

Index

- abrasive swabs 77
- Acanthamoeba* 7
- Aeromonas* 6–7
- aesthetics
 - animal infestations 102, 108, 118
 - metazoan animals 108
 - microorganisms 2
 - source mixing effects 54–5
- aggressive cleaning 76–7
- air gaps 62, 64
- air scouring
 - animal infestations 113
 - pipe network cleaning 76, 79, 81, 83–4
- air vessels 44–5
- amoebae 7
- amphipoda 111, 115–16
- animal infestations 7–8, 101–19
- AOC *see* assimilable organic carbon
- approval systems, pipe materials 58–9
- aquatic animals 104, 106–7, 112, 115
- aquatic snails 116
- Arizona 61
- Asellus aquaticus* 106, 107, 112, 115
- assemble teams 124
- assimilable organic carbon (AOC) 27–8, 32, 117
- auditing 133, 134
- backflow
 - design 41–2, 59, 60, 62–5, 67
 - hazard ratings 63–4
 - health checklists 67
 - Norwalk virus 75
 - operation 41–2, 59, 60, 62–5, 67
 - pipel network hydraulics 41–2

- bacteria
 - microbiology 7–9
 - prevention/minimization 21–30
- bacteriological sampling 97
- baffles 48
- ball-type hydrants 42
- BDOC *see* biodegradable dissolved organic carbon
- carbon
- Belfast 129
- benthic species 104–5
- BFP *see* biofilm formation potential
- bilharziasis 109
- biodegradable dissolved organic carbon (BDOC) 27–8, 32
- biofilm formation potential (BFP) 28–9
- biofilms
 - animal population sizes 107
 - formation 6–7, 11, 28–9
 - growth factors 20–1
 - monochloramine residual disinfection 25
 - pathogenic microorganisms 8–9
 - source mixing effects 56
- biological nitrification 30
- biological sand filters 31
- booster chlorination 33, 50–2, 94
- break tanks 62, 64
- breeding populations 105, 106
- Bristol, England 98
- broken water mains 88, 98
- by-passes 43

- calcium hypochlorite 94
- calibrating equipment 134
- Campylobacter* species 8
- Canada 32
- catchment protection 5
- CCTV *see* close-circuit television
- check valves 63, 64
- chemical cleaning 73
- chemical remedial measures, animal infestations 113–15
- chironomid (gnat) larvae 105, 112
 - remedial measures 113, 116, 117
- chloramines 22, 23–4, 113
- chlorination 33, 50–2, 94
- chlorine
 - animal infestations 113
 - concentration/contact times 95–6
 - construction/repair works 94–6
 - residuals 11, 33
 - treated water microbial quality 22–3
- chlorine dioxide 22, 24
- cholera 4
- Chydorus* 117
- clarifiers 31
- cleaning
 - construction/repair works 91–6
 - frequency 73
 - pipe networks 76–84
 - service reservoirs and tanks 71, 73
- Clitheroe Lancashire, England 10
- close-circuit television (CCTV) 129
- closed valves 57
- coagulant residuals 26
- coliform counts 11–13, 15, 32
- communication in operational monitoring 133
- community-managed systems 97–8
- conduits 129
- configurations of service reservoirs 47–8
- connections 70
 - see also* cross-connections
- construction
 - materials 66–7
 - precautions 87–99
 - repair works guidelines 87–99
- consumer relations 79
- control measures 122, 127, 130–1
- control valves 42–3, 62–3, 64, 65
- controlling microorganisms 11
- copper 115
- Coquitlam, Canada 32
- corrective actions 133
- corrosion 8, 29–30
- coxsackie 110–11

- cross-connections
 - design 59–62, 63–4, 67
 - hazard ratings 62, 63–4
 - health checklists 67
 - Norwalk virus 75, 126
 - operation 59–62, 63–4, 67
- crustacea 117
- cryptosporidiosis 129
- Cryptosporidium* oocysts 10
- Cyclops* 8, 108–9, 117
- Cyclops albidus* 106

- DCDA *see* double check detector
- assemblies
- dead-ends 39–40, 57
- decentralized treatments 33
- deposits 56, 77, 103–4
- depth of water 47
- design and operation
 - backflow protection 41–2, 59, 60, 62–5, 67
 - chlorination stations 50–3
 - cross-connection protection 59–62, 63–4, 67
 - disinfectant residuals 50–3
 - distribution systems 38–67
 - health checklists 65–7
 - mixing conditions 53–6
 - pipe location 59
 - pipe materials 58–9
 - piped networks 39–46
 - service reservoirs 46–50
 - zoning networks 57–8
- desktop risk assessments 126–7
- detritivores 106
- dichloramine 23–4
- dimensions of service reservoirs 47
- disinfectant residuals
 - booster dosing 50–2
 - design/operation 50–3
 - health checklists 66
 - management 25
 - microbial quality 22
- microbiology 11
- source mixing effects 55–6
- disinfection
 - animal associations 110–11, 119
 - concentration/contact time 22–6
 - construction/repair works 91–6
 - water quality deterioration 32
- dissolved organic carbon (DOC) 27–8
- distribution systems
 - animals 101–19
 - biofilm formation 6–7
 - construction/repair works 87–99
 - design 38–67
 - maintenance procedures 69–85
 - microbial monitoring 12–14
 - microorganisms 1–15
 - mixing conditions 53–6
 - operation 38–67
 - risk management 121–36
 - survey procedures 69–85
- diving cleaning equipment 73
- DOC *see* dissolved organic carbon
- documentation
 - repair works 88
 - water safety plans 124–5, 135–6
- double acting air valves 42
- double check detector assemblies (DCDA) 63
- double check valves 63
- double-acting air valves 44–5
- Dracunculus medinensis* 8, 108
- drinking-water
 - animals 101–19
 - microbial quality 30–2
 - pathogens 6
- dual check valves 63, 64

- echo viruses 110–11
- emergency repairs 89, 95, 97
- engineering works 87–99
- England *see* United Kingdom
- enteric viruses 9

- Enterobacter cloacae* 111
- environmental impacts 78–9
- equipment
 - calibration 134
 - chlorination stations 51–2
- Escherichia coli* 12–13, 15, 111
- Escherichia coli* O157:H7 4–5, 8
- excessive capacity 39
- external examinations 71–2
- external hazard vulnerability 126–7

- faecal pollution 12–13, 61
- feedback 52
- field disinfection 94–6
- field testing 64–5
- filter-papers, colour 77
- filtration 10–11, 31
- fittings 70–1, 74–5, 84
- fixed biomass proliferation 28–9
- flocculation 30–1
- flow
 - conditions 56
 - isolation fittings 74–5
 - patterns 48–9
 - proportional dosing 52
 - rates 80
 - surges 44–5
- flushing
 - animal infestations 112–13, 114–15
 - pipe network cleaning 76, 79, 80–1
- flying insects 105, 112
- food-chains 7–8, 106
- foxes 90
- free living amoebae 7
- frequency of inspection and cleaning 73
- freshwater shrimps 115–16

- GAC *see* granular activated carbon
- Gammarus* 115–16
- gaseous dosing 52
- gastropoda 116
- Georgia, USA 126

- giardiasis 61, 98
- gnats *see* chironomid larvae
- granular activated carbon (GAC) filtration 31
- grazer populations 106, 107
- growth
 - biofilms 6–7, 11, 20–1, 28–9
 - microorganisms 6–8, 20–1
- guidelines
 - construction/repair works 87–99
 - microbiological parameters 12–13
- guinea worm 8, 108

- hazard assessments 125–30
- hazard ratings 62, 63–4
- health checklists 65–7
- Helicobacter pylori* 8
- hepatitis 41
- heterotrophic plate counts (HPC) 13
- households, microbiology 9–11
- HPC *see* heterotrophic plate counts
- hydrants 42, 43, 44–5, 74–5
- hydraulics 25, 39–42
- hygiene training 97–8
- hygienic safety 87–99
- hypochlorous acid 22–3

- India 88
- ingress of animals 104–6
- inlets 48
- insect larvae 105, 112
 - remedial measures 113, 116, 117
- insecta 116
- insects 105
- inserted liners 92
- inspection frequency 73
- installation location/depth 43, 59
- integrated operations 45–6
- intermittent supply 41–2
- internal...
 - corrosion 29–30
 - examinations 71, 72, 73
 - surface cleaning 73

- invertebrates 101–19
- isolation 57–8
- isopoda 115

- jaundice 88
- joints 70

- laboratory testing 54, 56
- large buildings 9–11
- larvae 105, 112
 - remedial measures 113, 116, 117
- Legionella* 6, 7, 110
- Legionnaires' disease 25
- liners 92
- liquid dosing 52
- location/siting
 - chlorination stations 51
 - pipes 59, 66–7
- loops 39–40
- loss of supply 49
- low-flow dead-ends 39–40

- mains
 - cleaning programs 76–84, 92
 - repair guidelines 92–3
- maintenance 69–85
 - access to piped networks 43
 - backflow prevention 64–5
 - chlorination stations 52
 - cleaning 71, 73, 76–84
 - pipes 75–9
 - service reservoirs 70–5, 84
- management safety plan procedures 122, 135
- Massachusetts, USA 41
- mechanical control valves 62–3, 64
- mechanical scraping 76
- membrane retention 32
- metazoan animals 7–8, 108–12
- metered services 65
- microbial
 - flora 109
 - growth factors 20–1
 - monitoring 12–14
 - quality
 - animal effects 109
 - source mixing effects 55–6
 - treated water 19–34
 - safety 2–3
- microflora 110
- microorganisms 1–15
 - animal associations 109–11
 - construction/repair works 87–8
 - control 11
 - disinfection protection 110–11, 119
 - growth 6–8, 20–1
 - pathogens 8–9, 87, 88
 - treatment plants 5–6
- minimizing bacterial proliferation 21–30
- Missouri, USA 4–5
- mixing conditions 46–7, 53–6
- modelling
 - disinfectant residuals 25
 - mixing conditions 53–4
 - piped network hydraulics 40
 - zoning networks 58
- monitoring
 - animal populations 118
 - construction/repair works 96–7
 - microbial safety 2–3
 - pipe network cleaning 79
 - risk management support 131–5
- monochloramine 23–4, 25
- Mycobacterium avium* complex 6, 7

- Naegleria* 7
- Naegleria Fowleri* 7
- Nais* 113, 115, 116
- negative pressures 40, 70
- nematoda
 - disinfection protection 110–11, 119
 - parasitic 8, 108
 - remedial measures 116

- Netherlands 102
- new supply introduction
 - cleaning/disinfection 92
 - mixing effects 54–5
- nitrification 30
- nitrogen trichloride 23–4
- non-aggressive cleaning 76, 77–8, 79–84
- nonreturn valves 42–3
- Norwalk virus 75, 126
- nutrients 21

- oligochaete worms 113, 115, 116
- operation and design *see* design and operation
- operational limits 131
- operational monitoring 131–3, 134
- organic matter 27–9, 106–7
- outlets 48
- oxygen 21
- ozone 22

- parasites, viruses 110
- parasitic flat worms 109
- parasitic nematodes 8, 108
- Paratanytarsus grimmii* 105
- particulate content 26
- particulate organic matter 107, 117
- pathogens
 - animal associations 110
 - microbiology 6–7, 8–9
 - microorganism contamination 8–9, 87, 88
- personnel 90–1
- Peru, South America 4
- pesticides 114–15
- pH factors 21
- physical remedial measures 112–13
- Pierce County, Washington State, USA 75
- pipe location 59, 66–7
- pipe materials 9, 58–9, 66–7, 88
- pipe networks
 - cleaning 76–84
 - design 39–46
 - health checklists 65–6
 - maintenance 75–9
 - non-aggressive cleaning 76, 77–8, 79–84
 - operation 39–46
 - pathogenic microorganisms 88
 - survey procedures 75–9
- planning
 - mains cleaning programs 78–9
 - mixing conditions 53–4
- point-of-delivery 59–65
- point-of-entry 9–11
- point-of-use 9–11
- population sizes, animals 106–8
- potable water 60–2, 90–1
- powdered carbon 31–2
- power supplies 52
- pressure
 - chlorination stations 52
 - jetting 73, 76
 - maintenance and survey procedures 70
 - piped network hydraulics 40, 41
 - potable water systems 60–2
 - relief valves 44–5
 - surges 44–5
- preventing bacterial proliferation 21–30
- principles of microbial monitoring 13–14
- prioritizing risks 128–30
- process validation monitoring 131, 132, 134–5
- property types 63–4
- protozoan parasites 8, 9
- Pseudomonas* 6–7
- pump capacity 52
- pumping 49
- pumps 42–3, 44–5
- pyrethroids 114–15

- quality objectives 21–30

- Rairangpur, Orisa, India 88
- RDOC *see* refractory dissolved organic carbon
- record keeping 50, 135–6
- reduced pressure zone assemblies (RPZA) 63

- refractory dissolved organic carbon (RDOC) 27–8
- regulations and microbiological parameters 12–13
- relay stations 33, 50–2, 94
- remedial measures, animal infestations 112–18
- renovation works 87, 94
- repair works 87–99
- residence time 49
- residual disinfectant *see* disinfectant
- residuals
- restricted operations 90–1
- reviewing water safety plans 133
- risks
 - assessments
 - construction/repair works 96–7
 - semiquantitative 129
 - service reservoirs 49–50
 - water safety plans 125–7
 - characterization 125–30
 - construction/repair works 82, 94, 96–7
 - management 121–36
 - prioritizing 128–30
 - ranking 128–30
 - repair works 87–9
 - service reservoirs 49–50
 - water safety plans 125–7
- robotic cleaning equipment 73
- roundworms 116
- routine inspections/sampling 14, 15
- RPZA *see* reduced pressure zone assemblies
- Salmonella* 110–11
- sampling
 - animal occurrences 103–4
 - construction/repair works 97
 - microbial monitoring 14
 - microbial safety 2–3
 - service reservoirs 50
 - source mixing conditions 54–5
- sand filters 31
- sanitary significance
 - backflow/cross-connections 59–60
 - maintenance/survey procedures 70–1, 75–6
- sanitary surveys
 - controlling microorganisms 11
 - frequency 73
 - microbial monitoring principles 14
 - water safety plans 127–8, 129
- scale 29–30, 128
- Scandinavia 3–4
- Schistosoma* 109
- seals 70
- security of sites 49
- sediments 8, 70
- semiquantitative risk assessments 129
- septic tanks 75
- service reservoirs
 - animal infestations 118
 - animal occurrences 105
 - design/operation 46–50, 66
 - maintenance/survey procedures 70–5, 84
- sewage systems 61
- shape of service reservoirs 47–8
- Shigella* 110–11
- shrimps 115–16
- significance
 - backflow/cross-connections 59–60
 - maintenance/survey procedures 70–1, 75–6
 - metazoan animals 108–12
- site security 49
- siting
 - chlorination stations 51
 - pipes 59, 66–7
- slaters 115
- slug flows 83
- small community-managed systems 97–8
- snails 116
- sodium hypochlorite 94
- software 44–5, 54
- source mixing conditions 53–6
- source protection 5

- South America 4
- stagnation 9, 46
- standard forms 128
- State of Georgia, USA 126
- stop taps 64–5
- stratification 49
- supply losses 49
- supporting programmes 135
- surge shafts 44–5
- surges 44–5, 70–1
- survey procedures 69–85
- swabbing
 - animal infestations 113
 - pipe network cleaning 76, 79, 80, 81–2
- switching pumps 44–5
- system assessments 122
- system-specific validation 135
- systematic unidirectional flushing 112–13, 114–15
- tanks
 - break 62, 64
 - maintenance/survey procedures 70–4, 75, 84
- telemetry 52, 133
- temperature 20, 56
- testing 54, 56, 64–5
- thermotolerant coliforms 12–13, 15
- THMs *see* trihalomethanes
- TOC *see* total organic carbon
- total coliform counts 12, 32
- total organic carbon (TOC) 28, 32
- training 97–8
- treated water, microbial quality 19–34
- treatment works
 - animal infestations 104–5, 117–18
 - microbiology 5–6
- trihalomethanes (THMs) 22, 23
- trophic interactions 107
- trunk mains 43
- turbidity 26
- UK *see* United Kingdom
- ultrafiltration 31–2
- underground pipe rigs 95–6
- unidirectional flushing 112–13, 114–15
- United Kingdom (UK)
 - animal occurrences 102
 - Bristol 98
 - Clitheroe Lancashire 10
 - construction/repair works 95–6
 - particulate content 26
 - waterborne disease 3
- United States of America (USA)
 - Arizona 61
 - construction/repair works 96
 - Georgia 126
 - Massachusetts 41
 - Missouri 4–5
 - Pierce County, Washington State 75
 - waterborne disease 3
- urban water safety plans 128
- USA *see* United States of America
- Uzbekistan 4
- valve chambers 43
- valves 44–5, 74–5
- verification monitoring 131, 132, 133–5
- Vibrio cholerae* 4
- viruses
 - animal associations 110–11
 - enteric 9
 - microbiology 8, 9
 - Norwalk 75, 126
- volumetric dosing 52
- washout valves 42
- water
 - composition changes 56
 - depth 47
 - fleas 8, 106, 108–9, 117
 - purification devices 9–11
 - quality
 - deterioration 32
 - treated water microbial 30

- safety plans 3, 122–36
- usage devices 9
- waterborne disease 3–15
 - see also* individual diseases
- WHO Pesticide Evaluation Scheme (WHOPES) 114–15
- WHOPES *see* WHO Pesticide Evaluation Scheme
- working practice guidelines 89–90
- wormlike organisms 116
- worms
 - flat 109
 - guinea worm 8, 108
 - oligochaete worms 113, 115, 116
 - remedial measures 113, 116
 - roundworms 116
- zoning networks 57–8, 66

