

Maintainability Design Checklist

For Designers and Planners

Surfacing

1. Are there locations along the current pavement surface prone to ponding or icing?
2. Are there locations where pavement is regularly needing to be repaired?
3. Are there locations where pavement may be cracking or moving due to erosion or ground movements?
4. How will surface repairs be made considering the traffic?
5. How will the pavement be maintained and rehabilitated in the future?
6. Is the pavement designed to carry the projected loads?
7. Will widening be required in the near future? If yes, how will it be accomplished?

Shoulders

1. Does Maintenance need wider paved shoulders to perform their work? Where? How wide? For what length?
2. Will shoulders be needed as traffic lanes in the near future? If yes, are they designed to carry the load and have the appropriate cross slope for a traffic lane?
3. Can concrete shoulders be constructed integrally with concrete paving to eliminate joint failures and strengthen the roadway pavement?
4. For shoulder backing, are there areas that are prone to erosion? Can they be bladed safely for traffic?

Access

1. Where/what are the features that Maintenance needs regular access to maintain or inspect? Typical examples include but are not limited to controllers, cabinets, traffic management systems, irrigation, debris collectors, storm water management systems, and some bridges.
2. Can access to these features be provided from off highway locations, such as adjacent low volume roadways?
3. Are gates provided in fences to permit access to inspect and maintain landscaping, electrical, walls, bridges, and drainage facilities?

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4. Where access needs to come from the highway, are maintenance vehicle pullouts (MVP) needed? Where? What are the sizes of vehicles that will be using the MVP?
5. Where features are not adjacent to a gate or MVP, is a pathway (foot access) or road (vehicle access) needed?
 - a. What is the width needed for maintenance workers, equipment, and (for roads) vehicles to access?
 - b. What is Maintenance's preferred surface for pathways and access roads.

Drainage

1. Are drains adjacent to or under concrete barriers accessible for cleaning?
2. Do ditch designs cause erosion problems or do they resolve erosion issues?
3. For side ditches next to shoulder, what cross slope is needed to allow maintenance to sweep and remove debris?
4. For paved ditches, is the pavement designed to accommodate maintenance vehicles which will drive along or across the ditch?
5. Are pipe ends designed to control erosion?
6. Are clean-outs provided in closed drainage systems? Does Maintenance have access to these cleanouts for them, their equipment, and vehicles (if necessary)?
7. Are all pipe culverts large enough to permit cleaning?
8. Is rodent protection provided for underdrain outlets?
9. Will channel alignments cause erosion problems? Is there adequate right of way to make repairs?
10. Are pipe coatings resistant to abrasion and chemical conditions of effluent and soil?
11. Are nonstandard grates specified?

Roadsides

1. What plants are recommended for maintenance? Can drought-resistant plantings be used?
2. Can native grasses be used to reduce or eliminate mowing?

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3. Are slopes too steep to mow?
4. Are slopes flat enough to resist erosion and slides?
5. Are there currently areas prone to erosion or rock fall?
6. Can sound walls be placed on the right-of-way line to eliminate maintenance behind the walls? If not, is access provided?
7. Is their sufficient width and access provided to mow behind guardrails, barriers, walls, and fences?
8. Is their sufficient width between toe of slopes, top of cuts, or walls and right of way line or roadway for maintenance to access and maintain? What width is needed to avoid maintenance access on foot?

Traffic

1. Is it economical to flatten slopes in the clear zone to eliminate guardrail?
2. Does the guardrail design use standard materials, so maintenance can minimize the stocking of repair parts?
3. How will vegetation under guardrail be controlled? Would paving be justified?
4. Can maintenance repair guardrail without closing a traffic lane? If no, should a concrete barrier be substituted?
5. Should thermoplastic be specified instead of paint to reduce maintenance and interference with traffic?
6. Are attenuators standard so maintenance can minimize the stocking of repair parts?
7. Are signal controllers protected from traffic?
8. Are signs coated to reduce the effects of vandalism?
9. Will the fastener design for signs prevent theft?
10. Are pull boxes and irrigation control boxes located away from the shoulder out of the potential path of travel from vehicles?

Winter Maintenance

1. Is adequate room provided to store snow?
2. How will snow be removed from bridge decks?
3. Are median cross-overs provided on divided roadways for ease of routing snow and ice control vehicles?

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Miscellaneous

1. Are there any non-documented agreements with landowners?
2. Are there locations where vehicles park or turnaround off pavement?
Consider paving these areas.
3. Are school bus turning areas provided?

Bridges (for Bridge Designers)

1. Are bridges designed to permit jacking to facilitate servicing, repair or replacement of bridge bearings?
2. Are provisions included for waterproofing decks?
4. Are maintenance and operating manuals provided for movable bridges and other complex structures?
5. Is the shoulder wide enough to accommodate the snoopers or other inspection/maintenance activities without impeding traffic?
6. For skewed bridges, is the angle of snowplow blades considered in setting the bridge skew? Where the bridge skew and snowplow angle are the same, plows are more likely to catch on the joint, damaging the joint or the plow.
7. Are critical inspection items listed on the plans to advise bridge safety inspectors?
8. Are bridge components accessible for inspection and maintenance? If not, what is needed?
9. Are joints adequately sealed to prevent water getting into the bearings and supports below the joints?
10. Are the interiors of box beams accessible for inspection? Are outlets provided for lighting?
11. Do deck drains carry the water below the beams to prevent water damage from splash-back?
12. Do deck drainage systems have clean-outs? Does the system have any sharp bends that may cause clogging?
13. Is the channel protected to prevent erosion?
14. Is drainage at abutments provided to prevent erosion?
15. Are vertical and horizontal clearances adequate to prevent damage?

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16. Are there any unusual joint details?

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Appendix B –

Suggested Checklist for Maintenance Review of Plans

Landscape

- a. Plant materials have been planted following the “Plant Setback and Spacing Guide.”
- b. Trees should be located outside the Clear Recovery Zone (CRZ) as specified in the Highway Design Manual (HDM) Topic 309.1(2) and 902.2.
- c. Trees should be set back and provide adequate vertical clearance along pedestrian and bicycle pathways without requiring frequent maintenance.
- d. Trees located in overhead watered groundcover areas must be provided supplemental basin irrigation.
- e. Design should accommodate typical maintenance practices and equipment, e.g., not interfering with pulling hoses, mowing, access needs of maintenance equipment for proposed design, edging and minimizing the need to maintain slope and recovery area
- f. Planting shall maximize cover (including adequate on center spacing) by the end of the three (3) year plant establishment period.
- g. Mulch should be applied for weed suppression and/or water retention around base of trees, where plants will not fill in space at the time of construction. Hardscaping techniques, using rocks or other decorative features in lieu of ground cover or mulch, are expected to become more popular as means to minimize water usage.
- h. Planting and irrigation design shall reflect Caltrans’s goal of reduced pesticide use and water use as identified in Governor’s Executive Order B-18-12.
- i. Maximize use of overhead irrigation to enhance safety and maintainability. Whenever possible, include the placement of irrigation mains, wire and laterals away from shoulders to reduce possible damage caused by future construction or vehicles parked on the roadside and allow safer maintenance.

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Bridges (for Bridge Crews)

- a. Are bridges designed to permit jacking to facilitate servicing, repair or replacement of bridge bearings?
- b. Are provisions included for waterproofing decks?
- c. Are maintenance and operating manuals provided for movable bridges and other complex structures?
- d. Is the shoulder wide enough to accommodate the snooper without impeding traffic?
- e. For skewed bridges, is the angle of snowplow blades considered in setting the bridge skew?
- f. Where the bridge skew and snowplow angle are the same, plows are more likely to catch on the joint, damaging the joint or the plow.
- g. Are critical inspection items listed on the plans to advise bridge safety inspectors?
- h. Are bridge components accessible for inspection and maintenance?
- i. Are joints adequately sealed to prevent water getting into the bearings and supports below the joints?
- j. Are the interiors of box beams accessible for inspection? Are outlets provided for lighting?
- k. Do deck drains carry the water below the beams to prevent water damage from splash-back?
- l. Do deck drainage systems have clean-outs? Does the system have any sharp bends that may cause clogging?
- m. Is the channel protected to prevent erosion?
- n. Is drainage at abutments provided to prevent erosion?
- o. Are vertical and horizontal clearances adequate to prevent damage from maintenance equipment?
- p. Are there any unusual joint details?