

Index

- A**
- “A plus” ordering option, 45
 - accelerating admixtures (Type C), 35–36
 - acceptance criteria, strength testing, 171–178
 - accuracy
 - meter, 114
 - scale, 84–88, 89–90
 - ACI 211.1, 6 (table), 43, 45, 48, 74
 - ACI 211.2, 6 (table), 48
 - ACI 214R-11, 151
 - ACI 225R-99, 19
 - ACI 228.1R-03, 155
 - ACI 301, 2, 6 (table), 47, 77, 156. *See also* ACI 301-10
 - ACI 301-10, 2, 28, 50, 53, 145. *See also* ACI 301
 - ACI 305R, 6 (table)
 - ACI 306R, 6 (table), 115
 - ACI 318 Building Code, 154, 155, 157, 171
 - ACI 318, 6 (table), 49, 54, 77, 132. *See also* ACI 318-11
 - ACI 318-11, 2, 44, 145, 146, 152, 154, 155, 156, 157, 171, 174.
 - See also* ACI 318
 - ACI 350, 53. *See also* ACI 350-06
 - ACI 350-06, 44, 145. *See also* ACI 350
 - ACI Concrete Laboratory Testing Technician—Grade I, 150
 - added water, 88, 125. *See also* water
 - admixture dispenser on weight basis, 79 (figure)
 - admixtures, 24, 35–37
 - air-entrained, 25, 34–35, 104, 167
 - chemical, 35–37, 43, 74, 76–78
 - fiber, 76
 - liquid, 77–78
 - mineral, 24, 69, 126–127
 - purchaser specifications, 51–52
 - See also specific admixtures*
 - aggregate feed system, 82–83
 - aggregates, 27–29
 - alkali-reactive, 19, 28
 - batch tickets and, 127–128
 - in cold weather, 116
 - mass, 72, 82–83
 - measurement and, 72–73
 - proportioning, 45
 - reactivity evaluation, 28
 - storage, 81–84
 - See also* course aggregates; lightweight aggregates
 - agitators, 91, 93, 94–95, 97–99
 - air content, 11
 - check test, 147–148
 - losses, 64–65
 - point of discharge and, 44 (table)
 - test methods and, 133–135
 - test reports and, 50
 - tests, 61–62, 64–65, 67
 - tolerance and, 63–67
 - uniformity tests and, 167
 - values, 62–63
 - air content tests, 61–62, 64–65, 67, 147–148
 - air detrainer, 37
 - air entrainment, 23. *See also* air-entrained admixtures (AEA);
 - air-entrained concrete
 - air-dry mass, 47
 - air-entrained admixtures (AEA), 34–35
 - fly ash and, 25
 - mixing time, 104
 - uniformity tests and, 167
 - air-entrained concrete, 43–45, 61–67, 175
 - air-entrained portland cement, 21
 - air-free mortar, 168–169
 - air proportions, 18 (figure)
 - alkali oxide, 19
 - alkali-reactive aggregate, 19
 - alkali-silica reactivity (ASR) requirements, 2
 - alumina (Al_2O_3), 18
 - American Association of State Highway and Transportation
 - Officials (AASHTO), 19
 - Annex A1, 122, 165–170
 - anti-washout admixtures, 37

arbitration, low strength test and, 159–161
 architect/engineer (A/E) firms, 53, 63. *See also* purchaser
 architectural concrete, 43
 asphalt production, 81
 ASTM C29/C29M, 12, 13
 ASTM C31/C31M, 5 (table), 48, 131, 149, 152
 ASTM C33/C33M, 2, 5 (table), 19, 27, 29, 50
 ASTM C39/C39M, 5 (table), 132, 151, 154
 ASTM C42/C42M, 155
 ASTM C70, 127
 ASTM C78/C78M, 153
 ASTM C88, 28
 ASTM C125, 5 (table)
 ASTM C138/C138M, 5 (table), 11, 12, 13, 15, 46, 47, 66, 132–134, 149, 167, 611
 ASTM C143/C143M, 5 (table), 55, 56, 135, 149
 ASTM C150/C150M, 5 (table), 17, 19–21, 50, 51, 69, 71–72
 ASTM C172/C172M, 5 (table), 12–13, 64, 108, 136–137, 143–144, 146, 149, 167
 ASTM C173/C173M, 5 (table), 61, 149
 ASTM C219, 18
 ASTM C231/C231M, 5 (table), 12, 13, 61, 65, 133–134, 135 (figure), 149
 ASTM C260/C260M, 5 (table), 34–35, 50, 52
 ASTM C293/C293M, 153
 ASTM C330/C330M, 5 (table), 50
 ASTM C457/457M, 65
 ASTM C494/C494M, 5 (table), 50, 52
 ASTM C566, 127
 ASTM C567/C567M, 6 (table), 45–47
 ASTM C595/C595M, 6 (table), 20, 21–23, 24, 26, 50, 69
 ASTM C617/C617M, 132
 ASTM C618, 6 (table), 24–26, 50, 69, 126
 ASTM C637, 29
 ASTM C637, 6 (table)
 ASTM C666/C666M, 28, 64–65
 ASTM C685/685M, 15, 69, 81
 ASTM C917, 50
 ASTM C989/C989M, 6 (table), 26, 50, 69, 126
 ASTM C1017/C1017M, 6 (table), 50, 52
 ASTM C1064/C1064M, 6 (table), 137, 149
 ASTM C1074, 132
 ASTM C1077, 6 (table), 137–138, 142
 ASTM C1157/C1157M, 2, 6 (table), 20, 21, 23, 24, 26, 50, 69
 ASTM C1231/C1231M, 132
 ASTM C1240, 6 (table), 27, 50, 69, 126
 ASTM C1260, 28
 ASTM C1293, 28
 ASTM C1602/C1602M, 6 (table), 29–34, 47, 74
 ASTM C1603, 32
 ASTM C1610/C1610M, 42, 43

ASTM C1611/C1611M, 6 (table), 42, 43, 56, 135–136
 ASTM C1621/C1621M, 43
 ASTM C1697, 27
 ASTM D75/D75M, 28
 ASTM Subcommittee C09.40, 112, 160–161
 Automated Slump Adjustment System (ASAS), 111–115
 automated slump flow monitoring, 113–115
 automated water measurement, 125

B

bacteriocidal admixtures, 37
 bags, chemical admixture, 76
 bags, as measurement, 71–72
 basis of purchase, 11–15
 batch characteristics, 167
 batch persons, 84
 batch plant, 82
 certification, 165
 processes of, 82–83, 83 (figure)
 refinements, 8 (table)
 scale accuracy and, 84–88, 89–90
 water and, 88–89
 batch tickets, 123–128, 124 (figure)
 strength tests and, 152–153
 See also delivery ticket
 batching, 73
 accuracy limit, 72
 process, 81 82 (figure)
 instruments, 82–83
 sequence, 98
 silica fume and, 27
 tolerance, 11, 70, 76
 water and, 30–31
 See also scale; *specific considerations*; *specific hoppers*
 beam and poise weighing system, 87 (figure)
 beams, 150, 151
 bench scales, 77 (figure)
 bicalcium aluminate (C_2A), 18
 bin, 81
 bituminous coal, 25
 blade wear, 97–98, 99
 blades, 92–93, 95, 97, 98 (figure)
 blended hydraulic cements, 21–23
 brand names, 126
 build-up, drum, 97–98, 99
 burden on the purchaser, 115–116
 burns, 3–4

C

calcinated clay, 26
 calcinating, 23

calcium-aluminate cements, 37
calcium carbonate, 37
calcium chloride (CaCl_2), 37, 118. *See also* flaked calcium chloride (CaCl_2)
calcium oxide (CaO), 18
calcium silicate hydrate, 24
calcium sulfate (CaSO_4), 18
calculation of yield, 12, 13
calibrated volumetric tanks, 89
cellulose fibers, 37
cement, 19–24, 51, 52. *See also specific types*
cement balls, 98
central-mix plant, 92, 94, 95, 104. *See also* stationary mixer
central-mixed concrete, 7
certification requirement, strength, 149
certification tests, 49–50
charging hopper, 98
chemical admixtures, 35–37
 measurement, 76–78
 mixing water in, 74
 in self-consolidating concrete (SCC), 43
chert limitations, 28
chlorine limits, 32
clinker grinding process, 18–19
coal, 25. *See also* fly ash
code requirements, 1. *See also specific requirements*
coefficient of variation, strength testing, 156
cold weather conditions, 9 (figure), 115–116, 118, 138
coloring admixtures, 37
combined water, 30
communication with dispatch, 53–54
compartment, 81
completion of discharge, 111
composition, typical, 18 (figure)
comprehensive strength tests, 149, 151, 169, 171–174, 175 (table), 176 (table). *See also* strength tests
compression tests, 131–132
compressive strength tests, 50
computerized batch tickets, 110
computerized batching control system, 83, 156–157
concrete manufacturing facility. *See* batch plant
Concrete Plant Manufacturers Bureau (CPMB), 70, 72, 89–90, 92
Concrete Strength Testing Technician Certification, 150
concrete. *See* aggregates; admixtures; *specific components; specific practices tests; specific types; water*
concrete, central-mixed, 7
concrete, ready-mixed, 7
concrete, shrink-mixed, 7–8, 106
concrete strength. *See* strength

concrete, truck-mixed, 8, 106–109
constructability, 48, 56
construction cement, general, 19
continuous mixing, 81
contractor, 3
contractor requirements, 141–142
core strength, 154–155
corrosion-inhibiting admixtures, 37
corrosion, reinforced steel, 32
cost. *See* price
course aggregate, 27–28
 content, 166–67, 168, 168 (figure)
 size, 41
 in transit water addition, 57
cumulative aggregate batches, 73
curing, 48, 131–132, 138, 152
cylinders, 132, 149–150, 151
 test reports and, 50
 weather conditions and, 138

D

decumulative batcher, 83
delivery ticket, 52–54. *See also* batch ticket
density (unit weight), 12 (figure), 12–13, 14, 15, 45–47
 air content and, 66
 relative, 52
 test methods and, 132–133
 uniformity tests and, 167, 168
 See also density tests
density tests, 47 (table)
dial-head scale indicator, 83
discharge
 air content and, 44 (table), 63
 completion of, 111
 testing, 141
 uniformity, 96–97
 water addition and, 57, 58–59
discrepancies in yield, 11
division of responsibility, 45
documentation
 mixture proportions, 49, 53–54
 nonmandatory, 174
 See also batch ticket; delivery ticket
dosages, admixture, 52
drum, 92–94, 94 (figure), 98 (figure), 98–99. *See also* blades; drum revolutions
drum revolutions, 106, 111
dry mass, 49
durability, 48
 air content and, 64
 requirements, 41, 44, 53

E

engineers, arbitration panel of, 159–160
 entrapped air, 62. *See also* air-entrained concrete
 equilibrium density, 46
 equipment, 91
 automatic monitoring, 112–115
 nonagitating, 102, 121–122
 uniformity tests and, 96–97
 See also agitators; blades; cylinders; drum; hopper; mixers;
 scale

F

fiber admixtures, 76
 fiber reinforcement, 127
 field curing, 48, 152
 fine aggregate, 27
 flaked calcium chloride (CaCl_2), 76–77
 flexural strength tests, 149, 151, 153
 flowable fill, 37
 flowing concrete, 36
 fluidity, 55. *See also* slump test
 fly ash, 25, 126
 foaming agents, 37
 freeze-thaw resistance, 43, 44. *See also* air-entrained concrete;
 freeze-thaw tests
 freeze thaw tests, 64
 frequency, strength testing and, 152, 172–173, 173 (figure)
 frequency, testing, 145–146
 freshly mixed, 11
 front discharge drum, 91, 92 (figure)

G

general construction, 19–20, 22–23
 general construction cement, 19
 general purpose cement, 19, 24
 glass fibers, 37
 grade of slag, 126
 grading, aggregate, 52
 gray water, 33, 34 (figure)
 ground granulated blast furnace slag (GGBFS), 26
 gypsum, 18, 32

H

head pack, 98
 head water, 98
 high early strength cement, 20, 24
 high sulfate resistant portland cement, 20–21, 24
 hopper, batch, 69
 hopper, charging, 98
 hopper, weigh, 70, 81, 83
 hot weather conditions, 10 (figure), 116–118, 138
 hydration, 18, 24. *See also* mixing water; water

hydration-control (stabilizer) admixtures, 37
 hydraulic cement, 17–24, 69–71, 78

I

ice, 74, 75
 ID designation, 125
 individual batcher, 73
 initial water, 98
 inspection
 of mixers and agitators, 97–99
 plant, 129–130
 water addition, 110
 inspector, 144. *See also* inspection
 International System of Units (SI), 3
 in-transit water addition, 57–58

J

job waste, 11
 job-site water addition, 57, 58–59, 109–112, 125

K

kaolinite, 18, 26
 knowledgeable professional, 48–49. *See also* engineers;
 operator; technician

L

labcrete submittals, 50
 lawyers, 160
 length-diameter ratio (L/D), 155
 lightweight aggregates, 28–29, 49
 lightweight concrete
 density and, 143
 mass per unit volume, 45–47, 47 (table)
 lignite, 25
 limestone, 18, 23. *See also* cement
 limits of liability, 123
 liquid admixture, 77–78
 lithium-based additives, 37
 load-cell scale system, 70 (figure)
 load-to-load variations, 57
 low heat of hydration cement, 20, 24
 low reactivity with alkali reactive aggregates, 24
 low strength tests, 156, 159

M

magnetic meters, 75
 maintenance, mixer, 107
 manufacturer, 3
 manufacturer responsibility
 limitations of, 2
 mixture proportions and, 47–48
 plant inspection and, 129–130

proportions and, 52–53
 purchaser specifications and, 52–53
 quality and, 141
 slump and, 59–60
 mass, 11–12
 aggregates and, 72, 82–83, 127–128
 batching materials and, 69–70
 per cubic foot, 132–134
 per unit volume, 45–47, 132–134
 material batching, tolerance and, 70–71, 72–73, 76
 material tests, 49–50
 materials
 aggregates, 27–29. *See also* aggregates
 air-entraining admixtures, 34–35. *See also* air-entraining admixtures
 cementitious, 17, 18 (figure)
 chemical admixtures, 35–37
 hydraulic cement, 17–24, 69–71, 78
 manufacturer liberties and, 47–48
 measuring, 69–79
 supplementary, 24–27
 water, 29–34, 31 (table), 34 (figure), 34 (table). *See also* water
 maximum aggregate size, 29
 maximum allowable water content, 51
 mean, strength testing, 156
 measuring materials, 69–79
 metakoalin, 26
 metered water, 75, 127
 meters, 134–135. *See also* specific meters
 mild exposure, 43
 mineral admixtures, 24, 69, 126–127. *See also* admixtures;
 supplementary cementitious material (SCM)
 minimum cement content, 51, 52–53
 minimum field standards weights and test loads, 85 (table), 87
 mixer performance tests, 95–96, 104–106
 mixers
 mass determination and, 97–99
 slurry, 8
 stationary, 91–92, 95–96, 167. *See also* stationary mixer
 truck, 91, 92–94, 95–96, 108–109, 112–115, 167. *See also*
 truck mixer
 uniformity tests and, 165–166
 water and, 57–58, 75–76
 mixing revolutions, 106
 mixing time, 102–104, 106
 mixing trucks: water and, 75–76
 mixing uniformity, 95–97
 Mixing uniformity tests, 165–166
 mixing water, 29–31, 33, 73–76
 batch tickets and, 127, 128
 in-transit, 57

measurement, 88–89
See also water
 mixture proportions, 45
 documentation, 49
 manufacturer responsibility, 52–53
 purchaser responsibility, 50–51
 moderate exposure, 43
 moderate heat of hydration and moderate sulfate resistance
 cement, 20, 24
 moderate sulfate resistance, 19, 24
 mortar unit weight, 168

N

name, admixture specification, 52
 National Institute of Standards and Technology (NIST), 5
 National Ready Mixed Concrete Association (NRMCA), 89,
 92, 96, 98
 National Ready Mixed Concrete Association (NRMCA)
 CIP-9, 161
 National Ready Mixed Concrete Association (NRMCA)
 CIP-10, 161
 NIST Handbook 105-1, 6 (table), 86
 NIST Handbook 44, 85
 nominal maximum aggregate size, 29, 41–42
 nominal slump, 58
 nonagitating delivery, 121–122
 non-potable water, 30, 31, 33, 47
 normal distribution curve, strength test, 173 (figure)
 notes, 3
 NRMCA Plant Certification, 84–85, 121, 165
 NRMCA Plant Certification Checklist, 130
 NRMCA Publication 133, 154
 NRMCA Publication 159, 13

O

one-time water addition, 110–111, 112
 open-top containers, 121
 operations, 156–157
 operator, 84
 Option A. *See* ordering Option A
 Option B. *See* ordering Option B
 Option C. *See* ordering Option C
 optional requirements, 20–21
 ordering information, 41–54, 46 (table)
 ordering Option A, 41, 45
 ordering Option “A plus,” 45
 ordering Option B, 41, 45, 50
 ordering Option C, 41, 45, 52–54
 ordering option differences, 52, 53. *See also* specific ordering options
 oven-dry density, 46
 oven-dry mass, 47

over-design, 175, 176–178 (table)
 over-under indicator, 87 (figure), 88
 Ozyildirim, 65

P

parts per million (ppm), 34
 performance requirements, 19
 plant certification, 165
 plant inspection, 129–130
Plant Inspector Guide, 130
 plasticizing admixture, 36
 platform scales, 77 (figure)
 point of discharge. *See* discharge
 polymer modifiers, 37
 polypropylene fibers, 37
 portland blast-furnace slag cement, 22
 Portland cement, 17–18. *See also* hydraulic cement
 Portland-cement clinker, 18
 portland limestone cement, 23
 portland-pozzolan cement, 22–23
 potable water, 30, 47
 powdered admixtures, 76
 pozzolan, 22, 23, 24, 25–27, 126
 practice, 5
 compression tests and, 131–132
 performance accepting tests and, 137–138
 See also specific practices
 precision, air content testing, 61–62
 precision statement, 151
 preconstruction conference, 2
 preliminary sample, air content, 67
 prescriptive requirements, 19
 pressure air-meter measuring bowl (base), 167
 price
 low strength test arbitration and, 160
 purchaser approved changes, 117
 producer, 3
 pumping aids, 37
 pumping process specifications, 66
 purchase order requirements, 1–2
 purchaser, 3. *See also* purchaser liberties; purchaser responsibility; purchaser specifications
 purchaser liberties, 2, 49
 purchaser responsibility, 2, 48–49
 cold weather and, 115–116
 proportioning and, 50–51
 slump and, 59–60
 slump flow and, 58–59
 test reports and, 54
 water content and, 51
 See also purchaser specifications

purchaser specifications, 41–47, 47–48
 admixtures and, 51–52
 air content and, 62–63
 compressive strength and, 48
 See also purchaser responsibility

Q

quality assurance testing, 54
 quality control (QC), 28, 130
 quality portion, 2
 quantity, specific vs. minimum, 51

R

ready-mixed concrete, 7
 rear discharge drums, 91, 92 (figure)
 reasonable access, 129, 141–142
 reclaimer units, 33, 34 (figure)
 reference documents, 5–6 (table)
 relative density, aggregate, 52
 relative yield, 13
 required average strength, 174
 responsibility chain, 2
 responsibility groups, 45. *See also* manufacturer responsibility;
 purchaser responsibility
 retarding admixtures (Type B), 35, 36
 ribbon-loading batching sequence, 98
 rice-husk ash, 26
 runoff water, 33–34

S

safety issues, 3–4
 sampling, 133–134
 air content and, 64
 of fresh concrete, 136–137
 stationary mixers and, 129
 strength tests and, 149
 techniques, 2, 142
 test methods and, 136
 truck mixers and, 108–109
 uniformity tests and, 104–105, 108–109, 165–166
 sand, 18 (figure) saturated-surface-dry mass, 49
 scale, 70 (figure), 77 (figure), 83
 accuracy, 83, 84–88, 89–90
 test procedures, 83–87
 See also scale accuracy
 scale lever system, 70 (figure)
 seasonal variations, 11. *See also* weather conditions
 segregation, 42, 121
 selection, cement, 20
 self-consolidating concrete (SCC)
 admixtures and, 36

slump and, 55, 59
 slump flow and, 42–43, 135–136
 settling basin, 33, 33 (figure) 7-day comprehensive strength, 169
 severe exposure, 43–44
 shale, 26
 shrinkage-compensating expansive cements, 37
 shrink-mixed concrete, 7–8, 106
 silica (SiO_2), 18, 19
 silica fume, 27, 126
 size of course aggregate, 41–42
 skin protection, 3–4
 slag, 22, 23, 26, 126
 slag cement, 26–27
 slump cone, 135 (figure)
 slump flow, 42–43, 58–59, 113–115
 requirements, 58–59
 test methods and, 142–143
 See also slump flow test; slump, tolerance
 slump flow test, 55–56, 144–147. *See also* automated slump flow monitoring
 slump meters, 113
 slump responsibility, 60
 slump tests, 55, 144–147, 167
 batch uniformity and, 96–97
 nonagitating delivery and, 122
 test methods and, 135–136
 slump tolerance. *See* slump: tolerance
 slump, 42
 changes, 36 (table)
 losses, 57, 59, 110
 measurement, 56 (figure)
 responsibility, 59–60
 test methods and, 135–136
 test reports and, 50
 target, 58
 tolerance, 56–57, 58–59
 uniformity tests and, 167
 water addition and, 109–110
 See also job-site water addition. *See also* slump flow; slump flow test; slump test
 slurry mixer, 8
 slurry water (high solids content), 34
 sodium oxide (Na_2O), 19, 32
 solid limits, water, 32–33
 source, aggregate, 52
 special admixtures (Type S), 36
 specification, 1, 2, 27. *See also specific types*
 specification alteration, 2, 27
 specified comprehensive strength, 48
 specified minimum air content, 67
 spillage, 14

standard deviation, strength testing, 156, 172, 173–174, 174–175
 standard weights, 84
 stationary mixer, 91–92, 95–96, 102, 103 (table)
 performance tests and, 104–105, 108–109
 sampling and, 129
 steel fibers, 37
 storm runoff water, 33
 strain-load test, 86–87
 strength, 55. *See also* strength requirements; strength tests
 strength requirements, 153–157
 failure to meet, 159–161
 required average, 174–178, 175 (table), 176 (table)
 strength tests, 2, 50, 149–150
 acceptance criteria, 153–157, 171–178
 calculations, 171, 149, 151, 169, 171–174, 175 (table), 176 (table). *See also* over-design
 comprehensive, 149, 151, 169, 171–174, 175 (table), 176 (table)
 evaluation of, 151–152
 field-curing and, 152
 frequency, 152
 low, 156, 159
 See also strength requirements
 strike-off procedure, 133
 sub-bituminous coal, 25
 substitution load, 86
 supplementary cementitious materials (SCM), 24, 69. *See also* mineral admixtures
 surface texture requirements, 48

T

target slump, 58
 technicians, 142–143, 149, 150
 temperature
 hydration reactions and, 59
 test methods and, 137
 tests, 50, 144–145
 terminology, 1, 7–8
 test cylinders. *See* cylinders
 test load, 86
 test method, 5, 28
 air content and, 133–135
 density and, 132–133
 reporting requirements and, 138
 sampling and, 136
 slump and, 135–136
 temperature and, 137
 See also specific test methods
 test reports, 54
 test values, 95
 testing procedures, 141–161. *See also* air content tests; certification tests; comprehensive strength test; density tests; materials

tests; mixer performance tests; scale; quality assurance tests;
 slump flow tests; slump tests; strength tests; test reports;
 uniformity tests

time of set, 118

tolerance

- for aggregates and air content, 63–67
- batching and, 11, 70
- for chemical admixtures, 76
- for mixing materials, 70–71, 72
- slump, 56–57, 58–59
- water meter and, 75

total mass (weight), 12

total mixing water, 88

transportation, 109. *See also* mixers

transportation unit, 63. *See also* mixing trucks

tricalcium aluminate (C_3A), 18

Truck Mixer Manufacturers Bureau (TMMB), 92, 93, 94
 (figure), 95, 107

truck mixer wash out and settling basin, 33 (figure)

truck mixer, 75–76, 91, 92–94, 95–96

- automated water measurement, 112–115
- batch characteristics and, 167
- sampling and, 108–109
- water and, 57–58, 75–76

truck time, 112

truck-mixed concrete, 8, 106–109

Type A meter, 134

Type B meter, 134–135, 135 (figure)

type, admixture, 52

U

Uniform Arbitration Act, 160

uniformity requirements, 165–170, 166 (table)

uniformity tests, 95–97

- mixers and, 165–166
- stationary mixers and, 104–105, 108–109

See also uniformity requirements

uniformity. *See* mixing uniformity; uniformity requirements;
 uniformity tests

V

variability, testing component, 172

variance, strength testing, 156

variation, with-in test coefficient, 152

vibration, effect on air content, 65 (table)

Virginia Department of Transportation (VDOT), 65

viscosity, 42, 136

viscosity-modifying admixtures, 37

visual monitoring, batch, 84

Visual Stability Index (VSI), 136

volcanic tuff (ash), 25

volume loss, 14

volume purchase, 11

volumetric admixture dispenser, 79 (figure)

volumetric batching, 81

W

wash water, 30, 31, 32–33, 34, 34 (table)

wash water slurries, 34

washout pits, 31, 32, 33 (figure)

waste, 14

water, 18 (figure), 29–34, 31 (table), 34 (figure), 34 (table), 47

- added, 88, 124
- additives and slump, 57–59
- batching uniformity and, 96
- chemical admixture and, 74
- hot, 116
- job-site additions, 109–112
- maximum allowable content of, 51

See also ice; mixing water; *specific types*

water-cementitious materials (w/cm) ratio, 49, 51

water content, proportional to slump, 55

water from concrete production operations, 30

water losses, 14

water measuring system, 75

water meter, 75, 114

water per cubic measurement, 49

water reducer admixtures (Type A), 36, 78

water repellant admixtures, 37

weather conditions, 8, 8 (table), 9 (figure)

- aggregates and, 28
- air content and, 43–44
- cold, 9 (figure), 115–116, 118, 138
- hot, 10 (figure), 116–118, 138

weigh hopper, 70, 81, 83

weigh-on-the-belt configuration, 83

weighted water, 75, 127

wet mass, 47

Y

yield, 13, 13 (figure)

- calculation, 12, 13
- discrepancy of, 13–14
- per cubic foot, 132–134