



Appendix B

Countermeasure Service Life

Countermeasure service life is a key input variable to conduct a crash-based benefit cost (B/C) analysis of potential countermeasures for implementation. The B/C ratio is used by ADOT to prioritize HSIP funded projects.

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Introduction:

This appendix of countermeasure service life tables is compiled from tables extracted from FHWA's Technical Document Titled *Countermeasure Service Life Guide* published in March 2021. The entire document can be viewed/downloaded at https://safety.fhwa.dot.gov/hsip/docs/FHWA-SA-21-021_Countermeasure_Serv_Life_Guide.pdf

The FHWA Guide provides additional background information on factors that can impact countermeasure service life and analytical considerations when conducting benefit-cost analysis for multiple countermeasures or alternatives with differing service life.

The countermeasure service life is used in the ADOT Benefit to Cost Ratio Analysis.

Access Management

Table I provides service lives for access management countermeasures. The typical service life for all countermeasures in this category is 20 years. Agencies may consider these values, along with the other factors described in Section 2.5 of the FHWA Guide, when selecting a final service life value.

Table I. Typical Service Lives for Access Management Countermeasures.

Access Management Countermeasures	Service Life (Years)
Adjust Driveways Near Intersection	20
Change Driveway Density	20
Change Intersection Density	20
Change Median Width	20
Close Median Opening	20
Convert Driveway Entrance to Regular Intersection	20
Convert to Right-In-Right-Out Operations	20
Convert Two-Way to One-Way Operation	20
Create Directional Median Openings	20
Flatten Entrance Slopes	20
Increase Separation Distance Between Driveway and Downstream U-Turn	20
Install Flush/Depressed/Raised Median	20
Relocate Existing Driveway	20
Replace Two-Way Left-Turn Lane with Raised Median	20

Advanced Technology and ITS

Table 2 provides service lives for advanced technology and ITS countermeasures. The typical service life for all countermeasures in this category is 10 years. Agencies may consider these values, along with the other factors described in Section 2.5 of the FHWA Guide, when selecting a final service life value.

Table 2. Typical Service Lives for Advanced Technology and ITS Countermeasures.

Advanced Technology and ITS Countermeasures	Service Life (Years)
Implement Active Traffic Management Strategies	10
Implement Incident Management to Reduce Incident Duration	10
Install Changeable “Queue Ahead” Warning Signs	10
Install Changeable Message Signs	10
Install Changeable Speed or Crash Ahead Warning Signs	10
Install Long Vehicle Detection	10
Install Ramp Meters	10
Install Red Light Cameras	10
Install Speed Enforcement Camera/System	10
Install Toll Collection System	10
Install Wrong Way Driver Advanced Technology	10

Alignment

Table 3 provides service lives for alignment countermeasures. The typical service life for all countermeasures in this category is 20 years. Agencies may consider these values, along with the other factors described in Section 2.5 of the FHWA Guide, when selecting a final service life value.

Table 3. Typical Service Lives for Alignment Countermeasures.

Alignment Countermeasures	Service Life (Years)
Change Horizontal Alignment	20
Change Vertical Alignment	20
Improve Superelevation	20
Increase Stopping Sight Distance on Crest Vertical Curve	20
Make Geometric Improvements	20
Relocate Frontage Road	20

Bicycle

Table 4 provides service lives for bicycle countermeasures. The typical service life for countermeasures in this category range from 1 to 25 years. Agencies may consider these values, along with the other factors described in Section 2.5 of the FHWA Guide, when selecting a final service life value.

Table 4. Typical Service Lives for Bicycle Countermeasures.

Bicycle Countermeasures	Service Life (Years)
Install Standard Paint Bicycle Box	1
Install Standard Paint Bicycle Lane	1
Install Durable Marking Bicycle Box	5
Install Durable Marking Bicycle Lane	5
Install Bicycle Signal	10
Change Sidewalk Width	20
Install Bicycle Lane	20
Install Dedicated Bicycle Facility	20
Install Dedicated Bicycle Facility at Intersection	20
Install Raised Bicycle Crossings	20
Install Sidewalk Barrier	25

Delineation

Table 5 provides service lives for delineation countermeasures. The typical service life for countermeasures in this category range from 1 to 5 years. Agencies may consider these values, along with the other factors described in Section 2.5 of the FHWA Guide, when selecting a final service life value.

Table 5. Typical Service Lives for Delineation Countermeasures.

Delineation Countermeasures	Service Life (Years)
Install, Apply, or Restripe with Paint Markings	1
Improve Pavement Marking Retroreflectivity	1
Provide Standard Paint “STOP Ahead” Pavement Markings	1
Install, Apply, or Restripe with Tape or Thermoplastic Markings	5
Improvement Pavement Marking to Wet-Reflective Markings	5
Install Delineators	5
Install Profile Center Line Markings	5
Install Profile Edge Line Markings	5
Install Raised Reflective Pavement Markers	5
Provide Durable “STOP Ahead” Pavement Markings	5
Restripe with Epoxy	5

Highway Lighting

Table 6 provides service lives for highway lighting countermeasures. The typical service life for all countermeasures in this category are 15 years. Agencies may consider these values, along with the other factors described in Section 2.5 of the FHWA Guide, when selecting a final service life value.

Table 6. Typical Service Lives for Highway Lighting Countermeasures.

Highway Lighting Countermeasures	Service Life (Years)
Modify/Improve Lighting	15
Provide Intersection Lighting	15
Providing Segment Lighting	15

Interchange Design

Table 7 provides service lives for interchange design countermeasures. The typical service life for all countermeasures in this category are 20 years. Agencies may consider these values, along with the other factors described in Section 2.5 of the FHWA Guide, when selecting a final service life value.

Table 7. Typical Service Lives for Interchange Design Countermeasures.

Interchange Design Countermeasures	Service Life (Years)
Add Acceleration or Deceleration Lane	20
Change Ramp Type	20
Convert Interchange Configuration	20
Modify Number of Lane Changes at Merge/Diverge Area	20
Modify Speed Change Lane Design	20
Provide Auxiliary Lane Between Entrance and Exit Ramp	20
Install Grade Separation	30

Intersection Geometry

Table 8 provides service lives for intersection geometry countermeasures. The typical service life for countermeasures in this category range from 1 to 20. Agencies may consider these values, along with the other factors described in Section 2.5 of the FHWA Guide, when selecting a final service life value.

Table 8. Typical Service Lives for Intersection Geometry Countermeasures.

Intersection Geometry Countermeasures	Service Life (Years)
Provide Standard Painted Channelized Left-Turn Lane	1
Provide Durable Marking Channelized Left-Turn Lane	5
Add Left- or Right-Turn By-Pass Lanes	20
Add Quadrant Roadway to Intersection	20
Change Intersection Angle	20
Change Number of Lanes on Intersection Approach	20
Convert 4-Leg Intersection to Two 3-Leg Intersections	20
Convert Intersection RCUT/J-Turn	20
Convert Intersection to Continuous Flow Intersection	20
Convert Intersection to Median U-Turn	20
Convert Intersection to Superstreet	20
Convert T-Intersection to Continuous Green-T Intersection	20
Convert Traffic Signal to Roundabout	20
Convert Two-Way Stop Intersection to Roundabout	20
Improve Intersection Sight Distance (non-vegetation based)	20
Improve Left-Turn Lane Offset to Create Positive Offset	20
Increase Turn Lane Length	20
Install Channelization	20
Install Curb Extensions/Bulb Outs	20

**Table 8. Typical Service Lives for Intersection Geometry Countermeasures
(continued).**

Intersection Geometry Countermeasures	Service Life (Years)
Install Median Acceleration Lane	20
Install Reduced Left-Turn Conflict Intersection	20
Install Splitter Island	20
Install Turn Arounds	20
Modify Intersection Geometry	20
Provide Channelized Left-Turn Lane	20
Provide Channelized Right-Turn Lane	20
Provide Left-Turn Acceleration Lane	20
Provide Left-Turn Lane	20
Provide One-Way Couple	20
Provide Right-Turn Acceleration Lane	20
Provide Right-Turn Lane	20
Remove Intersection Leg	20

Intersection Traffic Control

Table 9 provides service lives for intersection traffic control countermeasures. The typical service life for countermeasures in this category range from 1 to 15. Agencies may consider these values, along with the other factors described in Section 2.5 of the FHWA Guide, when selecting a final service life value.

Table 9. Typical Service Lives for Intersection Traffic Control Countermeasures.

Intersection Traffic Control Countermeasures	Service Life (Years)
Install Standard Paint Temporary Traffic Circle	1
Add Retroreflective Tape to Backplate	5
Install Durable Marking Temporary Traffic Circle	5
Add Retroreflective Backplate	10
Change Signal Left-Turn Phasing	10
Change Signal Mount Type	10
Change Signal Permissions/Protections	10
Change Signal/Phase Interval	10
Convert Two-Way Stop Control to All-Way Stop Control	10
Convert Unsignalized Superstreet to Signalized Superstreet	10
Implement Flashing Yellow Arrow	10
Improve Signal Head/Lens Visibility	10
Install Closed Loop Signal System	10
Install Dynamic Signal Warning Flashers	10
Install Emergency Vehicle Pre-Emption Systems	10
Install Leading Pedestrian Interval	10
Install Left-Turn Yield Blank Out Sign	10
Install Optically Programmed Signal	10
Install Pedestrian Countdown Timer	10

Table 9. Typical Service Lives for Intersection Traffic Control Countermeasures (continued).

Intersection Traffic Control Countermeasures	Service Life (Years)
Install Pedestrian Signal	10
Install Traffic Signal	10
Permit or Prohibit Right-Turn-On-Red	10
Change Unrestricted Left-Turn Hours	10
Prohibit Left-Turns and/or U-Turns	10
Provide Advance Dilemma Zone Protection	10
Provide Intersection Flashing Beacon	10
Provide Signal Coordination	10
Provide Traffic Signal Actuation	10
Provide Traffic Signal Optical Programming	10
Provide Traffic Signal Time Lane Control	10
Relocate Signal Supports	10
Remove Unwarranted Traffic Signal	10
Replace Night-Time Flash with Steady Operation	10
Upgrade Traffic Signals	10
Implement Systemic Signing and Marking Improvements at Signal-Control Intersection	15
Implement Systemic Signing and Marking Improvements at STOP-Control Intersection	15

Pedestrian

Table 10 provides service lives for pedestrian countermeasures. The typical service life for countermeasures in this category range from 1 to 30. Agencies may consider these values, along with the other factors described in Section 2.5 of the FHWA Guide, when selecting a final service life value.

Table 10. Typical Service Lives for Pedestrian Countermeasures.

Pedestrian Countermeasures	Service Life (Years)
Install Standard Paint Advanced Yield or Stop Markings at Pedestrian Crossing	1
Install Standard Paint Crosswalk	1
Provide Improvements to Standard Paint Crosswalks	1
Install Durable Advanced Yield or Stop Markings at Pedestrian Crossing	5
Install Durable Marking Crosswalk	5
Install High-Visibility Yellow Crosswalks at School	5
Provide Improvements to Durable Marking Crosswalks	5
Implement Barnes Dance	10
Improve Pedestrian Signal	10
Install Actuated Overhead Flasher for a Pedestrian Location	10
Install Fencing	10
Install Pedestrian Hybrid Beacon	10
Install Rectangular Rapid Flashing Beacons	10
Install Advanced Yield or Stop Signs at Pedestrian Crossing	15
Install Fluorescent Yellow-Green Pedestrian Crossing Sign	15
Install Pedestrian Crossing with New Signs	15
Install Bus Shelter	20
Install Pedestrian Refuge Island	20
Install Raised Intersection	20
Install Sidewalk	20
Separate Pedestrians from Vehicle Traffic on Bridge	20
Construct Pedestrian and/or Bicycle Overpass or Underpass	30

Railroad Grade Crossings

Table 11 provides service lives for railroad grade crossing countermeasures. The typical service life for countermeasures in this category range from 1 to 25. Agencies may consider these values, along with the other factors described in Section 2.5 of the FHWA Guide, when selecting a final service life value.

Table 11. Typical Service Lives for Railroad Grade Crossing Countermeasures.

Railroad Grade Crossing Countermeasures	Service Life (Years)
Install Standard Paint Pavement Markings	1
Install Delineators	5
Install Durable Pavement Markings	5
Change Traffic Control at Railroad Grade Crossing	10
Install Flashing Beacons	10
Modify Railroad Grade Crossing Electronics	10
Install Automatic Railroad Gates	15
Install Flashing Lights	15
Install Safety Lighting	15
Install Signs and Crossbucks	15
Install Warning Bells	15
Install Warning Signs	15
Modify Railroad Crossing Alignment and Surface	20
Install Median Barrier	25
Close, Eliminate, or Separate Railroad Grade Crossing	30

Resurfacing

Table 12 provides service lives for resurfacing countermeasures. The typical service life for countermeasures in this category range from 5 to 10. Agencies may consider these values, along with the other factors described in Section 2.5 of the FHWA Guide, when selecting a final service life value.

Table 12. Typical Service Lives for Resurfacing Countermeasures.

Resurfacing Countermeasures	Service Life (Years)
Apply Chip Seal	5
Apply Open Graded Friction Course	5
Apply Slurry Seal	5
Apply Thin Layer of Hot Mix Asphalt	5
Apply Ultrathin Bonded Wearing Course	5
Apply Grooved Pavement Skid Treatment	10
Apply Skid Treatment and Seal Coat	10
Conduct Diamond Grinding	10
Install High Friction Surface Treatment	10
Pave Roadway Surface	10
Resurface Pavement	10

Roadside

Table 13 provides service lives for roadside countermeasures. The typical service life for countermeasures in this category range from 10 to 25. Agencies may consider these values, along with the other factors described in Section 2.5 of the FHWA Guide, when selecting a final service life value.

Table 13. Typical Service Lives for Roadside Countermeasures.

Roadside Countermeasures	Service Life (Years)
Change Clear Zone Width	10
Install End Treatment	10
Install Impact Attenuation System	10
Install Snow Fencing	10
Protect Culvert with Guardrail or Grate	15
Change Median Width	20
Change Roadside Hazard Rating	20
Change the Longitudinal Density of Utility Poles	20
Flatten Side Slope	20
Improve Horizontal Sightline Offset (non-vegetation based)	20
Install Rest Areas	20
Install Traversable Median	20
Install Truck Escape Ramp	20
Install Turnouts	20
Lengthen Culvert	20
Remove Culvert Headwall and Delineate	20
Remove or Relocate Fixed Object	20
Change Barrier Type	25
Construct Gateway Monument	25
Cushion Fixed Object	25
Install Cable Median Barrier	25
Install Concrete Median Barrier	25
Install Motorcycle Rub Rail under Existing W-Beam	25
Install Outside Guardrail/Barrier	25
Install Steel Median Barrier	25
Upgrade Median Barrier	25

Roadway

Table 14 provides service lives for roadway countermeasures. The typical service life for countermeasures in this category range from 1 to 20. Agencies may consider these values, along with the other factors described in Section 2.5 of the FHWA Guide , when selecting a final service life value.

Table 14. Typical Service Lives for Roadway Countermeasures.

Roadway Countermeasures	Service Life (Years)
Install Standard Paint Median	1
Install Durable Marking Median	5
Install Raised Pavement Markers on Median	5
Install Wildlife Detection Systems	10
Lane Restrictions – High Occupancy	10
Lane Restrictions – Trucks	10
Provide Milled Center Line Rumble Strips	10
Provide Milled Edge Line Rumble Stripes	10
Provide Transverse Rumble Strips	10
Install Glare Shields	15
Add Two-Way Left-Turn Lane	20
Change Lane Width	20
Change Pavement Width	20
Close Crossover	20
Convert Two-Lane Roadway to Four-Lane Divided Roadway	20
Implement Road Diet	20
Improve Drainage	20
Increase Number of Lanes	20
Install Passing or Climbing Lane	20
Reallocate Pavement Width	20
Widen Managed Lane Envelope	20

Shoulder Treatment

Table 15 provides service lives for shoulder treatment countermeasures. The typical service life for countermeasures in this category range from 5 to 20. Agencies may consider these values, along with the other factors described in Section 2.5 of the FHWA Guide, when selecting a final service life value.

Table 15. Typical Service Lives for Shoulder Treatment Countermeasures.

Shoulder Treatment Countermeasures	Service Life (Years)
Install Raised Shoulder Rumble Strips	5
Install Safety Edge Treatment	10
Provide Milled Shoulder Rumble Strips	10
Change Shoulder Type	20
Change Shoulder Width	20

Signs

Table 16 provides service lives for sign countermeasures. The typical service life for countermeasures in this category range from 5 to 20. Agencies may consider these values, along with the other factors described in Section 2.5 of the FHWA Guide, when selecting a final service life value.

Table 16. Typical Service Lives for Sign Countermeasures.

Sign Countermeasures	Service Life (Years)
Install Solar Power Flasher on Sign	5
Install Solar Power Flashing LED STOP Sign	5
Upgrade to Solar Power LED Sign	5
Install a Detection Warning System with CCTVs	10
Install Intersection Conflict Warning System	10
Install Sequential Dynamic Chevrons	10
Install Static Signs and Flashers “Truck Speed too Fast when Flashing”	10
Install Wired Flasher on Sign	10
Install Wired Flashing LED STOP Sign	10
Provide Actuated Advanced Flasher at Official Use Crossover	10
Provide Actuated “Prepare to Stop When Flashing Signs”	10
Updated to Wired LED Sign	10
Improve Sign Visibility (non-vegetation based)	15
Increase Sign Retroreflectivity	15
Install Advance Curve Speed/Warning Sign	15
Install Advance Signal Warning Sign	15
Install Advance Street Name Sign	15
Install Chevron Sign	15
Install Guide Sign	15

Table 16. Typical Service Lives for Sign Countermeasures (continued).

Sign Countermeasures	Service Life (Years)
Install Lane Use Sign	15
Install Sign	15
Install Speed Signing	15
Install STOP Sign, Oversize STOP Sign, or Double STOP Signs	15
Install Yield Sign	15
Provide a Mandatory Motorcycle Pull Off Area with Roadway Informational Signing	20

Structures

Table 17 provides service lives for structure countermeasures. The typical service life for countermeasures in this category range from 10 to 30. Agencies may consider these values, along with the other factors described in Section 2.5 of the FHWA Guide, when selecting a final service life value.

Table 17. Typical Service Lives for Structure Countermeasures.

Structure Countermeasures	Service Life (Years)
Improve Bridge Pavement Friction	10
Grooving Bridge Pavement	10
Install Frost/Ice Detectors on Bridge	10
Install Breakaway Sign Supports	15
Install Breakaway Utility/Light Poles	15
Install Overhead Sign Truss	15
Install Barrier on Bridge	25
Replace Bridge Guardrail	25
Upgrade Bridge Rail	25
Build Structure	30
Improve Drainage Structure	30
Remove Existing Bridge	30
Widen Bridge	30

Work Zone

Table 18 provides service lives for work zone countermeasures. The typical service life for all countermeasures in this category is one year. Agencies may consider these values, along with the other factors described in Section 2.5 of the FHWA Guide, when selecting a final service life value.

Table 18. Typical Service Lives for Work Zone Countermeasures.

Work Zone Countermeasures	Service Life (Years)
Modify Work Zone Duration	1
Modify Work Zone Length	1

Other

Table 19 provides service lives for other countermeasures. The typical service life for countermeasures in this category range from 10 to 50 years. Agencies may consider these values, along with the other factors described in Section 2.5 of the FHWA Guide, when selecting a final service life value.

Table 19. Typical Service Lives for Other Countermeasures.

Other Countermeasures	Service Life (Years)
Install Speed Humps	10
Install Transit Lane Priority	10
Install Transit Signal Priority	10
Change Posted Speed Limit	15
Implement Area-Wide Traffic Calming	15
Implement Time-Limited Parking Restrictions	15
Prohibit On-Street Parking	15
Remove Curb Parking	20
Change Transit Stop Presence/Location	20
Change Right of Way	30