Index

active earth pressure, 237
adhesion, 122
aeolian, 8
allowable bearing capacity, 59, 69–70
allowable pullout resistance, 286
allowable stress design, 59
allowable tensile strength, 312–313
alluvial, 8
amplitude, 357–360
anisotropic, 213
apparent opening size (AOS), 339
aquifers, 15, 42
assumed failure circle, 168
ASTM, 18
at-rest earth pressure, 237–239
Atterberg limits, 20, 24
auger flight, 20
augers, 19–20
average annual soil loss, 223
back slope, 285–290
bar-grout pullout failure, 282–283
basalt, 3
batter, 119, 285–290
bearing capacity, 50, 57–60
bearing capacity factors, 62–67
bearing capacity failure, 291
Becker penetration test (BPT), 382
bentonite, 7, 21, 38
berm, 204, 229–231
biological, 6–7
Bishop simplified method of slices, 158
Bishop-Morgenstern method, 181
bit, 19–23
blow count, 31–32
body wave, 392
borehole
  borehole, 20–23
  borehole diameter, 31–33, 383–384
  borehole shear test, 5
boring, 16–18, 23, 29
Boussinesq, 92–94, 97
braced sheet pile wall, 239
buttress, 204, 251
California sampler, 25–26
cantilever walls, 206, 250
carbonation, 7
Casagrande method, 104
catcher, 25
cautious estimate of unit weight, 160
characteristic value, 133, 138
carbonation, 7
chimney drain, 206, 323
Chinese criteria, 380, 387
circular foundations, 62
circular frequency, 377
claystone, 3
clogging resistance, 340, 343
coefficient of permeability, 212
coefficients of acceleration, 371
collapse, 15
colluvial, 8
combined footing, 90
compost, 225
core resistance, 8, 15, 19
compression index, 103–104
cone penetration resistance, 386–387
Index

cone penetration test (CPT), 34, 145
conglomerates, 3
consolidation, 103–105
contact lines, 11, 13
continuous foundations, 61
contour, 9, 93
conventional retaining wall, 250–251, 206–208
core, 1–2, 23–24
core barrel, 23–24
coring auger, 19–20
correction factors, 288, 291, 383
Coulomb active earth force, 248
Coulomb active earth pressure coefficient, 249
Coulomb passive earth force, 249
Coulomb passive earth pressure coefficient, 249
Coulomb's theory, 248, 367
creep, 155, 315–316
cretaceous, 2, 10–11
critical failure plane, 165
critical height, 166, 276
cross-plane permeability, 339–342
crust, 1–2, 353
Culmann's method, 158, 163–167
curved failure surfaces, 158, 168
cutoff walls, 229–230
cyclic resistance ratio (CRR), 381
cyclic stress ratio (CSR), 381

darcy's law, 212, 339–340
darcy's velocity, 212
debris flow, 154
deep wells, 219–220
deep-seated circles, 168
deep-seated failure, 262–263
deformation, 92
density, 33, 35, 60–61
depositional contact, 11
depth factors, 66–67, 255
design resistance, 59–60, 71
dewatering, 212, 217
dilatometer, 36–37
dip-slip fault, 354
direct shear strength, 5
dispersion, 227
displacement influence factors, 98
donut hammer, 32, 384
drainage, 201–205, 212–234
drainage galleries, 202
drawdown curve, 219–220
drawdown ratio, 194–197
drill bit, 19–23
drill rig, 16–18, 23, 26
drill rod, 20–35
drilled and grouted soil nails, 281, 283
driven pile, 118–120
driven soil nails, 281
driving moment, 168, 326
driving shoe, 25
durability, 224, 341–345
durability reduction factor, 312
dynamic active earth pressure, 361, 363–364
dynamic earth force, 361
dynamic earth pressures, 361
dynamic passive earth pressure, 362
earthquake, 353–363
  Alaska earthquake, 359
  San Francisco earthquake, 353
  Tangshan earthquake, 359
  Cape Mendocino earthquake, 359
  Northridge earthquake, 359
  Loma Prieta earthquake, 353
  Kobe earthquake, 359
  Jiji earthquake, 359
  Wenchuan earthquake, 359
  Chile earthquake, 359
  Haiti earthquake, 359
  Tōhoku earthquake, 359
eccentricity, 81–85
effective length, 83, 313
effective stress method, 157–158, 173
elastic settlement, 98
electrical resistivity imaging, 44–45
electromagnetics, 42–43
electroosmosis, 220–222
embedment, 57
embedment depth, 59, 69–70
embedment length, 140, 309
Eocene, 2, 10
eons, 1
epicenter, 353, 356, 359
epicentral distance, 353
epochs, 10
equipotential drops, 213, 228
equipotential lines, 212–213
equivalent clean sand, 383
equivalent open size (EOS), 339
eras, 1
Eurocode, 16
exit hydraulic gradient, 228
expansion, 6, 15
external failure modes, 281
external friction angle, 122, 124–125
external stability of retaining wall
extrusive rock, 3

facing failure modes, 282–283
facing flexure failure, 282–283
facing punching shear failure, 282–283
factor of safety, 58–59
factor of safety based on c
factor of safety based on \( \phi \)
failure mode, 59, 61–66
failure wedge, 164, 361
faults, 9, 11, 353
Fellenius method of slices, 158, 173
field testing, 15, 26, 29
fines content, 382–383
finite element methods, 158, 199
finite slope methods, 158, 199
flexural strength, 5, 92
flow channel, 213
flow lines, 212–214
flow net, 212–214
flow rate, 212–213
flow velocity, 212
fluvial, 8
focal depth, 353, 356
fold axis, 11
foliation, 4
foot wall, 354
formation, 2–6
frequency, 39–42, 360, 377
frequency domain, 39–42
frequency domain electromagnetics, 42
frost, 15, 49, 282

geobarric wall, 215
general bearing capacity theory, 64–65
general shear failure, 60–61
geocell, 306, 308
gecomposite, 284, 306, 308
geofoam, 306–308
gegrid, 306, 308–311
geologic fault, 353–354
geological time, 1–2
gromembrane, 306–308
gonet, 306, 308
geophysical technique, 44–45
gopipe, 206, 306
geosynthetic clay liner (GCL), 306
geosynthetic reinforced soil (GRS) slopes, 205
geosynthetic-reinforced walls, 206
gotechnical investigation report, 48
geotextile, 305, 307, 340–341
geotextile filter, 340–341
geotextile: heat-bonded, 305
geotextile: knitted, 305, 307
geotextile: needle-punched, 305, 307
geotextile: non-woven, 305
geotextile: resin-bonded, 305
geotextile: woven, 305
gracial, 2, 8
global factor of safety, 59, 69
global stability failure, 284
gneiss, 4
granite, 40
granular filter, 214–215
gravity drains, 202–203
gravity walls, 206
gravity wells, 202
ground penetration radar (GPR), 39–40

hammer efficiency, 31–32
hand auger, 17, 19–21
hardness, 5, 12, 29
head-stud failure, 282
heterogeneous, 158, 214
high-density polyethylene (HDPE), 307
hollow bar soil nails, 281
hollow stem flight auger, 19–21
Holocene, 2, 10
homogeneous, 17, 61–62
horizontal drainage layer, 233
horizontal drives, 201–203
horizontal driving force, 289
horizontal resisting force, 289
hydraulic conductivity, 30, 212
hydraulic gradient, 212, 217, 227
hydrolysis, 6
hypocentric distance, 353, 356
igneous rocks, 3
illite, 7
impervious blanket, 229–230
inclined backfill, 247
inclinometer, 37–38
infiltration, 201
infinite slope methods, 158–159
in-plane permeability, 340
interceptor trench drain, 201
internal drainage, 201
internal erosion, 217
internal failure modes, 281
internal stability, 250, 284
inter-slice forces, 211
intrusive rock, 3
isotropic, 92–93, 212–213
jet-grouted soil nails, 281
Jurassic, 2, 10
Kaolinite, 7
lacustrine, 8
laminar flow, 212
landslide, 154
lateral earth pressure, 124, 240
lateral spread, 154, 380
launched soil nails, 281
left lateral fault, 354
left-lateral normal fault, 354
left-lateral reverse fault, 354
limestone, 3–4
limit states design, 59
liner, 25, 306
liquefaction, 379
load inclination factors, 67
local shear failure, 61
longitudinal wave, 356
long-term flow compatibility, 340
Love wave, 357
magnification factors, 385, 397
Makdisi-Seed analysis, 377
marble, 4
marine, 8
mass methods, 158
mat foundations, 90
maximum velocity of ground motion, 376–378
mechanically stabilized earth (MSE) walls, 237, 308
metamorphic rocks, 4
methods of slices, 173
Meyerhof equation, 255
Michalowski charts, 158, 193
microgravity, 45–46
mid-point circle, 168–169
mineral soils, 7
minerals, 2–7
minimum factor of safety, 173
Miocene, 2, 10–11
mobilized cohesion, 157, 171
mobilized internal friction angle, 157, 171
modified Mercalli intensity (MMI) scale, 357
modular block, 310
Mohr's circle, 242–243
Mohr-Coulomb failure criterion, 156, 242–243
moment equilibrium, 156–157
moment magnitude scale (MMS), 359
monitoring well, 38
monomer, 306
Mononobe-Okabe method, 361
Montmorillonite, 7
Morgenstern charts for rapid drawdown, 194
mud rotary, 17, 19–21
mud rotary auger, 19
mudslide, 154
mudstone, 3, 6
nail bending and shear failure, 282
nail horizontal spacing, 291
nail inclination, 284, 291
nail tensile failure, 282–283
nail vertical spacing, 291
nail-soil pullout failure, 281
National Center for Earthquake Engineering Research (NCEER), 381
National Earthquake Hazards Reduction Program (NEHRP), 381
natural frequency, 360
natural period, 360
NAVFAC, 16
Newmark sliding block analysis, 367
nonhomogeneous slopes, 199
normal fault, 354
normal stresses, 159, 161
normalized allowable pullout resistance, 286
normalized maximum design tensile force, 287
normally consolidated, 33–34, 104
North American plate, 353

oblique fault, 354
oblique fault with rotational motion, 354
Oligocene, 2
open pumping, 218
ordinary method of slices, 173
organic soils, 7
overall reinforcement surface area geometry factor, 328
overburden stress, 6, 17
over-consolidated soil
overlap length, 310, 314
overturning, 250
oxidation, 6

Pacific plate, 353
Paleocene, 2
partial factor of safety, 71
partial factor of safety on the cohesion, 160
partial factor of safety on the internal friction angle, 160
partial factor of safety on the resistance, 160
partial factor of safety on the unit weight, 160
passive earth pressure, 237, 362
peak ground acceleration (PGA), 360
peak horizontal acceleration (PHA), 360
peak horizontal ground acceleration, 376–378
peak vertical acceleration (PVA), 360
penetrometer, 34
percent open area (POA), 339
perforated pipe, 220, 234
period, 1–2, 10, 360
permeability, 4–5, 50
permittivity, 339–340
Phyllites, 4
pile group, 145
pile group efficiency, 140–143
piping, 218, 227
piston sampler, 27
pitcher barrel sampler, 29
planar failure surfaces, 163
plasticity, 15, 30
pleistocene, 2, 10
pliocene, 2
plutonic rock, 3
point of application, 92
Poisson's ratio, 98, 101
polyamide (PA), 305
polyester (PET), 305, 307
polyethylene (PE), 305, 307
polymer, 306–308
polypropylene (PP), 305
polystyrene (PS), 305
polyvinyl chloride (PVC), 305
pore-pressure ratio, 181
porosity, 339
porous media, 212, 339
precast panel, 310
pre-consolidation pressure, 103–104
pressure distribution diagram, 241–245
pressure relief well, 230–231
primary consolidation settlement, 103
primary wave, 356
pseudostatic analysis, 368
pseudostatic method, 361
pullout friction factor, 328
punching shear failure, 60–61
quartzite, 4
quaternary, 1–2, 10
raft foundation, 57
rainfall and runoff factor, 223
Rankine active earth pressure, 242–245
Rankine passive earth pressure, 243–245
Index

Rankine’s active earth pressure coefficient, 243
Rankine’s passive earth pressure coefficient, 244
Rankine’s theory, 242
rapid drawdown, 194
Rayleigh wave, 357
reactivity, 5
redox, 6
reduction factor for chemical and biological degradation, 312
reduction factor for creep, 312
reduction factor for installation damage, 312
reduction factors, 312
reinforced soil slopes (RSS), 322
reinforcement coverage ratio, 328
reinforcement length, 330
relative density, 33, 35
residual, 8
resisting moment, 155
reverse fault, 354
revised universal soil loss equation (RUSLE), 223
Richter magnitude scale, 358
right lateral fault, 353–354
rigidity correction factor, 99–100
riprap, 224
rock coring, 18, 20
rock falls, 155
rock quality designation (RQD), 5
rolled erosion control products (RECP), 226
roller bit, 22
rotary bit, 21–22
rotary wash, 17, 21
rotational slope failure, 154–155
rupture, 154
safety hammer, 32, 384
sampler, 20–21
sampler correction, 32
sampling, 15
San Andreas fault, 353
sandstone, 3–4
saturated flow, 212
schist, 4
secondary consolidation settlement, 103
secondary wave, 356
section modulus, 265
sedimentary rocks, 3
seepage, 160–161, 227–230
seepage berm, 229–230
seismic reflection, 45
seismic refraction, 45
seismic slope stability, 367–368
seismic velocity, 4
seismic wave, 356
semi-gravity walls, 250
service limit states, 282
serviceability limit state, 57
settlement, 98, 103
settlement correction factor, 101
SH wave, 356–357
shale, 3
shape factors, 65
shear strength, 15
shear wave, 356, 377–378
shear wave velocity, 377–378
sheet pile wall, 262
Shelby tube sampler, 26
siltstone, 3
sinkholes, 40
skin resistance, 122
slate, 4
sliding, 253
sliding stability failure, 281, 283
slip surface, 157–159
slope circles, 168–170
slope drains, 201, 224
slope length, 223
slope stabilization, 200
slurry, 7, 229
slurry wall, 229
smectite, 7
soil erodibility factor, 223
soil nail, 237, 280
soil nail wall, 237, 280
soil nailing, 205
soil retaining structure, 237
soil retention, 214–216
solid stem flight auger, 19
specific gravity, 5, 23
Spencer method, 158
split barrel, 25–26
split spoon sampler, 25–26
spread footing, 57–58
SPT sampler, 25
square foundations, 62
stability coefficients, 184
stability number, 169, 171
standard penetration number, 32–33
standard penetration test (SPT), 29
steady-state flow, 342
steepness factor, 223
strata, 9, 15–16
stratified slopes, 198
straw tubes, 201–202
stress reduction coefficient, 381
strike-slip fault, 354
strip foundations, 61
structural failure, 137, 262
submerged slopes, 160–161
submerged unit weight, 68, 160
subsoil exploration, 15
subsurface drainage, 201, 323
subsurface erosion, 227
subsurface exploration, 15
suction wells, 202
suffusion, 227
support practice factor, 223
surcharge, 62, 65, 155
surface drainage, 201
surface drains, 201
surface erosion, 201, 223
surface runoff, 201
surface wave, 357, 359
surficial slope failure, 155
survivability, 341, 343
SV wave, 356–357
S-wave, 356
swell index, 103–104
Taylor’s chart, 158
tectonic, 1, 3, 353
tectonic plates, 353
tensile crack, 245
tertiary, 2, 10–11
Terzaghi’s bearing capacity theory, 61–62
thin-walled sampler, 26
through-seepage, 230
thrust fault, 11, 354
time domain, 42–43
time domain electromagnetics, 42–43
toe bearing capacity, 124, 126–127
toe circles, 168–170
toe drain, 203, 231
toe trench, 230–232
top sleeve, 25
topographic, 9
total factor of safety, 256
total hydraulic head, 212–213, 228
total resultant lateral earth force, 241
total stress method, 130, 157
transform fault, 354
transient flow, 342
translational slope failure, 154
transmissivity, 340
transverse wave, 356
trench, 201, 229
trial-and-error approach, 167
triaxial shear strength, 5
ultimate bearing capacity, 67
ultimate limit state, 57
ultimate tensile strength, 312
under-seepage, 227
undrained clay, 168
undrained clay slope, 168
undrained cohesion, 64
undrained shear strength, 8, 35
uniaxial compressive strength, 5
uniaxial tensile strength, 5
United States Compost Council (USCC), 225
universal soil loss equation (USLE), 223
unloading, 201
vacuum dewatering, 220
vane shear test, 35
vegetation, 9, 225
Index

vertical cut, 8, 238  
volcanic rock, 11  

wall footings, 61  
wash boring, 18, 23  
wave propagation, 357  
weathering, 6–7  

weep hole, 256  
well points, 218  
Wood-Anderson seismometer, 358  
working stress design, 59–256  

yield acceleration, 376–378