

# SUBJECT INDEX

## A

- Abrams W/c ratio law 299
- Abrasion
  - of aggregate 115, 117
  - of concrete 363
  - of vacuum dewatering 560
- Absolute volume 472
- Absorption of aggregate 78
- Accelerated curing 306
- Accelerated strength 499
- Accelerating Admixtures 150, 154
- Accelerating plasticizers 150
- Accelerators 125, 149
- Acetogenous shrinkage 347
- Acid attack 395
- Acid resisting concrete 412, 413
- Admixtures
  - accelerating 150
  - classification 125
  - compatibility 131
  - dosage 131
  - mineral 174
  - retarding 150
  - waterproofing 192
  - workability 219
- Aerated concrete 506
- Age factor 303
- Aggregates 67
  - abrasion test 76, 115
  - absorption 78
  - alkali reactivity test 86
  - angular 72
  - angularity 72
  - artificial 67
  - attrition test 76
  - bond 72
  - bone dry 79
  - bulk density 78
  - classification 67
  - crushing strength 113
  - crushing value 113
  - elongated 109
  - flaky 107
  - fineless modulus 94
  - gap graded 107
  - glassy 74
  - grading 91
  - impact value 114
  - irregular 70
  - lightweight 506
  - mechanical properties 113
  - modulus of elasticity 328
  - natural 67
  - refractory 44
  - saturated and surface dry 79
  - shape 70
  - soundness 85
  - specific gravity 77
  - specific surface 96
  - strength 113
  - surface index 98
  - texture 73
  - thermal property 90
  - unsound 85
  - void content 78
- Aglite 509
- Air entraining agent 159
- Air entraining cement 37
- Air entrained concrete 160
  - air context measurement 171
  - effect of mixing time 159
  - influence on workability 168
- Air Permeability 50
- Algae 83
- Alite 16
- Alkali 14
  - aggregate reaction 85
  - silica reactivity 85
  - silicate gel 85
- Alkalinity 398
- All-in-aggregate 105
- Aluminium powder, 515
- Aluminous cement 43
- American method of mix design 466
- Andesite 86
- Angularity Index 72
- Angularity number 70
- Argillaceous material 5
- Artificial aggregate 70
- Autoclave 55
- Acetogenous shrinkage 347

## B

- Bacterial Concrete 598
- Ball mill 9
- Barytes 523
- Basalt fibre 602
- Basalt fibre concrete 602, 603
- Basalt fibre, 602
- Batching 236
- Belite 16
- Biological process 388
- Blaine Airpermeability 50
- Blast Furnace slag 32
- Bleeding 234
- Blended cement
- Bloated clay 509
- Bogue's compound 15
- Boiling water method 498
- Bond strength 315
- Bonding admixture 196
- Boundry aggregate
- Breeze 508
- British method of mix design 474
- Bulk density of aggregate 78
- Bulk volume 467
- Bulking of sand 80
- Burnt clay 187

# C

Calcareous materials 5  
 Calcium aluminate hydrates 21  
 Calcium carbide method 82  
 Calcium chloride 549  
 Calcium hydroxide 20  
 Calcium nitrite 406  
 Calcium silicate hydrates 19  
 Calcium sulphate 399  
 Calcium sulphauminates 399  
 Capillary cavities 24, 18  
 Capillary segmentation 354  
 Capping of cylinder 424  
 Carbon dioxide 398  
 Carbonation 398  
 Carbonation depth 398, 400  
 Carbonation measurement 399, 400  
 Carbonation rate 398  
 Carbonation shrinkage 347  
 Carbonic acid 398  
 Carborundum powder 206  
 Carboxylated Acrylic Ester 144  
 Cathodic Protection 408  
 Cavitation 411  
 Cellular concrete 514  
 Cem-Fil 465  
 Centre-point loading 429  
 Ceramic bond 44  
 Chalcedony 86  
 Characteristic strength 489  
 Chemically bound water 25  
 Chert 86  
 Chloride attack 400  
 Chloride content in concrete 401  
 Chloride in cement 400  
 Cinder 508  
 Cleanliness of aggregate 83  
 Clinker 9  
 Coefficient of permeability 355  
 Coefficient of thermal expansion ,90  
     of Rocks 355  
     of light weight aggregate 514  
     of cement paste 24  
     of concrete 356  
 Coefficient of variation 464  
 Cold weather concreting 542  
 Coloured cement 38  
 Combining aggregates 487  
 Compackon 265  
 Compacting factor 226, 227  
 Compacting factor and slump 163  
 Compatibility 131  
 Complexities in SCC 588  
 Compound composition 15  
 Compressive strength 421  
 Concrete chemicals 198  
 Concrete reinforced with basalt fibre reinforcement 602, 605  
 Concrete repair system 215

Concreting  
     in cold weather 542  
     in hot weather 552  
 Condensed silica fume 183  
 Conductivity 369  
 Consistency 219  
 Contraction Joint 376  
 Control of Alkali-aggregate reaction 89  
 Conversion 43  
 Corrosion effect 401  
 Corrosion inhibitors 196  
 Corrosion reinforcement 401  
     of calcium chloride  
     of carbonation 398  
     of chlorides 401  
     of cover 400  
     of sea water 396  
 Course agg. content SCC 577  
 Cover 400  
 Crack control 378, 379  
 Crack propagation 23  
 Crack width 411  
 Cracking of mass concrete 372  
 Cracks in concrete 361  
 Crushed aggregate 105  
 Crushed sand 105  
 Crusher 105  
 Crusher dust 105  
 Crushing strength 74  
 Crushing value 74  
 C-S-H 19  
 Cube test 421  
 Cumulative percentage 95  
 Curing compounds 200  
 Curing methods 277  
 Curing period 289  
 Cylinder strength and Cube strength 428  
 Cylinder test 421

# D

Damp-proofing 192  
 Darex 159  
 Deffoculation 127  
 De-icing 387  
 Deleterious substance 84  
 Delhi Metro Project 590, 591  
 Densely packed system 45  
 Density of cellular concrete 510, 511, 512  
 Density of light weight concrete 510, 511, 512  
 Detraining agent 194  
 Deval test 76  
 Diatomaceous earth 507

Differential shrinkage  
 Diffusion of chloride 400  
 Dispersion of cement 127  
 Distilled water 120  
 Dorry abrasion test 76  
 Dry Process 9  
 Drying shrinkage 343  
 Durability 349  
     Fly ash 176  
     Silica fume 183  
     Thermal expansion 373  
     ggBS 32, 33  
 Dust in aggregate 106  
 Dynamic Modulus of Elasticity 331

## E

Early volume change 341  
 Economics of SCC 597  
 Eddystone light house 2  
 Effect  
     of age 354, 355  
     of carbonation 398  
     of silicafume 184  
     of water/cement ratio 356  
     of durability 352, 353  
 Effects of creep 339  
 Efflorescence 122  
 EFNARC 573, 575  
 Elastic deformation 337  
 Elasticity 325  
 Electrical curing 289  
 Electrical determination of moisture content 81  
 Electro-chemical action 401  
 Elongation Index 109  
 Entrained air 159  
 Entrained air influence on  
     strength 165  
     durability 161  
 Epoxy coated reinforcement 406  
 Epoxy coating 406, 407  
 ERC Chennai Trials 594, 596  
 Erosion 411  
 Esters 144  
 Ettringite 400  
 Evaporation of water 200  
 Exfoliated vermiculite 509  
 Expanded clay 505  
 Expanded shale, slate 505  
 Expanded slag 506  
 Expansion on freezing 385  
 Expansive cement 40  
 Exposed aggregate look 293

Exposure condition 414  
 Extensibility of concrete 375  
 External vibrator 268  
 Extra Rapid hardening Cement 30  
 Extreme weather concreting 542

## F

Fatigue 347  
 Feret's law 299  
 Ferrocement 566  
 Fibre reinforced concrete 526  
     bulking 81  
     crushed 105  
     grading zones 103  
     size 69  
 Fibrous particles in hydration 22  
 Fill-Box 575  
 Filling ability 575  
 Final aggregate 81  
 Fineness of cement 48, 57  
 Fineness test of cement 48  
 Fines in SCC  
 Finishing of concrete 291  
 Fire resistance 382  
 Flakiness Index 107  
 Flaky aggregate 70  
 Flash set 9  
 Flexural strength 428  
 Flocculation 127  
 Floor hardner 206  
 Flow table test 228, 229  
 Flowing concrete 145  
 Fluorescence microscopy 9  
 Fly ash 176  
     class C 177  
     class F 177  
     classification 177  
     composition 178  
     concrete properties 180  
     High volume (HVFA) 180  
     fineness 180  
     hydration 17  
 influence  
     on alkali-silica reaction 180  
     on durability 180  
     on permeability 180  
     on strength 181  
     on sulphate resistance 180  
     specific gravity of cement 301  
 Foam concrete 515, 516  
 Foamed slag 508  
 Form work permeable 411, 412  
 Form work removal 261  
 Form work stripping time 261  
 Form work vibrator 268  
 Free lime 14  
 Freezing 542  
 Freezing cycle 161  
 Freezing of fresh concrete 542  
 Frequency of vibrator 61  
 Fresh concrete 218

Friction in pumping 254  
 Frost action 363  
     heave 363  
     protection 363  
 Fullers grading curve 92  
 Fungicidal 196

## G

Gain of strength 303  
 Galvanizing 408  
 Gamma-ray 520  
 Gap grading 107  
 Gas concrete 194  
 Gel 17, 22  
     alkali silica 85  
     intrinsic strength 302  
     pores 22  
     porosity 22  
     unlimited swelling 86  
     water 119  
 Gel/space ratio 301  
     ggbs 33, 189  
     composition 189  
     content 190  
     fineness 188  
 Influence  
     on chloride mg res 190  
     on corrosion 190  
     on durability 190  
 Geopolymer Concrete 599, 600  
 Grades of concrete 304  
 Grading curve 100  
 Grading importance 459  
     pumping 251  
     workability 219  
     void content 459  
     slump 222  
 Grading limits 104  
 Grading of aggregate 91  
 Grading of cement 30  
 Grading zones 102  
 Granite 67  
 Gravimetric method 171  
 Griffiths hypothesis 302  
 Grinding clinker 9  
 Ground granulated blast  
     furnace slag ggbs 189  
 Grouting agents 195  
 GTM Screen Stability 575  
 Gunit 562  
 Gypsum content 5,  
 Gypsum reaction 21

## H

Haematite 521  
 Hand compaction 266  
 Hand mixing 242  
 Hard burnt magnesite 47  
 Haydite 509

Heat of hydration 18  
     determination 20  
     cement type 28  
     cement contents 415  
     pure compounds 18  
 Height/diameter ratio 426  
 Hexagonal aluminate hydrates 22  
 High performance concrete 323  
 High alkali content 88  
 High alumina cement 42  
 High density concrete 520  
 High early strength cement 46  
 High pressure steam curing 287  
 High range water reducers 129  
 High strength cement 45  
 High strength concrete 318  
     cracking 375  
     micro cracking 364, 365  
 High temperature 382  
 Influence  
     high alumina cement 42  
     strength 44  
 Histogram 461  
 Hong Kong Study 595  
 Hot weather concreting 552  
 Humidity 53  
 Influence  
     on plastic shrinkage cracks 341  
     on creep 332  
     on shrinkage 343  
     on carbonation 398  
 Hydration of cement 14  
 Hydraulic structure 36  
 Hydrophobic cement 39

## I

Ice as mixing water 555  
 Ice crystals 543, 544  
 Ideal grading curve 101  
 Igneous rocks 67  
 Ilmenite 521  
 Immersion vibrator 274  
 Impact value 76  
 Impermeable concrete 354  
 Impurities in aggregate 83  
 Impurities in water 120  
 Indian Scenario of SCC 590  
 Infra red radiation curing 288  
 Infra-red spectrometer 131  
 Initial setting time 52  
 Initial tangent modulus 327  
 In-site tests 436  
 Insoluble residue 58  
 Instantaneous recovery 338  
 Insulation of concrete 560, 561  
 Interface, aggregate-cement  
     micro structure 388  
 Intergrinding 190  
 Interlocking 70  
 Internal friction in pumping 254  
 Internal stresses  
     due to shrinkage 346

Intrinsic strength 302  
 Iron oxide 14  
 Iron shots 520  
 IRS T40 cement 40

## J

Joint sealant 215  
 Joints in concrete 376  
 J-ring 575

## K

Kaiga Nuclear Power Plant 592  
 Kelly ball test 231  
 Kiln 6

## L

Laboratory mexer 456  
 Laitance 234  
 Land content SCC 577  
 L-Box 575  
 L-Box 575  
 Lea and Nurse method 49  
 Leached 20  
 Le-chatelier test 55  
 Length gauge 109  
 Lightweight aggregate 505  
 Lightweight concrete 504  
 Lignosulphonates 130  
 Lime 54  
 Lime saturation factor 56  
 Linseed oil 413  
 Longitudinal wave 445  
 Los Angeles test 77  
 Loss of slump 140  
 Loss on ignition 58, 59  
 Low alkali cement 89  
 Low heat cement 34

## M

Macro-defect-free cement 45  
 Magnesium oxide 14  
 Magnesium phosphate cement 46  
 Magnesium sulphate 390  
 Magnetic method 453  
 Magnetite 521,522  
 Major compounds 15  
 Melamine 130  
 Manufacture of cement 5  
 Marsh cone 132, 133  
 Masonry cement 39  
 Mass concrete 372  
 Mass loss 386  
 Maturity 306  
 Maximum aggregate size 69  
     influence on strength 312  
     shrinkage 340  
     surface area 96  
     workability 219  
 Mean strength 464  
 Mechanical properties of aggregates 113  
 Mechanism  
     of shrinkage 342

    of creep 341  
     of action of superplasticizer 128, 129  
 Melamine 130  
 Membrane forming curing 200  
 Metakaolin 188  
 Microcracking 388  
 Microsilica 183  
 Mineral admixtures 174  
 Mini-slump 132  
 Minor compounds 15  
 Mix Composition of SCC 576  
 Mix design 458  
     ACI method 466  
     British method 473, 474  
     Indian standard method 489  
     Pumpable concrete 254  
     With fly ash 482  
 Mix design SCC 577  
 Mixers 244  
 Mixing of concrete 242  
     long time mixing 245  
     with super plasticizers 137  
     by hand 242  
     sequence of loading 245  
 Mixing SCC 577  
 Modulus of Elasticity 329  
     aggregate 76  
     concrete 329  
     dynamic modulus 331  
     static modulus 332  
 Modulus of rupture 429  
 Moisture  
     moisture movement 347  
     free moisture 81  
     measurement 81  
     in aggregate 81  
 Influence  
     on carbonation 398  
 Moisture 387  
 Influence  
     on durability 387  
     on strength 435  
     on Modulus of elasticity 435  
     on pulse velocity 448, 449  
 Mortar  
     bar test 87  
     segregation 233  
     shrinkage 340, 341

## N

Naphthalene 130  
 Natural aggregate 67  
 Natural sand 67  
 Neutron 520  
 New generation plasticizers for SCC 589  
 Non-destructive tests 437  
 Non-evaporable water 18  
 Non-tilting mixer 244  
 Normal distribution 461

## O

Ocrate process 414

## 622 ■ Concrete Technology

Oil-well cement 41  
Opal 86  
Opaline chert 86  
Ordinary portland cement 29  
Organic impurities 83  
Orimet 575  
Oven dry density 512, 513  
Over-vibration 276  
Oxide composition 14

### P

Pan-type mixer  
Particle  
    interference 107  
    shape of aggregate 70  
Passing ability 575  
Passivating layer 398  
Paste 23  
Pebble dash 294  
Penetration test 237  
Perlite 509  
Permeability 169  
    concrete 356  
Permeable formwork 411, 412  
Permissible stress 305  
pH  
    effect of carbonation 398  
    pore water 401  
    sea water 122  
    phenolphthalein 400  
Pigments 294  
Pipes for pumping 252  
Placing of concrete 259  
Placing SCC 577  
Plastic settlement 362  
Plastic shrinkage 341  
Platen 425  
Plum concrete 264  
Pneumatically projected concrete 561  
Point count method 455  
Poisson's ratio 332  
Poker vibrator 268  
Polymer bonding agent 204  
Polymer concrete 534, 535  
Polymer mortar 204  
Pore fillers 193  
Portland cement 5  
Powder type SCC 574  
Pozzolamic Materials 175  
Pozzolanic activity 176  
Pozzolema cement 35  
Prepacked concrete 556  
Preplaced aggregate concrete 556  
Pre-soaking of aggregate 514  
Pressure method 173  
Prism test 61  
Products of hydration 20  
Pull-out test 442  
Pulse velocity 444  
Pumice 506  
Pumpability 484

Pumped concrete 253  
Pumping concrete 489  
    blockage 259  
    distance 253  
    friction 254  
    height 253  
    pipes 253  
Pumps 251  
Pyrament cement 46

### Q

Quality control 460  
Quality of mixing water 119  
Quartz 67  
Quartzite 67  
Quenching of slag 508  
Quick setting cement 33

### R

Railway sleeper 40  
Ramming 267  
Rapid hardening cement 30  
Rate of hydration 18  
Rate of loading 435  
Raw meal 9  
Reactive aggregates 86  
Reactive powder concrete 320  
Ready mixed concrete 248, 249  
Rebound hammer 439  
    number 440  
Recovery of creep 338  
Redi-set cement 41  
Refractory  
    concrete 44  
    aggregate 44  
Regulated set cement 41  
Reinforced concrete  
    sea water 396  
    corrosion 402  
Relative humidity 53  
Relative Slump flow SCC 579  
Repair 216  
Residual deformation  
Resonant frequency method 445  
Retardation 147  
Retarding admixtures 147  
Retempering 246  
Retrogression of strength 288  
Reversing mixer 244  
Revibration 276  
Rhyolite 86  
Rice husk ash 186  
Ring tension test 434  
Risk factor 490  
Road Note No. 473

Robot for quality control of cement 9  
 Rock permeability 355  
 Roller compacted concrete 570  
 Roman cement 1  
 Root mean square deviation 462  
 Roughness of aggregate 73  
 Rust volume 403

## S

Sampling of aggregate 94  
 Sand  
   grading zone 102  
   standard sand 53  
   saturated and surface dry 79  
 Saw dust concrete 507  
 Scaling 161  
 Scanning electron microscope 26  
 Schmidt hammer 439  
 Sea water for mixing 122  
   for curing 123  
   salinity 395, 396  
 Sedimentation method 111  
 Segregation 233  
 Segregation resistance 575  
 Self compacting concrete, 572  
 Self levelling concrete 129  
 Self weight of concrete 504  
 Semidry process 5  
 Setting 50  
 Setting time 50  
   of concrete 236  
   temperature 52  
   high alumina cement 42  
 Settlement 362  
   of fresh concrete 362  
   vacuum dewatered concrete 560  
 Sewage attack 413  
 Shape of aggregate 70  
 Shrinkage 340  
   autoclaved concrete 287  
   autogenous 347  
   carbonation 347  
   effects  
     cement content 366  
     water/cement ratio 344  
     water content 366  
 Sieve analysis 93  
 Sieve test 49  
 Silica fume 183  
 Silica gel 89  
 Silicon tetrafluoride 413  
 Silt 83  
 Sintered fly ash 509  
 Slag cement 31  
 Slip-form paver 264  
 Slump flow 575  
 Slump loss 140  
 Soundness  
   of aggregate 85

  of cement 50, 50  
 Spalling 543, 544  
 Specific creep 329  
 Specific gravity  
   of aggregate 78  
   of cement 302  
   of fly ash 178  
 Specific surface 96  
 Spilling tensile strength 431, 432  
 Sprayed concrete 562  
 Squeeze type pump 252  
 Standard ASIM 28  
 Standard consistency 50  
 Standard deviation 462  
 Standard sand 50  
 Static modulus of elasticity 329, 331  
 Steam curing 282  
   at atmospheric pressure 282  
   at high pressure 287  
   cycle 285  
 Stearic acid 39  
 Strain 326  
 Strength of concrete 257  
   cement 50  
   vacuum dewatered 561  
   accelerated curing 306  
   characteristic 489  
   different ages 303  
 Stress strain relation 326  
 Structural light-weight concrete 513  
 Sugar as retarding agent 148  
 Sulphate action 389  
 Sulphate resisting cement 31  
 Sulphonated formaldehyde  
 Sulphur  
   capping 424  
   infiltrated concrete 525  
 Super sulphated cement 34  
 Superplasticizer 129  
   action 128  
   classification 130  
   compatibility 131  
   dosage 131  
   high performance concrete 321  
 Surface hardeners 198  
 Surface retarder 207  
 Surkhi 187  
 Swelling 347

## T

$T_{50\text{ cm}}$  Slump flow 576  
 Tangent modulus 327  
 Tannic acid 412  
 Tarapur Atomic Power Project 591  
 Target mean strength 489  
 Temperature  
   control in cold weather 363  
   differential 372, 373  
   heat of hydration 373  
   gradients 373  
 Ten per cent fines value 114  
 Tensile strain at cracking 372, 373

## 624 ■ Concrete Technology

Tensile strength 311  
  ring test 434  
  split tensile strength 433  
Test Methods SCC 579

Test  
  core 436  
  cubes 421  
  cylinder 421  
  chemical test 58  
  non destructive 437  
  in site 437  
Texture of aggregate 73  
Thermal  
  coefficient of expansion 91  
  coefficient of cement paste 90  
  gradient 373  
Thermal conductivity 368  
Thermal expansion 373  
Thermal expansion 373  
Third point loading 429  
Tilting mixer 244  
Transit mixer 250  
Transition zone 387  
Tremic concrete 263  
Tricalcium aluminate 31  
Truck mixed concrete 248

### U

U-Bdix 575  
Ultimate creep 339  
Ultra high early strength cement 46  
Ultrasonic pulse velocity 446  
Under water concrete 262  
Unhydrated cement 25  
Unlimited swelling gel 86  
Unsound particle 86  
Un-soundness 364  
  of aggregate 364  
  of cement 364

### V

Vacuum dewatering 560  
Vebe test 232  
Vebe time 232  
Vermiculite 509  
Vesuvius 2  
V-Funnel 575  
Vibrating table 269  
Vibrator 268  
  external 269  
  internal 269  
  surface 269  
  roller 269  
Vicat apparatus 52  
Viscosity Modifying Agents (VMA) 574  
Void content of aggregate 78

Volcanic 2  
Volume batching 238  
Volume changes in concrete 352  
Volumetric method for air content 171

### W

Wall effect 410  
Water content 469  
Water content in Geopolymer concrete 600  
Water proof membrane 211  
Water proofing admixture 192  
Water  
  chemically combined 25  
  for curing 123  
  gain 234, 235  
  permeability 355  
  reducer 129  
  repellent film 214  
  of workability 560  
Water/cement ratio 299  
  for durability 415  
  for full hydration 26  
  influence  
  strength 300  
  law 301  
  rule 301  
Wet curing 279  
wetting and drying 387  
Whisper concrete 296  
White cement 38  
Wind influence on evaporation 200  
Wood chips 507  
Workability 219  
  definition 220  
  shape 220  
  surface texture 220  
  air entrainment 162  
  gap grading 107  
  grading 220  
  super plasticizers 135  
  measurement 222  
  agents 195  
Workability of SCC 576

### X

X-ray  
  fluorescence 23  
  powder diffraction 23

### Y

Yield of concrete 471

### Z

Zero slump concrete 195  
Zinc 455  
Zones sand grading 102, 103