

Index

- A20 Round Hill Twin Tunnels, UK 266
- A90 road cuttings 371
- A9 Tayside, blast induced instability 177–8
- abrasion, tunnelling machines 315
- abseil methods, scaling loose rock 352
- accelerated consolidation, of wet fills 237
- acoustic barrier 212
- acoustic TV, in boreholes 259
- aggregate abrasion tests 246
- aggregate impact tests 246
- aggregate petrography, road construction materials 245–51
- aggregates, resistance to polishing 245–6
- alkali–silica reaction, in concrete roads 247–9
- alluvium, sulphates in 95
- ANFO 171, 176
- Anns vs London Borough of Merton (1978) 163
- Approved Inspectors 162
- archaeology
 - and the Brovello Tunnel 279
 - and geophysics 235
 - and route investigation 235
- arsenic, as contaminant 80

- baku timber piles 207
- Bargate Centre
 - buildings at risk 72
 - fill 69
 - geology 67–79
 - hydrogeology 70–1
- basement construction, excavations for 67–77
- bauxite mining, Le Thoronet (Var, France) 330–1
- bearing values 18, 19–20
- bedding shear 322
- bitumen macadam, acceptability limits of aggregates 247
- black powder blasting 170, 176, 369, 371, 375
- blast disturbance, of rock 178
- blast vibration monitoring 381
- blastability assessment 357–8
- Blastability Index (BI) 358
- blasting 8–10, 11–13
 - black powder 170, 176, 369, 371, 375
 - nitroglycerine 170
 - Troodos Ophiolite 355–9
 - of Tuen Mun Highway, Hong Kong 378, 380–1
 - in tunnels 11–12
- blasting induced instability, rock slopes 176–9
- blasting vibrations, frequency and wave length 381
 - bored piles, rotary 120
- borehole location, geophysical aids 230

- Bracklesham Beds 67, 69, 70
 - permeability 71
- Brenda Mine, Canada 328–9
- brickearth 69
- bridge foundations 60–1
 - marble formation, Hong Kong 127–34
- BRIG3D 327–8
- Brovello Tunnel, Italy
 - archaeology 279
 - geological conditions 279
 - roof support system 279–88
- BS5750 83, 369
- BSD, before and after blasting 181
- buildability, and the engineering geologist 391–2
- Building Act 1984 162
- building control, in construction 161–6
- building damage, and CFA piles 164
- Building Notice 162
- Building (Procedure) (Scotland) Regulations (1981) 162
- Building Regulations 1991 162
- Building Research Establishment (BRE) Digest 250 (1981) 80, 95
- Building (Scotland) Acts 161, 162
- Building (Self-Certification of Structural Design) (Scotland) Regulations (1992) 162
- Building Standards (Scotland) Regulations (1990) 162
- buildings at risk, Bargate Centre 72
- Burnaston 115
 - choice of piles 120
 - glacial channel 118
 - groundwater 119–20
 - Mercia Mudstones 119
 - pile design 120–6

- Cadishead, Manchester 44, 46
- caissons, offshore 47, 52
- calcite, and Liquid Limit in Gault 150
- Caracas Metro, grout jet stabilization 109–10
- Carboniferous rocks foundations 42
- Carmaux open pit coal mine 322–4
- Castle Hill, Kent 257
- Caterpillar Tractor Co, rippability and seismic velocity 335–6
- Catsbrain Clay 361
- cavity collapse 23
- cavity surveying, areas of shallow mine workings 136
- CCTV 184
 - in boreholes 259
 - zones of rock disturbance 178–9, 181
- cement stabilization 193

- Certificate of Completion 162
 CFA (continuous flight auger) piles 55
 and building damage 164
 in Mercia Mudstone 120, 121, 122
 Chalk 189
 plate loading tests 38
 raft foundations 37–41
 Chalk aquifer 80
 Channel Tunnel 257, 260, 263, 264
 instrumentation 262
 UK Cross-over 262, 263, 264, 265
 chromium, as contaminant 80
 Claywood Ironstone 271
 coal mining, surface collapse 135–6
 Cologne, jet grout underpinning 109
 composite action, geogrid and stone mattress 207, 208
 composite cut-offs, Willemsspoort Tunnel 111–12
 concrete, chemical attack on 100–1
 Condeep platforms 49, 51
 cone penetration tests 48, 49
 construction
 and building control 161–6
 engineering geology 3–26
 role of engineering geologists in 389–401
 containment, in treatment of rock slopes 184
 contamination, of groundwater 80
 continuum modelling of rock bodies 326
 contract arrangements, Midge Hall Valley Sewer 311
 contract procedures, and the engineering geologist 392–4
 contractor-designed piles 115–26
 convergence arrays, Shing Mun Tunnels 266
 convergence measurements, NATM 261
 Coraline limestone foundations 40, 41
 corduroy mat, over compressible peat 207, 208, 209, 210
 corrosivity tests 234
 counterfort drains 200
 Craigend, rock slopes 369–70
 creep of foundations, Triassic rock 34–6, 37
 cross-hole seismics 221, 223, 259
 CSIR, rock mass rating system 339
 cut-off wall, and natural groundwater flow 67, 68, 75, 76
 cut-offs, jet grouting 111–12
 cutting failures, Eocene and Cretaceous deposits 196–9
 cyclic loading, offshore structures 47, 52

 deep drains, Hastings Beds 364
 deformation parameters, Gault Clay 154–6
 DEGRES 322, 323
 dentition, of rock slopes 184
 Department of Transport, Specification for Highway Works (1986) 214
 design, of jet grouting 85, 112–14
 design economy, and the engineering geologist 391
 dewatering, evaporative methods 237–44
 diffusion equation, evaporative drying 238
 diggability/rippability 7–8, 223, 315, 335–6
 digging plant 7–8

 dilatant joints, displacement vectors 328
 discontinuities
 and blasting methods 372
 computer presentation 175
 field data presentation 174
 line scan surveys 372
 and rock slopes 173–6
 and sensitivity histograms 176
 stereograms 222, 259, 322, 346, 349, 372, 374
 discontinuum modelling of rock bodies 326–9
 discrete-continuum dualism, jointed rocks 326
 distinct element modelling, rock mass analysis 327–9, 333
 Don Valley Intercepting Sewer Scheme, ground treatment 269–77
 dowels
 in masonry retaining wall reconstruction 345–54
 modelling of shear strength 347
 stainless steel 347
 in treatment of rock slope instability 184
 downhole geophysics 259
 drainage design and construction, polystyrene fill embankments 217
 drilling
 for grout injection 273
 in tunnels 11–12
 driven piles, effect of groundwater regime 57
 drying curve, isothermal conditions 239
 drying tests 239
 drying times, and heights of material 243
 Dundee Formation 220
 Dundee Inner Ring Road
 rock engineering 220–7
 site investigation 220–3
 trial rock anchors 221
 Dunham Park Reservoir 44, 46
 dynamic compaction 24, 25, 40
 dynamic pile testing formulae 122
 dynamite 171

 Earnley Sand 70
 East Pennine Coalfield 135–41
 electrical resistivity surveying 233–4
 electromagnetic inductive conductivity 230, 231
 embankments
 constraints and geotechnical parameters 212–14
 design and construction 214–17
 with expanded polystyrene 212–18
 failures in Eocene and Cretaceous deposits 169–9
 geogrid reinforced 212–18
 on London Clay 214
 engineering geologists, role in construction 389–401
 engineering geology
 and construction 3–26
 definitions 3, 389
 history of the term 389

- environmental constraints, roadway construction (Indonesia) 205–7
- environmental impact, highway construction 184–5
- ettringite 100
- evaporative dewatering 237–44
- excavation construction, using soil nails 364
- excavation explosives, development 171
- excavation sequence, Brovello Tunnel 285–7
- excavation support, jet grouting for 108–9
- excavation techniques, rock slope stability and maintenance costs 369–76
- excavations 7–8
 - classifications 3
 - methods 6–10
 - slope stability 4–6
 - styles of failure 4–6
- explosives 9
 - for excavations 171
- extensometers, Shing Mun Tunnels 261, 262

- failure, in excavations 4–6
- failure mechanisms
 - slopes 321–4
 - soil nails 363
- faulted ground, stabilization of 226
- faults
 - and differential settlement, Fushun West Open Pit Mine 331
 - underestimation of 314
- FEM (finite element modelling), rock bodies 324
- Ferryhills road cuttings 371
- fibreglass dowels, Channel Tunnel 264
- fills, and waste materials 23–5
- FLAC (fast Lagrangian analysis of continua) 256, 257
- flexural toppling, Brenda Mine 329
- flood plain gravels 79
- flow net, Valley Gravel 75
- fluid extraction 22–3
- footings, damage by CFA piles 55
- forward probing 275
- foundations 18
 - bridge 60–1
 - design (Snebra Ghill Bridge 61
 - in Gault Clay 143–60
 - response on rocks 33–42
 - response on soils 42–57
 - settlement of 21–2
 - site investigation practices in Gault Clay 158–9
 - structures 21
- fragmentation blasting 181
- full-scale footing test, Gault Clay 157–8
- Fushun West Open Pit Mine, China 331–3
- Gabcikovo Power Station, CSSR 86
- gas extraction 22–3
- gases, in tunnels 18

- Gault Clay 189, 257
 - compressibility and weathering 158–9
 - CPT tests 154
 - deformation parameters 154–6
 - drained modulus vs depth 154–56, 154–6
 - effects of tectonism 146
 - engineering geological assessment 147–57
 - foundations in 143–60
 - index properties 147, 151, 152
 - lithology and mineralogy 143–6
 - post-depositional history 146
 - Quaternary activity 146
 - shear strength and depth 152, 153, 154
 - site investigation practices 158–9
 - stratigraphic correlations in Southern England 144
 - stratigraphy and occurrence 143
 - weathering 146, 148
- GEOCOMP 347
- geodatabase, and warrant process 163
- geogrid
 - as facing material 362, 365
 - material properties 83
- geogrid reinforced embankment, with expanded polystyrene 212–18
- geogrid reinforced road over peat 203–10
- geogrid and stone mattress, composite action 207, 208
- geogrid-reinforced mattress 81, 83, 94
 - load transfer 82
- geohydrology, and basement construction 67–77
- geometric modelling, DEGRES 323
- geophysics
 - aid to borehole location 230
 - applicability 230
 - and ground investigation 136
 - pipeline route investigations techniques 229–35
 - surveys 230–5
- geostatistics, quantification of uncertainty 260
- geotechnical databases 95, 104
- geotechnical design parameters, RADSR 80–1
- geotextiles, rock filled gabions and mattresses 218
- glacial channel, Burnaston 118
- glacial clays
 - Burnaston 115–16, 117
 - precast piles in 122–6
 - weathering of 116
- glacial deposits 189
- glacial till, presence of roots 164
- Glasgow City District Council, Building Control Dept 162–3
- Glauconitic Marl 263, 264
- graben toppling, Brenda Mine 329
- gravel bands, Brovello Tunnel 287
- gravity dams 40–2
- gravity surveying 234
- Great Oolite Limestone 189
- ground consolidation 24, 25

- Ground Engineering Unit, Building Control Dept,
 Glasgow 162–3
 ground heave, avoidance at Brovello Tunnel 281
 ground instrumentation, for NATM 261, 262
 ground probing radar 231–3
 ground reference conditions, Midge Hall Valley Sewer
 312–13
 ground surface collapse, in areas of shallow coal mining
 135–6
 ground treatment, by grouting 135–41
 ground vibrations 10, 24
 and piling 164
 groundwater
 Bracklesham Beds 71, 72
 Burnaston 119–20
 contamination 80
 monitoring 59, 60
 tidal response 80
 groundwater flow, effect of cut-off wall 67, 68, 75, 76
 groundwater observations, Midge Hall Valley Sewer 311
 grout jet stabilization, Caracas Metro 109–10
 grout take
 in areas of coal mining 135–41
 estimation 137–8
 factors influencing 136–7
 grouting
 infill 274–5
 perimeter curtain wall 273
 grouting boreholes, density of 138–9
 grouting techniques, London Clay 289–90
 grouts, for soil nails 352
 grouts and grouting 24
- H piles 49
 hand-wedged rock slopes 369, 370, 371
 hard ground, methods of excavation in 8–10
 Hastings Beds
 deep drains installation 364
 soil nailing in 361–8
 hazard rating, sulphate attack 103
 hazardous materials, conductivity data 229
 hazards
 areas of shallow coal mining 135
 in excavations 4
 of sulphate 102, 103
 Heathrow Express Trial Tunnel 266–8
 Hensingham Bypass 57–65
 high sulphate contents, engineering effects 100–3
 high sulphide contents, engineering effects 100–3
 highway rock engineering, UK 169–87
 highway rock slopes, basic requirements 172
 highways construction 25–6
 environmental impact 184–5
 maximizing use of on-site materials 190–4
 slope stability 194–200
 soil and rock fill requirements 190
 soils in 189–203
 types of contract 185
 UK 170
 use of untreated materials 193–4
 hill slide, Le Thoronet Abbey 330–1
 honeycombed structures, Hong Kong 131
 Hong Kong
 bridge foundations 127–34
 honeycombed structures 131
 mud flow deposits 131
 slope works 377–84
 weathering grades 129–30
 hydrogen sulphide, potential dangers 272
 hydrogeological regime, London Docklands 80
- inclined drillings, Midge Hall Valley Sewer 311
 instability regions 175
 Institution of Chemical Engineers ‘Green Book’ 311–12
 instrumented rock bolts, Shing Mun Tunnels 261, 262
 intrusive rocks, Hong Kong 131
 Itchen Valley terraces 69
- jet grout base slab, Lecco, Italy 111
 jet grout columns
 design 85, 86, 87
 diameter 85, 107
 effect of ground conditions 107
 in situ strength 86
 jet grout composite cut-off, Willemsspoort Tunnel 111–12
 jet grout cut-off
 Senjet Dam 112
 Thicka Dam (Kenya) 111
 jet grout stabilization, Louvre Museum, Paris 109–10
 jet grout underpinning, at Servas 109
 jet grouting 85–93, 280–8
 applications 107–14
 case histories 86–7, 90, 91
 column diameter 107
 in construction 105–14
 control 91, 92–3, 112–14
 for cut-offs 111–12
 design 85, 112–14
 double jet 88, 106
 for excavation support 108–9
 instrumentation 91
 Lyon metro 107–8
 Malenchini tunnel 108–9
 Old Post Office of Cologne 109
 principles 105–7
 Rhine alluvium 109
 Rhône alluvials 112
 Rhône Valley silts 108
 selection of system 87–8
 Singapore metro 108–9
 single jet 88, 106
 strengthening and underpinning 109–10
 triple jet 88, 89, 91, 107
 volcanic soils 111

- jet mix arch, Brovello Tunnel 284–5
- jet mix system, Brovello Tunnel 280–8
- joints and faults, in tunnelling 15

- karstic surface, Hong Kong 132–3
- Kessock Bridge 45, 47
- Kimmeridge Clay 189
 - sulphate 95
- kinematic admissibility assessments 222
- Kingston Bridge, Surrey 87
- Kirsten rock excavability 223
- Klosterkaserne, Konstanz, Germany 86
- Kriged contours, on the base of the Glauconitic Marl 260
- Kuz–Ram model 181

- land development constraints, in coal field areas 135
- Le Thoronet Abbey, hill slide 330–1
- lead, as contaminant 80
- Lecco (Italy), jet grout base slab 111
- lime modification, of clay soils 192, 193
- lime treatment, of wet fills 238
- line scan surveys, discontinuities 372
- Liquid Limit, in Gault, and calcite content 150
- load transfer, mattress to piles 82
- logging
 - and jet grout control 93
 - terminology in 261
- London Clay 258
 - effect of lime on plasticity 192
 - embankments on 214
 - horizontal slickensides 212
 - NATM trial tunnels 266–8
 - sulphate 95
 - tunnel-induced settlements 289–97
- London Docklands
 - hydrogeological regime 80
 - Lower Lea Crossing 91
 - piled embankment 79–84
 - pollutants 80
- Louvre Museum, Paris, jet grout stabilization 109–10
- low-rise buildings, on Gault Clay 159
- Lower Chalk 257
- Lower Greensand 189
- Lower Lias, sulphate in 95
- Lugeon tests 275
- Lyon metro, jet grouting 107–8

- M1 motorway 189
- M2 motorway 189, 191
- machine tunnelling 11
- maintenance, of rock slopes 369–76
- maintenance costs, pre-split slopes 375
- Malenchini tunnel, jet grouting 108–9

- marble formation
 - Hong Kong 127–34
 - geology 129–30
 - geotechnical characterization 129–32
- Marble units, Hong Kong 131–2
 - foundation problems 132–3
 - lithostratigraphy 132
 - solution cavities 132
- Marble/dyke contacts, Hong Kong 133
- marine geophysics 259
- Marston's formula 208
- masonry retaining wall, soil nails and dowels 345–54
- Meadow Croft Colliery 309
- medieval hill fort, Brovello Tunnel 279
- medieval moats, effect on seepage 69, 73, 75
- Mercia Mudstones
 - Burnaston 119
 - CFA piles 120, 121, 122
 - pre-cast piles 122–6
 - swelling of 123
- metasedimentary rocks, Hong Kong 131
- methane, potential dangers 272
- Middle Lias, sulphate in 95
- Midge Hall Valley instability 309
- Midge Hall Valley Sewer 309–17
- Midland Bank Project, Jersey 91
- Milton Park footing tests
 - Gault Clay 157–8
 - time settlement 158
- mine workings, treatment of abandoned 269–77
- modelling limitations, large and complex geological structures 330–3
- moisture condition value (MCV) 192–3
- Moncrieffe Hill 369–70
- MORECS system 241, 243
- Mount Veyrier Limestone Quarry 321–2
- mud flow deposits, Hong Kong 131
- Murphy vs Brentwood District Council (Hince 1990) 163
- Mypex ground cover 214, 217

- National Measurements and Accreditation Service (NAMAS) 396
- NATM
 - continuum computer modelling 256
 - control measurements 261
 - design 256–8
 - discontinuum computer analysis 256 and engineering geology 255–68
 - ground instrumentation 261, 262
 - monitoring at Shing Mun Tunnels 261, 262
 - precedent practice 256
 - shotcrete as primary support 258
 - simplified analytical methods 256
 - site investigation for 258–60 and soil nailing 362
- NBSD (natural block size distribution) 181

- negative shaft friction 123
- New Lanark Mills
 - ground investigation 346–7
 - ground properties 352
 - Scotland 345
- NGI quality index (Q) 315
- nitroglycerine 170
- noise, and piling 164
- noise bund 218
- non-linear strain behaviour 259
- North Queensferry
 - blast induced instability 176–7
 - rock cuttings 176–7
 - rock slopes 370–2
- North West New Territories, Hong Kong 127–34

- observations, during tunnel construction 260
- offshore structures, cyclic loading 47, 52
- old mine workings, tunnels in 11
- Old Post Office (Cologne), jet grout underpinning 109
- on-site materials, maximizing use for highways 190–4
- Oosterchelde, closure barrier 47–52
- OPC:PFA grouts 274
- opencast mining and quarrying, slope stability analysis 321–34
- optimization, rock slope design 182–3
- Oxford Clay 189
 - sulphate in 95

- Padang Island, Indonesia 205
- Peasmarsh 361
- peat, compressible (Indonesia) 205, 206, 207
- Pergau Dam, Malaysia 87
- periglacial mechanisms, and horizontal shears 212
- permeability, Bracklesham Beds 71
- petrography, road construction aggregates 245–51
- phenols, as contaminants 80
- piezometric contours, Valley Gravel 75
- pile buckling 133
- pile design, Burnaston 120–6
- pile foundations
 - areas of shallow mine workings 136
 - and warrant process 164
- pile spacings, geogrid reinforced road over peat 207, 208
- pile tests 123, 124, 125
- pile wall, contiguous 51, 54, 55
- piled raft embankments, design 81–3
- piled rafts 79
- piles
 - choice of (Burnaston) 120
 - contractor-designed 115–26
 - load transfer from reinforced mattress 82
- piling
 - ground vibrations 164
 - loss of ground 164
 - and noise 164

- pit slopes, stress and deformation patterns 324–6
- planar sliding 5
- plane failure, instability region 175
- plant, for digging 7–8
- plate loading tests 34, 36, 38, 45, 46, 154, 157–8, 159
- Pleistocene sands, cone penetration tests 48, 49
- polish-resistance, of aggregates 245–6
- pollutants, London Docklands 80
- pollution plumes, electrical conductivity survey 230
- polypropylene geogrid 83
- polystyrene, and geogrid reinforced embankment 212–18
- polystyrene fill, design of embankment sections 215
- Port and Airport Development Strategies (PADS), Hong Kong 377
- Powrie Brae, failure back analysis 221
- pre-jetting, Thika Dam, Kenya 113
- pre-split blasted rock slopes 369
- pre-split blasting
 - borehole accuracy 180–1
 - dynamic phase 179
 - quasi-static component 179
- pre-split slopes, maintenance costs 375
- pre-splitting 12
- precast piles 120, 122, 123
 - in glacial clays 122–6
 - in Mercia Mudstone 122–6
- precise survey monitoring, rock slopes 385
- preconsolidation 45
- Prescribed Fees, building control 162
- pressure grouting 61–3
- pressuremeter tests, Gault Clay 154, 155, 159
- professional training, of engineering geologists 397–8
- Public Health Acts 161
- pyrite
 - sulphide ions in 100
 - sulphuric acid formed from 100
 - weathering of 100

- qualitative engineering geological assessment, Gault Clay 159
- Quality Assurance (QA), and the engineering geologist 396–7
- quality system 397
- quasi-static component, presplit blasting 179

- radar
 - ground probing 231–3
 - groundwater table determination 233
- raft design, geogrid reinforced road over peat 207–8
- raft foundations, areas of shallow mine workings 136
- Recent deposits 189
- reinforced concrete, raft foundations, areas of shallow mine workings 136
- reinforced earth 61, 63–5, 200
- remedial works, Hong Kong rock slopes 381–5

- residual volcanic soils, jet grouting 111
- resin grouted dowels 347
- retaining walls, mobilization of tension 348
- Rhine alluvium, jet grouting 109
- Rhone Valley alluvials, jet grouting 108, 112
- rippability/diggability 7–8, 223, 315, 335–6
 - rating 357
 - and seismic velocities 335–43
- risk, in tender assessment 395
- risk analysis, tunnel investigation 260
- River Roch 309
- roadway construction, environmental constraints (Indonesia) 205–7
- Rochdale Metropolitan Borough Council 311
- rock
 - characteristics 7–8
 - excavation 176–83
- rock anchoring system, Dundee Ring Road 223, 224, 226
- rock bolts, slope instability treatment 184
- rock classification scheme, Dundee Ring Road 225
- rock disturbance, seismic refraction profiling of 178–9
- rock engineering, highways, UK 169–87
- rock face stabilization 347–8
- rock filled gabions and mattresses, geotextiles 218
- rock mass
 - engineering properties 338–9
 - seismic properties 339–41
 - transient dilatational response during blasting 381
- rock mass description, Carmaux 322
- rock mass discontinuity recording 311
- Rock Mass Rating (RMR) 14, 15, 315, 373–4, 375
- Rock Mass Rating (RMR) vs Rock Quality Index (Q) 337
- Rock Quality Index (Q) vs Rock Mass Rating (RMR) 337
- rock slopes
 - blasting induced instability 176–9
 - bulk blasted 369, 370, 371
 - design 172, 182–3
 - discontinuities 173–6
 - instability treatment 183–4
 - natural instability 173
 - optimization of 173
 - stability assessments 173
 - stability domain 173–6
 - stability and maintenance 369–76
 - stability status 6
- rock stiffness, *in situ* 34–42
- rock for support, classification of 13–15
- ROCKLORD, limitations of 372
- roots in glacial till, shallow foundations 164
- Rosin–Rammler equation 181
- rotational sliding 5
- route investigation, archeology 235
- Royal Albert Dock Spine Road (RACSR), geotechnical design parameters 80–1
- Royal Albert Dock Spine Road (RADSR) 79, 80
 - geology 79, 80
- RQD 342
 - marble formation (Hong Kong) 128
- Scottish Building Regulations (1963) 161
- secant bored pile wall, anchored 71–2
- seepage, effect of medieval moats 69, 73, 75
- seismic investigations, cross-hole 223
- seismic reflection surveying 234
- seismic refraction profiling, and rock disturbance 178–9
- seismic refraction surveying 234
- seismic velocity, diggability/rippability 7–8, 335–43
- Senjet Dam, Switzerland, jet grout cut-off 112
- sensitivity histograms, discontinuities 176
- Servas, jet grout underpinning 109
- Sewer Tunnelling, in Coal Measures 309–17
- shallow coal mining 135–41
- shallow mine workings, and warrant process 165
- Shing Mun Tunnels, Hong Kong 261, 262, 264, 265, 266
- Shotcrete 255
 - primary support for NATM 258
 - sealing layer 260
- shrinkage and heave, Gault Clay 159
- Silkstone Coal Seam 269, 271, 272
- silo foundations, distortion of 39
- Silurian rock, foundations 42
- SIMBLOC 327–8
- Singapore Metro
 - heave 113
 - jet grouting 108–9
- single jet system, Brovello Tunnel 281
- site construction, and the engineering geologist 396
- site investigation, Gault Clays 158–9
- Sizewell II Power Station 90–1
- slope designs, standard 172
- slope drains 200
- slope maintenance costs, effect of excavation techniques 369–76
- slope stability
 - excavations 4–6
 - in Hastings Beds 361–2
 - highways 194–200
 - Midge Hall Valley 316
- slope stability analysis, influence of geological structures 321–34
- slope works, Hong Kong 377–84
- Snebra Ghyll beds 60
- Snebra Ghyll Bridge 59–65
- soft ground, methods of excavation in 6–8
- soft ground tunnelling 15–17
- softening of clay, by vibrations 51, 54
- soil nail force, and slope displacement 365–6
- soil nail trial, load displacement 354
- soil nailed slope, performance 365–8

- soil nailing 61, 64–5
 - and deep drains 364
 - design 363–4, 365
 - drilled and grouted 364
 - driven 364
 - failure mechanisms 363
 - in Hastings Beds 361–8
 - and NATM 362
 - retaining wall reconstruction 345–54
- soil and rock fill for highways 190
- soils, in highways 189–203
- soils classification, for jet mixing at Brovello Tunnel 280
- solution cavities, Marble units (Hong Kong) 132
- solution mining 23
- sonic fracture index 340–1
- Specifications for Highway Works (1986)* 61
- Specifications for Highway Works (MCHW 1) (1991)* 189, 191
- spoil, monitoring of density 114
- spontaneous combustion 23, 272
- SPT tests, Gault Clay 154, 156
- stabilisation, with rock fill 42
- stability, of tunnels 12, 13
- stability domain, rock slope 173–6
- stability status, rock slopes 6
- statutory duties, health and safety 161
- stereograms, of discontinuities 222, 259, 322, 346, 349, 372, 374
- stereonets 174
 - use in rock slope remedial works 384
- strained quartz, potential for alkali–silica reaction 248–9
- strata parameters, Midge Hall Valley Sewer 312
- stratigraphic correlations, Gault Clay 144
- strengthening, jet grouting 109–10
- stress and deformation patterns, pit slopes 324–6
- structural foundations 33–57
- structures, distortions of 22
- sulphates
 - attack on concrete 100–1
 - in British rocks and soils 95–104
 - as contaminants 80
 - hazard of 102, 103
- sulphides, as contaminants 80
- sulphuric acid, from pyrite 100
- support, in treatment of rock slopes 184
- surface subsidence 22–3
- swelling ground 15, 16
- swelling potential assessment 260

- Tai Lam Pluton, Hong Kong 379
- tank failure, Cadishead 44, 46
- Tebing Tinggi Island, Indonesia 205
- tectonism, Gault 146
- tender assessment, and the engineering geologist 394–5
- Tensar SR55 geogrids 214, 215
- Tensar SR80 geogrid 63
- Tensar SS1 207, 208
- Tensar SS2 83
- Terrace Gravel 212
- Tertiary rocks, slope stability 324
- Thames River, water levels 80
- Thanet Sands 79
- Thika Dam, Kenya
 - jet grout cut-offs 111, 113
 - pre-jetting 113
- Thruscross Dam, Yorkshire 40–2
- tidal response, groundwater 80
- timber piles 208
- TNO pile testing 125
- toluene, as contaminant 80
- toppling 5, 175
- Torness NPS, foundations 34
- Toyota Car Plant, Derbyshire 115–26
- Transcona Grain Silo failure 43–4
- transient slope movements, Tuen Mun Highway blasting 380–1
- transport network, UK 169
- Transport Research Laboratory (TRL) 245, 250
- treatment methods, rock slope instability 183–4
- trial shafts and headings 260
- Triassic rocks, plate loading tests 36
- tricalcium aluminate 100
- triple tube core barrel sampling, Hong Kong 128
- Troodos Ophiolite, blasting in 355–9
- Tuen Mun Highway
 - Hong Kong 379, 380–5
 - temporary stability of existing slope during blasting 380–1
- Tunbridge Wells Sand 361–2
- tunnel investigation, risk analysis 260
- tunnel roof support system, Brovello Tunnel 279–88
- tunnel-induced settlements
 - London Clay 289–97
 - use of grouts 289–97
- tunnelling 10–18
 - in soft ground 15–17
- tunnelling machines, choosing of 315
- tunnels
 - and faults 11
 - gasses in 18
 - ground investigation 10–11
 - high temperatures in 18
 - monitoring of construction 316
 - and old mine workings 11
 - stability 12, 13
 - in superficial materials 11
 - and water 17, 18

- UDEC (universal distinct element code) 257, 258, 328–9
- UK
 - building control 161
 - transport network 169

- ultra-lightweight fill (expanded polystyrene) 214
- ultra-violet fluorescent dyes, crack revealing 250
- ultrasonic scanning, areas of shallow mine workings 36
- uncertainties
 - engineering geological conditions 26
 - geostatistical techniques 260
 - in rock engineering 185
 - tunnel behaviour 260
- underpinning, jet grouting 109–10
- Valley Gravel 69, 71
 - flow net 75
 - perched groundwater 69
 - piezometric contours 75
 - piezometric levels, effect of construction 73
- vertical seismic profiling (VSP) 259
- VES electrical surveying 233–4
- vibration monitoring, Tuen Mun Highway blasting 378, 380–1
- vibration-less excavation of rocks 185
- vibrations
 - and excess pore pressures 49
 - softening of clay 51, 54
 - traffic 207
- vibro-replacement 24
 - approval for use 164
- vibroflotation 40
- vibroseis surveys 259
- volcanic rocks, Hong Kong 131
- volcanic soils, jet grouting 111
- volume compressibility vs depth, Gault Clay 156
- Wadhurst Clay 361, 362
- warrant applications, geotechnical aspects 163–5
 - warrant process
 - during construction 163
 - geodatabase 163
 - and pile foundations 164
 - pre-construction 163
 - and shallow mine workings 165
 - warrant process and shallow foundations 164
 - waste colliery shale, sulphate hazard 103
 - waste materials, and fills 23–5
 - water, and tunnels 17, 18
 - Weald Clay, *in situ* piles 49
 - weathered glacial clays 116
 - weathered mudstones 119
 - weathering
 - and compressibility 158–9
 - Gault Clay 146, 148, 158–9
 - weathering grades, Hong Kong 129–30
 - wedge failure
 - evaluation of 174
 - instability region 175
 - wedging, and black powder blast slopes maintenance 375
 - weepholes, in retaining walls 350
 - wet fills, treatment of 237–44
 - Wet Sleddale, Cumbria 42
 - Willemspoort Tunnel, Holland, jet grout composite cut-off 111–12
 - Wittering Formation 70, 72
 - Woolwich and Reading Beds 79
- Yeung Long Area (Hong Kong), geology 128–9
- zinc, as contaminant 80
- zones of blast disturbance 178
 - use of CCTV 178–9, 181