

CHECKLIST 3: DETAILED DESIGN STAGE AUDIT

Issue	Yes	No	Comment
3.1 General topics			
3.1.1 Changes since previous audit			
Do the conditions for which the scheme was originally designed still apply? (i.e. no significant changes to the surrounding network or area to be served, or traffic mix)			
Has the design of the project remained unchanged since previous audit (if any)?			
3.1.2 Drainage			
Will the new road drain adequately?			
Are the road grades and crossfalls adequate for satisfactory drainage?			
Are flat spots avoided or adequately dealt with at start/end of superelevation?			
Has the possibility of surface flooding been adequately addressed, including overflow from surrounding or intersecting drains and water courses?			
Is gully pit spacing adequate to limit flooding?			
Is pit grate design safe for pedal cycles? (i.e. gaps not parallel with wheel tracks)			
Will footpaths drain adequately?			
3.1.3 Climatic conditions			
Has the design taken into account weather records or local experience which may indicate a particular problem? (for example, snow, ice, wind, fog)			
3.1.4 Landscaping			
Will drivers be able to see pedestrians (and vice versa) past or over the landscaping?			
Will intersection sight lines be maintained past or over the landscaping?			
Will safety be adequate with seasonal growth? (for example, no obscuring of signs, shading or light effects, slippery surface, etc.)			
Will roadside safety be adequate when trees or plantings mature (no roadside hazard)?			

Issue	Yes	No	Comment
Has 'frangible' vegetation been used in possible run-off road areas?			
3.1.5 Services			
Does the design adequately deal with buried and overhead services? (especially in regard to overhead clearances, etc.)			
Has the location of fixed objects/furniture associated with services been checked? (including any loss of visibility, position of poles, and clearance to overhead wires)			
3.1.6 Access to property and developments			
Can all accesses be used safely?			
Is the design free of any downstream or upstream effects from accesses, particularly near intersections?			
Do rest areas and truck parking area have adequate sight distance at access points?			
3.1.7 Emergencies, breakdowns, emergency and service vehicle access			
Has provision been made for safe access and movements by emergency vehicles?			
Does the design and positioning of medians and vehicle barriers allow emergency vehicles to stop and turn without unnecessarily disrupting traffic?			
Have broken-down vehicles or stopped emergency vehicles been adequately considered?			
Is provision for emergency telephones satisfactory?			
Are median breaks on divided carriageways safely located? (i.e. frequency, visibility)			
3.1.8 Future widening and/or realignments			
If the scheme is only a stage towards a wider or dual carriageway is the design adequate to impart this message to drivers? (is the reliance on signs minimal/appropriate, rather than excessive?)			
Is the transition between single and dual carriageway (either way) handled safely?			

Issue	Yes	No	Comment
3.1.9 Staging of the scheme			
If the scheme is to be staged or constructed at different times: <ul style="list-style-type: none"> are the construction plans and program arranged to ensure maximum safety? do the construction plans and program include specific safety measures, signing; adequate transitional geometry; etc. for any temporary arrangements? 			
3.1.10 Staging of the work			
If the construction is to be split into several subprojects, is the order safe? (i.e. the stages are not constructed in an order that creates unsafe conditions)			
3.1.11 Adjacent developments			
Does the design handle accesses to major adjacent generators of traffic and developments safely?			
Is drivers' perception of the road ahead free of misleading effects of any lighting or traffic signals on an adjacent road?			
Has the need for screening against glare from lighting of adjacent property been adequately considered?			
3.1.12 Stability of cut and fill			
Is the stability of batters satisfactory? (for example, no potential for loose material to affect road users)			
3.1.13 Skid resistance			
Has the need for anti-skid surfacing been considered where braking or good road adhesion is most essential? (for example, on gradients, curves, approaches to intersections and signals)			
3.2 Design issues (general)			
3.2.1 Geometry of horizontal and vertical alignment			
Does the horizontal and vertical design fit together correctly?			
Is the vertical alignment consistent and appropriate throughout?			
Is the horizontal alignment consistent throughout?			
Is the alignment consistent with the function of the road?			
Is the design free of misleading visual cues? (for example, visual illusions, subliminal delineation like lines of poles)			

Issue	Yes	No	Comment
3.2.2 Typical cross-sections			
Are lane widths, shoulders, medians and other cross-section features adequate for the function of the road?			
Are the shoulder widths adequate for stationary vehicles and errant vehicles?			
Are median widths adequate for road furniture?			
Is superelevation consistent with the road environment?			
Is the width of traffic lanes and carriageways suitable in relation to: <ul style="list-style-type: none"> ▪ alignment? ▪ traffic volume? ▪ vehicle dimensions? ▪ the speed environment? ▪ combinations of speed and traffic volume? 			
Are the shoulder crossfalls safe for vehicles to traverse?			
Are batter slopes drivable for cars, trucks?			
Are side slopes under structures appropriate?			
Have adequate facilities been provided for pedestrians and cyclists?			
3.2.3 Effect of cross-sectional variation			
Is the design free of undesirable variations in cross-section design?			
Are crossfalls safe? (particularly where sections of existing highway have been used, there have been compromises to accommodate accesses, at narrowings at bridges, etc.)			
Are any curves with adverse crossfall within appropriate limits?			
Is superelevation provided and sufficient at all locations where required?			
3.2.4 Roadway layout			
Are all traffic management features designed so as to avoid creating unsafe conditions?			
Is the layout of road markings and reflective materials able to deal satisfactorily with changes in alignment? (particularly where the alignment may be substandard)			
Is there adequate provision for overtaking?			
Are overtaking lanes provided where required and safely commenced and ended?			
Are overtaking requirements satisfactory?			

Issue	Yes	No	Comment
Is the design free of sunrise/sunset problems?			
Have public transport requirements been adequately catered for?			
3.2.5 Shoulders and edge treatment			
Are the shoulders likely to be safe if used by slow moving vehicles or cyclists?			
Are the following safety aspects of shoulder provision satisfactory? <ul style="list-style-type: none"> ▪ provision of sealed or unsealed shoulders ▪ width and treatment on embankments ▪ crossfall of shoulders 			
3.2.6 Effect of departures from standards or guidelines			
Any approved departures from standards or guidelines: is safety maintained?			
Any hitherto undetected departures from standards: is safety maintained?			
3.2.7 Visibility and sight distance			
Are horizontal and vertical alignments consistent with visibility requirements?			
Has an appropriate design speed been selected for visibility requirements?			
3.2.8 Environmental treatments			
Has safety been considered in the location of environmental features? (for example, noise fences)			
3.3 Alignment details			
3.3.1 Visibility; sight distance			
Are horizontal and vertical alignments consistent with the visibility requirements?			
Is the design free of sight line obstructions due to safety fences or barriers? <ul style="list-style-type: none"> ▪ boundary fences? ▪ street furniture? ▪ parking facilities? ▪ signs? ▪ landscaping? ▪ bridge abutments? ▪ parked vehicles in laybys or at the kerb? ▪ queued traffic? 			

Issue	Yes	No	Comment
Are railway crossings, bridges and other hazards all conspicuous?			
Is the design free of any other local features which may affect visibility?			
Is the design free of overhead obstructions (for example, road or rail overpasses, sign gantries, overhanging trees) which may limit sight distance at sag curves?			
Has a clear headroom or a high vehicle detour been provided where necessary?			
Is visibility adequate at: <ul style="list-style-type: none"> ▪ any pedestrian, bicycle or cattle crossings? ▪ access roads, driveways, on and off ramps, etc.? 			
Has the minimum sight triangle been provided at: <ul style="list-style-type: none"> ▪ entry and exit ramps? ▪ gore areas? ▪ intersections? ▪ roundabouts? ▪ other conflict points? 			
3.3.2 New/existing road interface			
Have implications for safety at the interface been considered?			
Is the transition from old road to the new scheme satisfactory?			
If the existing road is of a lower standard than the new scheme, is there clear and unambiguous warning of the reduction in standard?			
Have the appropriate provisions for safety been made where sudden changes in speed are required?			
Is access or side friction handled safely?			
Does the interface occur well away from any hazard? (for example, a crest, a bend, a roadside hazard or where poor visibility/distractions may occur)			
If carriageway standards differ, is the change effected safely?			
Is the transition where the road environment changes (for example, urban to rural; restricted to unrestricted; lit to unlit) done safely?			
Has the need for advance warning been considered?			

Issue	Yes	No	Comment
3.3.3 Readability of the alignment by drivers			
Will the general layout, function and broad features be recognised by drivers in sufficient time?			
Will approach speeds be suitable and will drivers correctly track through the scheme?			
3.3.4 Detail of geometric design			
Are the design standards appropriate for all the requirements of the scheme?			
Is consistency of general standards and guidelines, such as lane widths and crossfalls, maintained?			
3.3.5 Treatment at bridges and culverts			
Is the geometric transition from the standard cross-section to that on the bridge handled safely?			
3.4 Intersections			
3.4.1 Visibility to and at intersections			
Are horizontal and vertical alignments at the intersection or on the approaches to the intersection consistent with the visibility requirements?			
Is the standard adopted for provision of visibility appropriate for the speed of traffic and for any unusual traffic mix?			
Will the design be free of sight line obstructions due to safety fences or barriers <ul style="list-style-type: none"> ▪ boundary fences? ▪ street furniture? ▪ parking facilities? ▪ signs? ▪ landscaping? ▪ bridge abutments? ▪ parked vehicles in laybys and at the kerb? ▪ queued traffic? 			
Are railway crossings, bridges and other hazards all conspicuous?			
Is the design free of any other local features which may affect visibility?			
3.4.2 Layout			
Are intersections and accesses adequate for all vehicular movements?			

Issue	Yes	No	Comment
Have the appropriate design vehicle and check vehicle been used for turning dimensions?			
Are swept paths accommodated for all likely vehicle types? (has the appropriate design vehicle been used?)			
Are intersections free of any unusual features which could affect road safety?			
Are pedestrian fences provided where needed? (for example, to guide pedestrians or discourage parking)			
Has pavement anti-skid treatment been provided where needed?			
Have islands and signs been provided where required?			
Vehicles which may park at or close to the intersection: can they do this safely or does this activity need to be relocated?			
Are safety hazards due to parked vehicles avoided?			
3.4.3 Readability by drivers			
Will the existence of the intersection and its general layout, function and broad features be perceived correctly and in adequate time?			
Are the approach speeds and likely positions of vehicles tracking through the intersection safe?			
Is the design free of misleading elements?			
Is the design free of sunrise or sunset problems which may create a hazard for motorists?			
3.4.4 Detailed geometric design			
Can the layout safely handle unusual traffic mixes or circumstances?			
Does any median or any island safely account for: <ul style="list-style-type: none"> ▪ vehicle alignments and paths? ▪ future traffic signals? ▪ pedestrian storage space and surface? ▪ turning path clearance? ▪ stopping sight distance to the nose? ▪ mountability by errant vehicles? 			
Is adequate vertical clearance to structures provided? (for example, powerlines, shop awnings)			
3.4.5 Traffic signals			
Is the signal phasing/sequence safe?			

Issue	Yes	No	Comment
Is adequate time provided for traffic movements and pedestrian movements?			
Will the signal lanterns be visible? (for example, not obstructed by trees, poles, signs or large vehicles)			
Are lanterns for other approach directions adequately shielded from view?			
Are high-intensity signals and/or target boards provided if likely to be affected by sunrise/sunset?			
Does the alignment (vertical and horizontal) provide satisfactory stopping sight distance to the intersection or back of queue?			
Are pedestrian facilities provided where they are required?			
Will approaching drivers be able to see pedestrians?			
Are partially or fully controlled turning phases provided where required?			
Are signal posts located where they are not an undue hazard?			
Are road markings for turning traffic satisfactory?			
Have adequate pedestrian phases been provided?			
3.4.6 Roundabouts			
Is adequate deflection provided to reduce approach speeds?			
If splitter islands are needed, are they adequate for sight distance, length, pedestrian storage, etc.?			
Is the central island prominent?			
Can the appropriate design vehicle and check vehicle be accommodated?			
Are the central island details satisfactory? (delineation, mountability, conspicuousness)			
Can pedestrians be seen by drivers in sufficient time?			
Can pedestrians determine whether vehicles are turning? (no obstructions to sight lines)			
Are direction markings in approach lanes provided where required?			
Is the lighting adequate?			

Issue	Yes	No	Comment
3.4.7 Other intersections			
Has the need for kerbed or painted islands and refuges been considered?			
Do intersections have adequate queue length/storage for turning movements (including in the centre of a staggered intersection)?			
3.5 Special road users			
3.5.1 Adjacent land			
Are all accesses to and from adjacent land/properties safe?			
Have the special needs of agriculture and stock movements been considered?			
3.5.2 Pedestrians			
Can pedestrians cross safely at: <ul style="list-style-type: none"> ▪ intersections? ▪ signalised and pedestrian crossings? ▪ refuges? ▪ kerb extensions? ▪ bridges and culverts? ▪ other locations? 			
Is each crossing point satisfactory for: <ul style="list-style-type: none"> ▪ visibility, for each direction? ▪ use by the disabled? ▪ use by the elderly? ▪ use by children/schools? 			
Is pedestrian fencing on reservations and medians provided where required for each crossing?			
Is fencing adequate on freeways?			
Are pedestrians deterred from crossing roads at unsafe locations?			
Are pedestrian related signs appropriate and adequate?			
Is width and gradient of pedestrian paths, crossings, etc. satisfactory?			
Is surfacing of pedestrian paths, crossings, etc. satisfactory?			
Have dropped kerbs been provided for each crossing?			
Have channels and gullies been avoided at each crossing?			

Issue	Yes	No	Comment
Is lighting satisfactory for each crossing?			
Are crossings sited to provide maximum use?			
Is avoidance of a crossing unlikely? (for example, by more direct but less safe alternative)			
3.5.3 Cyclists			
Have the needs of cyclists been considered: <ul style="list-style-type: none"> ▪ at intersections (particularly roundabouts)? ▪ especially on higher speed roads? ▪ on cycle routes and crossings? ▪ at freeway entry and exit ramps? 			
Are shared cycleway/footway facilities (including subways and bridges) safe and adequately signed?			
3.5.4 Motorcyclists			
Has the location of devices or objects that might destabilise a motorcycle been avoided on the road surface?			
Is the roadside clear of obstructions where motorcyclists may lean into curves?			
Will warning or delineation be adequate for motorcyclists?			
Has barrier kerb been avoided in high-speed areas?			
In areas more likely to have motorcycles run off the road is the roadside forgiving or safely yielded?			
Are all unnecessary poles, posts and devices removed or appropriately shielded?			
Are drainage pits and culverts traversable by motorcycle?			
3.5.5 Equestrians and stock			
Have the needs of equestrians been considered, including the use of verges or shoulders and rules regarding the use of the carriageway?			
Can underpass facilities be used by equestrians/stock?			
3.5.6 Freight			
Have the needs of truck drivers been considered, including turning radii and lane widths?			
Have the needs of freight transport been considered, adequately signed and catered for?			

Issue	Yes	No	Comment
3.5.7 Public transport			
Have the needs for public transport been considered, adequately signed and catered for?			
Have the needs of public transport users been considered?			
Have the manoeuvring needs of public transport vehicles been considered?			
Are bus stops well positioned for safety?			
3.5.8 Road maintenance vehicles			
Have the needs of road maintenance vehicles been considered, adequately signed and catered for?			
Can maintenance vehicles be safely located?			
3.6 Lighting, signs and delineation			
3.6.1 Lighting			
Has lighting been adequately provided where required?			
Is the design free of features which interrupt illumination? (for example, trees or overbridges)			
Is the design free of lighting poles that would present a fixed roadside hazard?			
Are frangible or slip-base poles to be provided?			
Ambient lighting: if it creates special lighting needs, have these been satisfied?			
Is the lighting scheme free of confusing or misleading effects on signals or signs?			
Does the lighting adequately illuminate crossings, nearby paths, refuges, etc.?			
Are all gore areas adequately illuminated?			
Are all merge areas adequately illuminated?			
Is the scheme free of any lighting black patches?			
If there are locations with accident problems that are known to be amenable to treatment with improved lighting, has this lighting been provided?			
3.6.2 Signs			
Are signs appropriate for their location?			

Issue	Yes	No	Comment
Are signs located where they can be seen and read in adequate time?			
Will signs be readily understood?			
Are signs appropriate to the driver's needs? (for example, direction signs, advisory speed signs, etc.)			
Are signs located so that drivers' sight distance is maintained?			
Are signs located so that visibility is maintained: <ul style="list-style-type: none"> ▪ to/from accesses and intersecting roads? ▪ to/from pedestrians and important features on the road? 			
Have the consequences of vehicles striking signposts been considered?			
Are sign supports out of the clear zone?			
If not, are they: <ul style="list-style-type: none"> ▪ frangible? ▪ shielded by barriers (e.g. guard fence, crash cushions)? 			
Has an over-reliance on signs (in lieu of adequate geometric design) been avoided?			
Are signs on the new scheme consistent with those on the adjoining section of road (or will the previous signs need to be upgraded)?			
3.6.3 Marking and delineation			
Are markings (lines, arrows, etc.) consistent with standard markings?			
Have any locations where standard markings might be confusing or misread been identified and treated in a way which considers road users' likely responses?			
Are barrier lines (no overtaking) provided where required?			
Are raised retroreflective pavement markers (RRPMs) provided where necessary?			
Are curve warning signs, advisory speed plates or chevron alignment markers provided where required?			
Are markings on the new scheme consistent with those on the adjoining section of road (or will the previous markings need to be upgraded)?			
Are diagonal markings or chevrons painted where required?			
Will markings and delineation be visible at night-time?			

Issue	Yes	No	Comment
Will markings and delineation be visible in wet weather?			
Has the need for profiled (audible) line marking been considered?			
Have both high and low-beam cases been considered?			
Are guide posts of the frangible type?			
3.7 Physical objects			
3.7.1 Median barriers			
Have median barriers been considered and properly detailed?			
Have all design features that require special attention (for example, end treatments) been considered?			
3.7.2 Poles and other obstructions			
Are all poles located well away from moving traffic?			
Have frangible or breakaway poles been included where required?			
Are median widths adequate to accommodate lighting poles or trees?			
Is the position of traffic signal controllers and other service apparatus satisfactory?			
Is the roadside clear of any other obstructions that may create a safety hazard?			
Have all necessary measures been taken to remove, relocate or shield all hazards?			
Can roadside drains and channels be safely traversed by any vehicle that runs off the road?			
3.7.3 Crash barriers			
Are crash barriers provided where necessary and properly detailed? (for example, at embankments, structures, trees, poles, drainage channels, bridge piers, gore areas)			
Is the crash barrier safe? (i.e. unlikely to create a danger for road users including pedestrians, cyclists, motorcyclists, etc.)			
Are the end conditions of the crash barrier safe and satisfactory?			

Issue	Yes	No	Comment
<p>Is the guard fence designed according to standards for:</p> <ul style="list-style-type: none"> ▪ end treatments? ▪ anchorages? ▪ post spacing? ▪ block outs? ▪ post depth? ▪ rail overlap? ▪ stiffening at rigid obstacles? 			
<p>Is all guard fence necessary? (i.e. what it shields is a greater hazard than the fence)</p>			
<p>Where pedestrians and cyclists travel behind guard fence, is the rear of the fence safe for them?</p>			
<p>3.7.4 Bridges, culverts and causeways/floodways</p>			
<p>Are bridge barriers and culvert end walls safe regarding:</p> <ul style="list-style-type: none"> ▪ visibility? ▪ ease of recognition? ▪ proximity to moving traffic? ▪ the possibility of causing injury or damage? ▪ collapsible or frangible ends? ▪ signs and markings? ▪ connection of crash barriers? ▪ roadside hazard protection? 			
<p>Is the bridge railing at the correct level and strong enough?</p>			
<p>Is the shoulder width on the bridge the same as on the adjacent road lengths?</p>			
<p>Is safe provision made for non-vehicular traffic over structures? (for example, pedestrians, pedal cycles, horses/stock, etc)</p>			
<p>Are all culvert end walls (including driveway culverts) drivable or outside the clear zone?</p>			
<p>Have causeways/floodways etc. been given correct signing and adequate sight distance?</p>			
<p>3.8 Additional questions to be considered for development proposals</p> <p>3.8.1 Horizontal alignment</p>			
<p>Is visibility adequate for drivers and pedestrians at proposed accesses?</p>			
<p>Is adequate turning space provided for the volume and speed of traffic?</p>			

Issue	Yes	No	Comment
Are curve radii and forward visibility satisfactory?			
Are sight and stopping distances adequate?			
3.8.2 Vertical alignment			
Are gradients satisfactory?			
Are sight and stopping distances adequate?			
3.8.3 Parking provision			
Is on-site parking adequate to avoid on-street parking and associated risks?			
Are parking areas conveniently located?			
Is adequate space provided in parking areas for circulation and intersection sight distance?			
3.8.4 Servicing facilities			
Are off-street loading/unloading areas adequate?			
Are turning facilities for large vehicles provided in safe locations?			
Is emergency vehicle access adequate?			
3.8.5 Signs and markings			
Have necessary traffic signs and road markings been provided as part of a development?			
Is priority clearly defined at all the intersection points within the car park and access routes?			
Will the signs and markings be clear in all conditions, including day/night, rain, fog, etc.?			
3.8.6 Landscaping			
Does landscaping maintain visibility at intersections, bends, accesses and pedestrian locations?			
Has tree planting been avoided where vehicles are likely to run off the road?			
3.8.7 Traffic management			
Have any adverse area-wide effects been addressed?			
Will the design keep travel speeds at a safe level?			
Are the number and location of accesses appropriate?			
Are the facilities for public transport services safely located?			

Issue	Yes	No	Comment
Are any bicycle facilities safely located in respect of vehicular movements?			
Are pedestrian facilities adequate and safely located?			
3.8.8 Other			
Has appropriate street lighting been provided?			
Are all roadside hazards appropriately dealt with?			
Has safe pedestrian access to the development been provided?			
3.9 Any other matter Safety aspects not already covered			
Is the road able to safely handle oversize vehicles, or large vehicles like trucks, buses, emergency vehicles, road maintenance vehicles?			
If required, can the road be closed for special events in a safe manner?			
If applicable, are special requirements of scenic or tourist routes satisfied?			
Have all unusual or hazardous conditions associated with special events been considered?			
Have all other matters which may have a bearing on safety been addressed?			