

Index

Page numbers in **boldface** refer to figures.

Page numbers followed by *t* refer to tables. Page numbers followed by *n* refer to notes.

A

AASHTO Green Book. *See A Policy on Geometric Design of Highways and Streets*

Abbreviations, viii

Acceleration effects, vertical, 68-69

Acceptance of traffic calming measures, **2**

Advance warning

signs, 90, 92, 94

visual pre-warning, 174

Aesthetic considerations

benefits of, 66

landscaping, 83-85

property value impacts of traffic calming, 114, 115

speed hump design, 31

speed hump markings, 66

temporary measures, 82, 83

Agins v. City of Tiburon, 133

Angle point, **13**, 41, **54**

speed impacts, **101**

volume impacts, **101**

Angled choker, 41

Areawide treatments, 63, 82, 155-156

defining area of impact, 166-167

warrants and, 159

Arterials and collectors. *See High-volume streets*

Australia, 13, 87

Axial shifts, 39

B

Best Development Practices, 182, 186

Bicycle traffic

impacts of traffic calming measures, 114

traffic island design, 36

Block length, 196*n*

Brick streets, 34

Britain, 10, 11-14, 87, 170

Buchanan, Colin, 11

Bulbouts, 39

BUMP sign, 93

C

Canada, 2

design standards, 74, **75-81**, 159

safety impacts of traffic calming, 111

Canadian Guide to Neighbourhood Traffic Calming, 2, 32, 74-81

Center island narrowings, 40-41, **52**, **57**

design trends, 62

signing and marking, 86-92

with speed table, **59**

Centerline striping, 122

Chicanes, **59**

accident reduction effectiveness, 110

Canadian design standards, **79**

definition, 38

design, 38

signing and marking, 90, 93

speed impacts, **102**

test installation, 83

volume impacts, **102**

Chokers, 41, **53**

with center island, **57**

legal liability, 135, **136**

with raised crosswalk, **57**

signing and marking, 90

snow removal, 152

with speed hump, **56**

with speed table, **59**

volume control effectiveness, 61*t*

Cobblestone surface, **34**

limitations, 34

Collision reduction, 109-112

effectiveness of traffic calming measures, 228-233*t*

Constrictions, 41

Costs

accommodating emergency services, 147

enforcement methods, 118*t*

landscape maintenance, 84-85

neighborhood cost-sharing, 167

project priority rating systems, **156**, 161-164

property value impacts of traffic calming, 114-115

savings due to accident reduction, 109

speed humps, 118*t*

speed tables, 33

traffic calming measures, 58

traffic circles, 36-37

Crime prevention, 5-6, 112-114

police attitudes toward traffic calming, 150-152

Cul-de-sac design, 187

Cul-de-sacs, 19
Curb design, traffic circle, 72-73
Curb extensions, 31
 lateral shifts, 39
 neckdowns, 39-40
 vehicle turning speed and, 39, **40**
Curvature of roadway
 horizontal, 66-68
 speed control, 40, 66-69
 vertical, 68-69
Cut-through traffic
 areawide traffic calming approach, 63
 design solutions, 60, 183-184
 effective/ineffective designs, 17-19

D

Deflector islands, **55, 62**
 design trends, 62
 for main roads, 173-174
Denmark, 10-11, 62, 171, 174
Design
 abruptness of alignment change, 69-70
 areawide approach, 63, 82
 for arterials and collectors, 170-178
 Canadian standards, 74, **75-81**
 case studies of effective/ineffective choices, 17-19
 combinations of measures, 58-60
 emergency response considerations, 144-150
 generalized assessment of measures, 19, 20*t*
 geometric. *See* Geometric design
 half closures, 20-23
 horizontal curvature, 66-68
 landscaping, 83-85
 narrowings, 62
 neckdowns, 39-40
 new developments, 182-189
 predictability vs. randomness, 61-62
 problem identification, 17
 public involvement, 167-168
 roundabouts, 38, 179-180
 signing and marking, 85-97
 spacing of measures, 63
 speed tables, 33, 34
 street network, 60
 traffic circles, 35
 trends, 58, 60, 62-63
 underdesign/overdesign, 69-70
 vertical curvature, 68-69
 WILMAPCO standards, 189
 See also Planning and implementation
Deviations, 38
Diagonal diverters, 23, **27**
 Canadian design standards, **75**
 concerns of emergency services, 146
 signing, 92
 volume impacts, **102**

Diagonal road closure, 23
Diamond choker, **13**
Disabled persons, 134, 181*n*
Diversion potential, 105, 159-161
 defining area of impact, 166-167
 neighborhood collector, 175
Diverter-closure, **56**
 legal challenges to, 131
 volume impacts, **102, 103**

E

Edgeline striping, 122
Education and enforcement, 3
 activities of, **4**
 cost comparison, 118*t*
 effectiveness, 116-118, 234*t*
 neighborhood speed watch, 117-118
 neighborhood traffic safety campaigns, 116
 photo-radar speed enforcement, 118
 police attitudes toward traffic calming, 150-152
 police presence, 118
 radar speed display unit, 116-117
Emergency response services, 138
 access to facilities, 145
 concerns about traffic calming, 138
 delay-associated risks, 153*n*
 design considerations, 144-150
 modification of measures to accommodate, 147-148
 in planning process, 144, 145-146
 rationale for opposition to traffic calming, 138
 response times, 140-143, 144*t*
 strategies for addressing concerns of, 143-150
 street width design, 188-189
 traffic calming innovations for, 148-150
 traffic calming policies for, 138, 139-140*t*
 traversable diverter, 15
 vertical curvature of roadway, 69
 See also Police departments
Enforcement. *See* Education and enforcement
European traffic calming efforts, 10-14
 accident reduction effectiveness, 112
 on arterials and collectors, 170-175
 See also specific country

F

Failure to act, 134-135
Failure to warn, 87, 133
Featured traffic calming programs, vii, 8
Federal Highway Administration, 1
Fire and rescue services. *See* Emergency response services
Florida Roundabout Guide, 179-180
Forced turn islands, 23, **29**
 Canadian design standards, **77**
 concerns of emergency services, 146
France, 10, 174

Friends of H Street v. City of Sacramento, 134-135

Full diverters, 23

Full street closures, **24**

- community concerns, 20
- definition and characteristics, 19-20
- policies and procedures, 20, 21*t*

Funding, 1

- neighborhood cost-sharing, 167

G

Gateways, 40, 174

Geometric design

- for arterials and collectors, 171
- new developments, 182
- roundabouts, 73
- speed humps, 70-71
- speed impacts, 103-105
- speed tables, 71-72
- traffic circles, 72-73

Germany, 10, 11

Great Britain, 10, 11-14, 87, 170

H

Half circle, **55**

Half closures, **15, 25**

- concerns of emergency services, 146, 147
- definition, 20
- design, 20-23
- legal challenges to, 131
- signing and marking, 92
- volume impacts, 61*t*, **103**, 108

Hammerhead, **54**

Hazard Elimination Program, 1

High-volume streets

- conversion of one-way to two-way, 180-181
- design speeds, 170-171
- European designs for, 170-175
- pre-warnings, 174
- reallocation of right-of-way, 171-174
- roundabouts, 178-180
- selection of measures, 171
- spacing of measures, 171
- speed table design, 69
- street edge treatments, 175
- in suburban network design, 188
- traffic calming rationale, 170
- U.S. designs for, 175-178

Historical development of traffic calming measures

- in Europe, 10-14
- in United States, 14-15, 58-63

Hospitals, 145

I

Impacts of traffic calming measures

- angled slow point, **101**
- benefits of aesthetic design, 66
- case example, 99
- chicanes, **102**
- collision reduction, 109-112, 228-233*t*
- crime reduction, 5-6, 112-114
- defining area of impact, 166-167
- determinants of, 100
- diagonal diverter, **102, 103**
- diverter/closure, **102**
- education and enforcement activities, 116-118, 234*t*
- effective/ineffective choices, 17-19
- effectiveness of regulatory measures, 119, 235*t*
- European studies, 13-14, 116
- generalized assessments, 19, 20*t*
- geometric design, 70
- German experience, 11
- half closure, 61*t*, **103**
- measurement methodology, 100, 103
- median chokers, **102**
- neighborhood livability, 5
- noise levels, 116
- one-lane choker, 61*t*
- property values, 114-115
- psycho-perception controls, 121-123, 236*t*
- raised crosswalk, **101**
- raised intersection, **101**
- research opportunities, 116
- roundabouts, 37-38
- semi-diverter, **103**
- speed control, 100-105, 207-225*t*
- speed humps, 31, 70-71, **100**, 103
- speed tables, 71, **100, 101, 102**
- Stevens neighborhood demonstration project, 14-15
- street life, 114
- traffic circles, 37, **101, 102**
- volume control, 105-109, 207-225*t*

Impeller, **13**

Institute of Transportation Engineers, 1, 6-7

- District 6 survey, 7

Intermodal Surface Transportation Efficiency Act of 1991, 1, 164

Intersection humps, 34

Intersection islands, 34

Intersection narrowings, 39

Island diverters, 23

Israel, 10

J

Japan, 10

Jiggle bumps, **54, 121**

Jogs, 39

K

Knuckles, 39

L

Landscaping

- benefits of, 83-84
- maintenance, 84-85, 86*t*

Large-vehicle traffic

- fire trucks, 147, 148
- horizontal curvature of roadway, 67
- left-turns at circles, 72
- traffic island design, 35, 37
- turning radii, 68
- vertical curvature of roadway, 69

Lateral shifts, 39, **54**

signing, 93

Legal issues, 127-130, 128-129*t*

- access for persons with disabilities, 134
 - case law, 131-135
 - challenges to traffic calming measures, 7-8
 - damage claims, 135-136
 - exercise of police powers, 137*n*
 - failure to act, 133, 134-135
 - failure to warn, 87, 133
 - legal authority, 131-133
 - loss of access claims, 133-134
 - minimizing liability, 127-131, 137*n*
 - reference standards, 86
 - risk of legal action, 127, 137*n*
 - signing and marking, 85
 - speed humps, 31
 - statutory authority for traffic calming, 130
 - takings claims, 133
 - tort liability, 87, 132-133, 137*n*
- Legislation, federal
- advantages of, in implementing traffic calming, 13-14
 - traffic calming, 1
- Livable Streets*, 1, 2
- Local area traffic management, 13

M

Mackie v. Seattle, 133

Manual on Uniform Traffic Control Devices for Streets and Highways, 62, 119, 130, 132, 159

signing and marking guidelines, 85, 86, 87, 89-90, 92

Marking

- case example, 90-92
- chicanes, 90
- half closures, 92
- local weather considerations, 94
- MUTCD* guidelines, 85, 86, 87, 89-90, 92-93
- national standards, 87
- patterns, 94-97
- psycho-perception controls, 121-123

- purpose, 85
- speed humps, 66, 92, 94-97
- speed tables, 94-97
- traffic islands, 86-89, 90

Median barriers, 23, **28**

Canadian design standards, **78**

Median chokers, 40, **55**

- speed impacts, **102**
- volume impacts, **102**

Median diverters, 23

Median slow points, 40

Memphis v. Greene, 134

Metric conversions, viii

Midblock medians, 40

Midblock narrowings, 41

Midblock yield points, 41

Mitigation of diversion effects, 160-161

Modified intersections, 39

Moratoria on traffic calming, 7-8

Multiple classification analysis, 108-109, 124*n*

MUTCD. See *Manual on Uniform Traffic Control Devices for Streets and Highways*

N

Narrow streets, 184, 188-189

Narrowings

- concerns of emergency services, 146
- definition, 39
- with deflection, 62
- design trends, 62
- psycho-perception controls, 122
- types of, 39, 40-41

Neckdowns, 39-40, **51**

- concerns of emergency services, 146
- with raised intersection, **56**
- with traffic circle, **59, 67, 102**

Neighborhood livability, 5

Neighborhood support

- acceptable traffic speeds, 164
 - acceptable traffic volume, 164
 - balloting, 164-166
 - cost-sharing, 167
 - margin of approval, 166
 - petitions for, 164
 - in planning and implementation process, 154-156, 167-168
 - significance of, 164
 - for speed humps, 31-32
 - surveying, 164-167
 - for turn restrictions, 120
 - use of temporary measures, 82
- Neighborhood Traffic Mitigation Program Toolkit*, 23, 41
- Neighborhood watch, 117-118
- Netherlands, 10
- NETSIM, 124*n*
- New developments

- design guidelines, 182, 189
- regulations, 183-184
- street network design, 184-189
- street widths, 184
- New urbanism, 182, 196*n*
- Noise levels, 116
- Norway, 10
- Nubs, 39

O

- On-street parking, 38
- One-way closures. *See* Half closures
- One-way streets, 120-121
 - high-volume, conversion to two-way, 180-181
- One way–two way, **30**

P

- Parallel choker, 41
- Partial closures. *See* Half closures
- Pavement width, 123
- Peak-hour turn restrictions, 120
- Pedestrian- and Transit-Friendly Design*, 189
- Pedestrian traffic
 - center islands, 41
 - crossing speed calculations, 69
 - impacts of traffic calming measures, 114
 - neckdowns, 39
 - new development design, 184
 - speed table designs for, 33, 34
 - traffic island design, 36
- Photo-radar speed enforcement, 118
- Pinch points, 41
- Planning and implementation
 - areawide treatment, 155-156
 - basic program options, 155
 - control matrix approach, 157, **158**
 - current practice, 7
 - diversion thresholds, 160-161
 - emergency response considerations, 144, 145-146
 - good practice, 15
 - legal liability, 130-131
 - legislative support, 13-14
 - phases of, 154
 - project priority rating systems, **156**, 161-164
 - public involvement, 154-156, 164-168
 - reactive/proactive, 155-156
 - spot improvements, 155-156
 - time frames, 154
 - use of temporary measures, 82-83
 - warrants, 157-161
- See also* Design
- Plateaus, 34
- Police departments, 150-152
 - concerns about traffic calming, 138, 139-140*t*
- A Policy on Geometric Design of Highways and Streets*, 130, 189, 198*n*

- Political action, 7-8
- Pork chops, 23
- Predictability of design, 61-62
- Pre-warnings, 174
- Problem identification, 17
- Property values, 114-115
- Psycho-perception controls, 31, 121-123
 - effectiveness, 236*t*
- Public Involvement Techniques for Transportation Decision-Making*, 167
- Public opinion
 - acceptance of traffic calming measures, **2**
 - effectiveness of traffic calming measures, 5
 - speed control vs. emergency response, 150
 - traffic calming concerns, 1
- See also* Neighborhood support
- Public works, 152-153
- Purposes of traffic calming, 3-6

R

- Radar speed display units, 116-117
- Raised crossings, 32
- Raised crosswalks, 33, **57**
 - Canadian design standards, **80**
 - speed impacts, **101**
 - volume impacts, **101**
- Raised intersections, 34
 - Canadian design standards, **81**
 - with gradual ramp, **153**
 - with neckdown, **56**
 - speed impacts, **101**
 - vertical curvature effects, 69
- Raised junctions, 34
- Realigned intersections, 39
- Regulatory measures
 - effectiveness, 119, 235*t*
 - legal authority for, 131-132
 - new developments, 183-184
 - one-way streets, 120-121
 - rest on red/rest on green, 121, 145-146
 - STOP signs, 119-120
 - takings claims, 133-134
 - turn restrictions, 120
- Removal of traffic calming measures, 164, 165*t*
- Rest on red/rest on green, 121, 145-146
- Reversing curves, 38
- Right-of-way reallocation, 171-174
- Right turn islands, 23
- Road width, 122
- Roundabout Design Guide*, 73
- Roundabouts
 - advantages, 179
 - applications, 37, 73-74
 - in Australia, 13
 - design, 38, 179-180
 - geometric design, 73

for high-volume streets, 178-180
as pre-warning gateways, 174
traffic calming effects, 37-38
Route modification, 2, 3
Rumble strips, 174
Rumford v. City of Berkeley, 131

S

Safe crosses, 39
definition, 41
Safety Benefits of Traffic Calming, 109
Self-enforcing measures, 2, 3, 150
Semi-diverter, **26**
Canadian design standards, **76**
definition, 20
speed impacts, **103**
volume impacts, **103**
Seminole County tables. *See* Speed tables
Serpentines, 38
Side friction factors, 67, 97*n*
Sight distances, 62
Signing
advance warning, 90, 92, 94
case example, 90-92
chicanes, 93
effectiveness of regulatory measures, 119
half closures, 92
lateral shifts, 93
legal liability, 133, 135
MUTCD guidelines, 85, 86, 87, 89-90, 92
national standards, 87
purpose, 85
specialty signs, 93
speed humps, 93, 94-97
speed tables, 93, 94-97
traffic islands, 86-89, 90, 92-93
Slager v. Duncan, 134
Snow removal, 152-153
Spacing of measures, 63
for arterials and collectors, 171
speed hump effectiveness, 226-227*t*
speed impacts, 105
Speed bumps, 31, 169*n*
legal challenges to, 131-132
legal liability, 132-133
Speed control
abruptness of alignment change, 69-70
for arterials and collectors, 170-178
design trends, 60, 61-63
determinants of traffic speed, 103-105
goals of traffic calming, 3
horizontal curvature design, 66-68
horizontal measures, 31, 34-39
impacts of traffic calming measures, 100-105, 207-225*t*
measurement methodology, 100-103
modeling techniques, 108
narrowings for, 31, **31**, 39-41, 41
neighborhood watch for, 117-118
noise level impacts, 116
photo-radar speed enforcement, 118
police enforcement, 118
in project priority rating systems, 161, 164
psycho-perception controls, 121-123
radar speed displays, 116-117
rest on red/rest on green, 121, 145-146
spacing of measures, 63
speed hump effectiveness, 226-227*t*
techniques, 19, **42-57**.
use of STOP signs, 119
vertical curvature design, 68-69
vertical measures, 31-34
volume control and, 106, 108, 124*n*, 161, **162**
Speed cushions, 148
Speed hump, 22-foot flat-topped. *See* Speed tables
Speed hump, 12-foot parabolic
design, 70-71
effective use, 18
guidelines, 18*t*, 31
height, 31, 70
profile, **71**
speed impacts, **100**
vertical curvature effects, 68-69
volume impacts, **100**, 105, 106-107
Speed hump, 14-foot parabolic, 32, 71
profile, **71**
speed impacts, **100**, 103-105
volume impacts, **100**, 105
Speed hump, 22-foot parabolic, 32
Speed hump, 10-foot rounded, 32
Speed hump, 30-foot rounded, 32
Speed hump, 12-foot with sinusoidal rise, 32
Speed humps
accident reduction effectiveness, 110
aesthetics, 31
for arterials and collectors, 171, 172*t*
with center island, **57**
with choker, **56**
concerns of emergency services, 146
costs, 118*t*
crime reduction impacts, 113
definition and characteristics, 31
delays in emergency response times caused by, 141, 142*t*
design, 70-71
effectiveness, 31, 103
emergency response concerns, 138, 153*n*
gradual ramp, 153
height, 70
impact effects, 137*n*
legal liability, 31, 135-136
marking patterns, 66, 122
modification to accommodate emergency services, 147-148,
149
moratoria against, 7-8

- neighborhood support, 31-32
 - profiles, **32**
 - risk of legal action, 127
 - signing and marking, 92, 93, 94-97
 - sinusoidal design, 32, 153
 - snow removal, 152, 153
 - spacing, 63, 105, 226-227*t*
 - speed control effectiveness, 226-227*t*
 - split/offset, 149
 - vertical curvature, 68-69
 - volume impacts, 105, 109
 - warrants, 157
 - Speed platforms, 32
 - Speed tables, 6, 32
 - with center island, **57**
 - with center island narrowing, **59**
 - with chicane, **59**
 - with choker, **59**
 - costs, 33
 - current practice, 33
 - definition and characteristics, 32-33
 - delays in emergency response times caused by, 142*t*, 143
 - design, 71-72
 - design variations, 34
 - effectiveness, 105
 - Gwinnett County model, 72
 - height, 69, 70
 - legal challenges to, 131-132
 - limitations, 34
 - modifications to accommodate emergency services, 148
 - pedestrian use, 33, 34
 - profiles, **72, 73**
 - signing and marking, 93, 94-97
 - speed impacts, **100, 101, 102**
 - with transverse markings, 122
 - vertical curvature, 68, 69
 - volume impacts, **100, 101, 102**
 - Split median, **55**
 - Staggerings, 39
 - Star diverters, 23, **30**
 - State and local government
 - discretionary functions, 132-133
 - legal authority for implementing traffic calming, 131-132
 - ministerial functions, 132, 133
 - tort liability, 132-133
 - Stevens neighborhood demonstration project, 14-15
 - STOP signs, 119-120
 - Street closures
 - concerns of emergency services, 146
 - crime reduction impacts, 113
 - modifications to accommodate emergency services, 150
 - motorized gate, 150
 - snow removal and, 152
 - takings claims, 133-134
 - See also* Full street closures; Half closures
 - Street layout, 60
 - grid design, 186, 196*n*
 - networks, 184-189
 - spacing of streets, 188-189
 - Streetscaping, 2, 3
 - semi-enclosed, 123
 - Superelevation rate, 67, 97*n*
 - Sweden, 10, 11
 - Switzerland, 11
- ## T
- T-intersections
 - speed control measures, 39
 - traffic circles at, 62, 127, **127**
 - Temporary measures
 - aesthetic considerations, 82, 83
 - application, 82-83
 - community acceptance, 82
 - Terminology, 2-3
 - Test installations, 83
 - Textured pavements, **34**
 - definition, 34
 - Tort liability, 87, 132-133
 - Traffic accidents. *See* Collision reduction
 - Traffic calming
 - costs, 58
 - current practice, 6-8
 - definition and scope, 2-3, 9*n*
 - federal funding, 1
 - historical development
 - in Europe, 10-14
 - in United States, 14-15, 58-63
 - legal authority for, 131-132
 - programs, vii
 - public concerns, 1
 - purposes, 3-6
 - related studies, 2
 - standards and guidelines, 87-90, 159, 189
 - Traffic circles, **15**
 - accident reduction effectiveness, 110, 111
 - costs, 36-37
 - curb design, 73
 - definition, 34
 - delays in emergency response times caused by, 142*t*, 143
 - design considerations, 35-37
 - diameter, 74*t*
 - effectiveness, 37
 - geometric design, 72-73
 - landscaped, 84
 - large-vehicle maneuvers, 35, 72
 - mountable, 35, 73
 - with neckdowns, **59, 67, 102**
 - rationale, 35
 - signing and marking, 86-93
 - snow removal, 152-153
 - speed impacts, **102**

- at T-intersections, 62
- volume impacts, **101**, **102**, 105
- vs. STOP signs, **119**
- Traffic control devices, 2
 - legal status of traffic calming measures as, 131-132
- Traffic in Towns*, 11
- Traffic restraint, 11
- Transit-oriented development guidelines, 184, 196*n*
- Transportation and Community and System Preservation Pilot Program, 1
- Transportation Equity Act for the 21st Century, 1
- Transverse markings, 122
- Trapezoidal humps, 32
- Travel demand management, 11
- Traversable diverter, **15**, 15
- Tree canopy, 123
- Truncated diagonal diverters, 23, **30**
- Truncated diverter, **15**
- Turn restrictions, 120
- Turning radii, 68
- Twisted choker, 41
- Twists, 38

U

- University of California at Berkeley Survey, 7, 155
- Urban redevelopment, 6
 - neckdown use, 40
- Urban Transportation Monitor*, 31

V

- Vicksburg v. Harrellton*, 133
- Volume control
 - accident reduction effectiveness, 111
 - concerns of emergency services, 146
 - design trends, 60
 - determinants of traffic volume, 105, 106-107
 - diversion goals, 159-160
 - diversion thresholds, 160-161
 - goals of traffic calming, 3, 105
 - impacts of traffic calming measures, **100-103**, 105-109, 207-225*t*
 - measurement methodology, 105-106
 - modeling techniques, 107-109
 - in project priority rating systems, 161, 164
 - speed control and, 106, 108, 124*n*, 161, **162**
 - techniques, 19-23, 23, **24-30**
 - turn restrictions for, 60
 - undesired diversion, 160

W

- Warrants
 - advantages of, 159
 - alternatives, 157
 - definition, 157
 - diversion analysis, 159-161
 - limitations, 159
 - STOP signs, 119
 - types, 157
 - vs. project priority rating systems, 161
- Watts profile hump, 31, **32**
- Width of streets, 184, 188-189. *See also* Narrowings
- Windom v. City of Sarasota*, 132
- Woonerven, 10