major road, but not less than 4 m, used for driver setback? Y/N (M)
- (d) For private road intersections, does the measured corner sight distance equal or exceed the SSD? Y/N (M)
- (e) At intersections where a state highway route turns across or crosses another state highway, is safe intersection sight distance provided? Y/N (A)

- (f) Where grades exceed 3% and are longer than 2 km, and where there are high truck volumes on the crossroad or where the intersection is skewed, was consideration given to increasing the approach sight distance values? Y/N

### 2.6.9 Channelisation

- (a) Has the need for a separate right-turn lane been considered? Y/N
- (b) Have double right-turn lanes been considered at signalised intersections on multilane highways where the right-turn demand exceeds 300 vehicles per hour? Y/N
- (c) Are both single and double right-turn lanes at least 3.5 m wide each? Y/N (M)
- (d) (1) Do the approach taper and deceleration lane designs meet or exceed the minimum lengths recommended in Austroads - Part 5? Y/N
- (2) Has storage length been considered? Y/N  
(Lesser designs may be acceptable in urban areas where constraints exist, speeds are moderate, and traffic volumes are relatively low.)
- (e) Do left-turn lane designs satisfy the same requirements discussed above for left-turn lanes? Y/N
- (f) (1) Are left-turn lanes at least 3.5 m wide? Y/N
- (2) Is the shoulder width adjacent to any left-turn lane at least 1.2 m? Y/N (M)
- (g) (1) At off-ramp terminals, are "free" left turns avoided? Y/N
- (2) If not, is a minimum 60 m acceleration lane or lane addition provided on the local street, and no right turn movements within 125 m? Y/N (A)
- (h) Do traffic islands conform to Austroads - Part 5? Y/N

### 2.6.10 Are kerbs limited to highway facilities where the running speeds are less than 75 km/h? Y/N (A)

- (a) Where speeds are 70 km/h or less in urbanised areas with kerbed medians, are 0.6 m left shoulders provided? Y/N (M)

### 2.6.11 (1) Are median openings spaced at least 500 m apart? Y/N

- (2) Have median opening locations within 100 m of an access opening or street intersection been shifted to be directly opposite such intersections? Y/N (A)

### 2.6.12 Have emergency passageways been located where decision sight distance is available? Y/N (A)

### 2.6.13 (a) On expressways, are access openings spaced at least 1 km from adjacent public road intersections, or to another private road access opening that is wider than 10 m? Y/N (A)

- (b) Is SSD provided? Y/N (M)

### 2.6.14 Do urban driveway designs meet the width, spacing, and surfacing requirements of the local authority? Y/N

### 2.6.15 For driveways on frontage roads or on rural highways, does the proposed driveway width accommodate the maximum legal vehicle turning radius? Y/N

**2.6.16** For signal installation projects on two-lane two-way highways where widening is needed for adequate operation of the intersection, have the minimum design requirements of Austroads - Part 5 been met or exceeded? Y/N

**2.6.17** Is the design "pedestrian friendly"? For example, does the design include adequate signal phasing and refuge areas to minimize pedestrian/vehicle conflicts in the intersection? Y/N

**2F.18 Wheelchair Ramps**

- (a) Is reasonable access provided to individuals with disabilities at bridge footpath approaches and at kerbs in the vicinity of pedestrian separation structures? Y/N (A)
- (b) For new construction, are two ramps proposed at each corner? Y/N (A)
- (c) In retrofit situations, is the one-ramp design proposed only where the volume of right-turning vehicles is low? Y/N (A)
- (d) Are ramps and/or kerb openings provided at mid-block crosswalks and where pedestrians cross kerbed channelisation or median islands? Y/N (A)
- (e) Has consideration been given to retrofit all corners of an existing intersection even though the project scope does not disturb each corner? Y/N (A)
- (f) Does each ramp design conform to the current local authority standards? Y/N (A)
- (g) Have driveways been designed to be traversable? Y/N

**2.6.19** Have intersection designs been reviewed by the appropriate Transit Traffic Operations Reviewer? Y/N

**2.6.20 Pedestrians**

- (a) In rural or suburban areas, physical conditions may force students to walk on roadways. In these conditions, have 2.4 m shoulders been used or has a separated walkway at least 1.2 m wide been provided? Y/N
- (b) Is a pedestrian Over.Crossing. warranted Y/N
- (c) Is the minimum width for the pedestrian Over.Crossing. 2.4 m? Y/N (A)
- (d) Are pedestrian ramps provided on all pedestrian separation structures? Y/N (A)

**2.7 Interchanges**

**2.7.1** Are the minimum interchange spacing requirements satisfied by the design? Y/N (M)

**2.7.2** Are all traffic movements provided for at each proposed local street Interchange so as to minimize the possibility of wrong-way movements? In other words, have isolated ramps and partial interchanges been avoided? Y/N (A)

**2.7.3** At motorway-to-motorway interchanges, does the signed route and major traffic volume) move to the right? Y/N

- 2.7.3**
- (a) Have motorway to motorway interchange's been reviewed to determine if any turning movements are so minimal that they need not be provided for? Y/N
  - (2) If they are identified, have they been discussed with Transit reviewers? Y/N

- 2.7.4** Do loop ramp/connectors have radii in the range of 50 m - 65 m as measured to the right edge of the travelled way of the outer most lane of multilane facilities? Y/N
- 2.7.5** Do direct connectors have minimum radii of 260 m? Y/N  
(Radii of at least 350 m are desirable.)
- 2.7.6** Has each Interchange design been reviewed by the Highway Strategy and Standards Manager? Y/N
- 2.7.7** Has ESD been provided at all motorway exits and branch connectors? Y/N (A)
- 2.7.8** Has a minimum ESD of 190 m been provided at secondary exits on collector - distributor roads? Y/N (A)
- 2.7.9** Is the maximum ramp profile grade 8% or less? Y/N  
(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. (A))
- 2.7.10** Is the maximum profile grade on motorway to motorway direct connections 6%? Y/N (A)
- 2.7.11** Is the vertical curve beyond the nose of each motorway exit designed to provide a minimum 80 km/h Stopping Sight Distance? Y/N (A)
- 2.7.12** Does the on-ramp profile parallel (approximately) the mainline profile for at least 30 m prior to the inlet nose to provide inter-visibility to facilitate merging? Y/N
- 2.7.13** For ascending off-ramps joining the crossroad, if the ramp ends in a crest vertical curve, does the last 15 m of ramp have a profile grade of 5% or less? Y/N (A)
- 2.7.14** For descending off-ramps, is the sag vertical curve length at the ramp terminal at least 30 m? Y/N (A)
- 2.7.15** At overcrossing Interchanges, do all the ramps intersect the crossroad where it's profile grade is 4% or less? Y/N (A)
- 2.7.16** For right-turn manoeuvres from an off-ramp at unsignalised ramp intersections, is the 7-1/2 second sight distance criteria provided? Y/N (A)
- 2.7.17** Is a minimum of 125 m, 160 m preferred, provided between each ramp intersection and the adjacent local street intersection? Y/N (M & A)
- 2.7.18** Is 5% the maximum algebraic difference in pavement cross slope between adjacent traffic lanes, or between a traffic lane and the adjacent gore area? Y/N (A)
- 2.7.19** Where ramps have a curve radii < 90 m with a central angle >60 degrees, have they been widened for the design heavy vehicle turning paths? Y/N (M)

- 2.7.20** Does each motorway entrance and exit ramp connect to the left of the through traffic? Y/N (HOV "drop" ramps may enter and exit the motorway/expressway from the median) (M)
- 2.7.21** Does each entrance and exit design conform to the requirements of Drawing 1/2000/77/7994 (single lane), and Figure ??? (two lane entrances and exits), and/or Figure ??? (diverging branch connections) Y/N (A)
- 2.7.22** Has the need for an auxiliary lane to facilitate the merging of trucks been considered where the physical and traffic conditions noted in Section ??? are present? Y/N (A)
- 2.7.23** 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? Y/N (A)
- 2.7.24** Has a design speed of 80 km/h been provided at the exit nose of both ramps or branch connections? Y/N (A)
- 2.7.25** (a) Prior to the first curve of a motorway exit, has the standard deceleration distance "d" been provided in accordance with Drawing 1/2000/77/7994 ? Y/N  
 (c) Has "d" been provided for the first curve after the exit from a collector-distributor road? Y/N (M & A)
- 2.7.26** Where exit ramps are preceded by, or located on, sustained and significant downgrades, has additional "d" distance been provided (see AASHTO Green Book methodology)? Y/N
- 2.7.27** If the exit nose is located downstream of the 7 m dimension, is the maximum paved width between the mainline and ramp shoulder edges 6 m? Y/N (A)
- 2.7.28** (a) Is the design speed at the inlet nose consistent with the approach alignment? Y/N  
 (b) For branch connections, or diamond ramps with high speed alignment, is the design speed at the inlet nose at least 80 km/h? Y/N (A)
- 2.7.29** Is the design speed on each branch connection a minimum of 80 km/h? Y/N (A)
- 2.7.30** Regardless of the horizontal curve radius used, does the vertical alignment of each branch connection provide SSD consistent with approaching vehicle speeds? Y/N (A)
- 2.7.31** (a) Does each ramp terminus design provide for a minimum design speed of 40 km/h? Y/N (A)  
 (b) When a "through" movement is provided at the ramp terminus, is the minimum ramp design speed at least equal to the design speed of the facility for which the through move is provided? Y/N (A)
- 2.7.32** (a) 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  $2/3WV$ ? Y/N  
 (b) Is the lane dropped on the left? Y/N (A)

- 2.7.33** Where the length of any single-lane ramp exceeds 300 m, has widening to two lanes to permit passing been considered? Y/N (A)
- 2.7.34** Excluding ramp metering retrofit projects, is the lane drop taper on a two-lane entrance ramp equal to 50:1? Y/N (A)
- 2.7.35** Where design year traffic volumes exceed 1,500 equivalent passenger cars per hour, has a two-lane width of exit ramp been provided? Y/N (A)
- 2.7.36** Is a 400 m length of auxiliary lane provided prior to each two-lane exit ramp? Y/N (A)
- 2.7.38** Where design year volumes range between 900-1,500 vehicles per hour (vph), has a single lane exit been designed with provisions for the addition of a second lane and the standard auxiliary lane? Y/N (A)
- 2.7.38** Is there at least 300 m between successive on-ramps, or if less than 300 m, is there an auxiliary lane between the ramps which is carried beyond the second entrance ramp? Y/N (A)
- 2.7.39** (a) Is there at least 300 m between successive exit ramps from freeways and expressways? Y/N  
(b) Also, is there at least 180 m between successive exit ramps from collector-distributor roads? Y/N (A)
- 2.7.40** Are kerbs avoided on the high side of ramps or in exit ramp gore areas? (C-D roads are O.K.) Y/N
- 2.7.41** On freeway-to-freeway connectors:
- (a) Where DHV exceeds 1500 ecu, has more than one lane been provided? Y/N (A)
  - (b) Where DHV ranges between 900 and 1500 ecu, has a single lane been proposed with provisions for additional lanes? Y/N (A)
  - (c) Has a single lane connector longer than 300 m been widened to two lanes with minimum 1.5 m shoulders to facilitate passing? (not needed for capacity) Y/N (A)
  - (d) Is the length of any lane drop taper not less than 2/3WV? Y/N (A)
- 2.7.42** Are merging and diverging branch connections designed in accordance with Figures ??? and ??? respectively? Y/N (A)
- 2.7.43** At a branch merge, has a 800 m length of auxiliary lane been provided beyond the merge of one lane of the entry? Y/N (A)
- 2.7.44** At a branch diverge (Figure ???), has a 800 m length of auxiliary lane been provided in advance of the exit? Y/N (A)
- 2.7.45** Where the weaving distance between successive entrance and exit ramps (Figure ???) is less than 600 m, has an auxiliary lane been provided between these ramps? Y/N (A)

- 2.7.46** Has the basic number of lanes been maintained through each local interchange? Y/N (A)
- 2.7.47** 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 interchange (at least 1 km from nearest entry or exit nose), and does the lane drop occur on the right lane on a tangent with a straight or sag profile? Y/N
- 2.7.48** Have the lengths of weaving sections been determined from Figure ??? or ?? ? Y/N
- 2.7.49** Have the weaving sections in:
- (a)** urban areas been designed for LOS C-D? Y/N (A)
  - (b)** rural areas been designed for LOS B-C? Y/N (A)
- 2.7.50** **(a)** On main motorway lanes, is the weaving length defined on Figure ??? at least 500 m? Y/N
- (b)** And has an additional 300 m been added for each additional lane to be crossed by weaving vehicles? Y/N (A)
- 2.7.51** Does the ramp design provide for future expansion and/or retrofitting for ramp meter installation (including HOV bypass lane)? Y/N
- 2.7.52** Where multi-lane ramps are metered, is the lane drop taper past the meter limit line:
- (a)** 50 to 1 or greater? Y/N
  - (b)** 30 to 1 or greater? Y/N (A)
  - (c)** 15 to 1 or greater? Y/N (M)
- 2.7.53** Do multi-lane ramps complete the lane-drop taper by the 2 m separation point when no auxiliary lane is provided? Y/N (A)
- 2.7.54** Where an auxiliary lane is provided, is the lane-drop transition completed by the convergence point? Y/N (Ramp Metering Guidelines, A)
- 2.7.55** **(a)** Have access rights been acquired along interchange ramps to their junction with the nearest public road? Y/N
- (b)** At these junctions, does access control extend at least 15 m beyond the end of the kerb return, ramp radius, or taper? Y/N (M)
- 2.7.56** For new construction, does access control extend 30 m beyond the end of kerb return or ramp radius in urban areas and 100 m in rural areas, or as far as necessary to ensure that entry onto the facility does not impair operational characteristics? Y/N (A)

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## Appendix B: Fact Sheet for Exceptions to Mandatory Design Standards

Prepared by: \_\_\_\_\_  
 (Name)

Submitted by: \_\_\_\_\_  
Project Manager
Date
Telephone

Recommended for Approval: \_\_\_\_\_  
Regional Manager
Date
Telephone

Concurrence by: \_\_\_\_\_  
State Highway Planning Manager
Date
Telephone

Approved by: \_\_\_\_\_  
Highway Strategy and Standards Manager
Date

### 1 PROPOSED PROJECT AND NON-STANDARD FEATURES

#### 1.1 Project Description:

Briefly describe the project; what is the proposal? Note the type of project and/or major elements of work to be done, such as safety or operational improvement, roadway widening, rehabilitation, reconstruction, etc. Provide the geographic project limits and length; ie. *'SH 53 in South Wairarapa District, between Featherston (RP 0.0) and Martinborough (RP 18.0)'*.

#### 1.2 Nonstandard Features:

Describe the proposed non-standard feature or the existing non-standard feature which is proposed to be maintained; if newly proposed, is the non-standard feature an improvement over the existing condition?

#### 1.3 Standard for Which Exception Is Requested:

State the specific standards and refer to the applicable Chapter, Topic, or Index numbers of the State Highway Geometric Design Manual.

#### 1.4 Existing Highway:

Describe the general highway characteristics, focusing on those features relevant to the proposed design exception, such as the widths of lanes, shoulders, median, formation, and structures; horizontal and vertical alignment and clearances; design speed, sight distance, grades, cross slope, superelevation, etc.

If relevant, note structure clear width and the lane and shoulder widths across the structure; does the structure clear width match or exceed the approach roadbed width?

Note bridge-rail type; does it meet current standards for structural adequacy?

Provide a similar, but brief, description of adjacent highway segments, highlighting existing nonstandard features when relevant to the proposed exception.

### 1.5 Safety Improvements:

Describe proposed improvements that would qualify as safety enhancements, such as: median barrier, guardrail upgrade, flattening slopes, correcting superelevation, eliminating roadside obstructions, etc.

### 1.6 Total Project Cost:

Include a good summary estimate of project cost segregated by major elements, including: roadway, structures, right of way, utility relocation, environmental mitigation, etc., as needed.

## 2 REASON FOR REQUESTING EXCEPTION

Be thorough, but brief; justification must be as complete and convincing as possible. Reasons exceptions have been granted in the past include a combination of excessive cost, road reserve impacts and/or environmental impacts. Supportive factors have included low accident frequency, local opposition, and consistency with adjacent highway segments.

A commitment to correct a nonstandard feature with a future project should not be made in the Fact Sheet unless absolutely necessary. If a commitment must be made, the follow-up project is to be programmed and Transit must have the authority to define the project's scope. Additionally, the follow-up project's status must be monitored in accordance with the procedures established by each region.

Provide a detailed account of the follow-up project in Section 7 (see below).

## 3 ADDED COST TO MAKE STANDARD

Summarize an estimate of the added cost above the proposed project cost which would be required to meet the design standard for which the exception is requested. The estimate does not have to be highly developed, but must be realistic.

Also, when the Fact Sheet covers multiple nonstandard features, provide separate cost summaries for the "standardisation" of individual design features.

## 4 TRAFFIC DATA

Include both AADT's and design (peak period) hourly volumes. For rehabilitation projects, use current year traffic. For all others, use design year traffic, usually 25 years after construction is complete. For interim projects that are to be superseded by programmed future construction, provide traffic data for both the ultimate programmed construction year and the ultimate project's design year

## 5 ACCIDENT ANALYSIS

Traffic safety is of primary importance when considering approval or rejection of design exceptions. To strengthen the justification for design exceptions, the Fact Sheet must include an analysis of accident data to identify prevalent accident types and causes, plus an evaluation of the effect of the requested design exceptions on accident types and frequencies.

Summarise an analysis of how the proposed project will help alleviate identified safety problems; or as a minimum, how it will not contribute to any increase. This analysis must be based on evaluation of statistical data regarding both the number and severity of accidents as well as actual versus countrywide average accident rates. For design

exceptions related to spot locations, ie. nonstandard vertical curves, on existing highways, and analyse only the accident data within the vicinity of the feature. The analysis should also examine data for high accident frequency spot locations, if any are within the proposed project limits.

Accident data analysis should be supplemented by a review of regional accident diagrams covering the project area in order to enhance the understanding of prevalent accident types and how they relate to existing and proposed highway design features. Provide a summary of "actual" versus 'expected' accidents; however, merely stating the "actual" versus "expected" numbers is insufficient.

In determining accident causes, keep in mind that although terms like '*excessive speed*', '*inattention*', '*failure to yield right of way*', '*under the influence*', etc., are perfectly valid for the police they have meaning for the highway engineer only as they relate to the underlying highway characteristics. Hence, the engineer must instead look for other reasons, such as: tight radius curves with inadequate superelevation, high-volume turning movements without separate turn lanes, a concentration of rear-end/side-swipe accidents in a particular lane, etc. In general, the accident concentrations detected in this manner are too small for a printout, but collectively they are the key to understanding the vehicle-highway interactions that are the basic causes of accidents.

## **6 INCREMENTAL IMPROVEMENTS**

Discuss other practical alternatives that are intermediate in scope and cost between the proposed project (requiring this design exception) and the full, standard solution. For example, to justify retaining an existing horizontal curve with  $R=100$  m when the standard minimum radius is 260 m, the costs and impacts of an alternative which proposes a 175 m radius curve (and possibly others) would need to be analysed and discussed in this section.

Provide enough information on costs versus benefits, right of way and environmental impacts, etc., to explain why none of the incremental alternatives are recommended.

These alternatives should normally be investigated prior to requesting an exception.

## **7 FUTURE CONSTRUCTION**

Describe any planned future projects in the vicinity of the proposed design exception, but do not make a commitment to correct the nonstandard design features unless absolutely necessary (see Section 2). If a commitment must be made, describe the follow-up project's funding source and schedule as listed in the appropriate programming document.

## **8 PROJECT REVIEWS, CONCURRENCE**

Note relevant project reviews by others. Provide the date of meeting or discussion, and state the individual's concurrence with the proposed design exception.

## **9 ATTACHMENTS**

- (a) Provide location and/or vicinity map for the project. When the Fact Sheet covers multiple exceptions at various locations, a project strip map may be provided to indicate the general location of the various design exceptions.
- (b) Provide cross sections and/or special details to clearly illustrate the proposed condition for each location that does not meet the mandatory standard for horizontal/vertical clearance and lane/shoulder/bridge clear width.
- (c) Letters, resolutions, traffic study summaries, etc., which further develop or clarify the reasons discussed under Section 2 may be attached.

Do not attach superfluous materials, such as complete project plan sets or engineering reports unless specifically requested by the Project Review Group.

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