Index

AASHTO 213, 217, 218, 219, 220, 234, 235

Above Ground 7, 8, 80, 265, 325, 326, 327, 328, 329, 493, 495, 511, 514, 535, 594

Above Ground Piping Systems

Abrasion Resistance 55, 79, 94, 169

Acceptance Deflection 293

Access 329, 418, 429,430, 432, 433, 435, 429, 504, 563

Advantages 7, 9, 43, 44, 159, 319, 347, 420, 435, 489, 493, 494, 496, 513, 540, 561, 563, 564

AGA 141, 171

Aging 210

Air Entrapment 387

Allman 211, 268

American Association of State Highway and Transportation Officials 218

American Society for Testing and Materials (ASTM) 346, 439

American Water Works Association (AWWA) 164

Anchor 26, 266, 312, 321, 332, 337, 338, 339, 340, 372, 373, 374, 413, 414, 427

Anchored 266

Anchoring 336, 345, 346, 385

ANSI 37, 88, 96, 153, 162, 163, 180, 267, 361, 369, 376

Apparent Modulus 12, 13, 57, 62, 63, 100, 101, 231, 232, 233, 250, 253, 281, 327, 328, 330, 333, 419, 422, 450, 454, 455, 457, 458, 464, 470, 473, 475

Apparent Tensile Strength 142 Appearance 37, 86, 141, 329

Applications 5, 6, 7, 10, 11, 12, 13, 15, 16, 25, 34, 39, 41, 43, 44, 48, 63, 65, 69, 71, 72, 73, 75, 79, 80, 85, 86, 87, 90, 95, 98, 99, 127, 145, 146, 149, 161, 162, 163, 164, 165, 166, 169, 170, 171, 172, 175, 177, 179, 180, 181, 195, 197, 203, 207, 212, 214, 215, 217, 238, 241, 246, 247, 252, 258, 262, 265, 266, 285, 288, 291, 294, 297, 300, 319, 325, 347, 363, 368, 376, 379, 381, 390, 401, 402, 403, 406, 422, 424, 426, 436, 445, 447, 451, 452, 455, 457, 483, 489, 483, 489, 494, 522, 537, 553, 561, 562, 563, 571, 579, 583, 586, 587, 589, 590, 595, 601

Arching 214, 216, 217, 230, 233, 240, 246, 247, 248, 249, 251, 283, 288, 293, 319, 449, 451, 452, 502

Armored 214, 525

Army Corps of Engineers 296

ASCE 268, 315, 441, 446, 460, 463, 472, 602, 603

Asphalt Dipped 192

Assembly 15, 141, 265, 302, 309, 349, 350, 355, 364, 365, 367, 368, 382, 392, 432, 436, 471, 541, 542, 545, 550, 551, 559

ASTM 7, 16, 24, 29, 30, 34, 37, 39, 40, 41, 47, 52, 57, 62, 64, 66, 68, 70, 73, 74, 79, 80, 81, 82, 83, 84, 86, 89, 90, 91, 92, 93, 99, 101, 103, 125, 127, 133, 134, 139, 141, 142, 143, 145, 146, 147, 148, 149, 150, 152, 153, 154, 156, 157, 158, 160, 162, 163, 164, 166, 167, 168, 170, 171, 172, 177, 178, 180, 181, 182, 188, 189, 213, 214, 220, 225, 231, 232, 234, 236, 238, 239, 267, 268, 272, 286, 290, 291, 294, 298, 316, 318, 344, 346, 349, 351, 352, 355, 357, 376, 392, 404, 414, 421, 429, 439, 440, 441, 446, 447, 457, 460, 464, 472, 487, 492, 493, 494, 496, 497, 498, 500, 503, 504, 505, 513, 515, 522, 526, 536, 553

ASTM D1248 47 ASTM D2683 515 ASTM D1586 236 ASTM D1598 66

ASTM D2321 213, 346, 439

ASTM D2513 180, 181, 188, 357, 376

ASTM D2774 213

ASTM D2837 68, 70, 82, 178, 346

ASTM D3035 188, 346

ASTM F894 189, 231, 232, 239, 376, 429, 439

Aude 199, 268

Average Inside Diameter 151, 189, 281,500

AWWA 7, 13, 16, 37, 41, 72, 86, 98, 125, 142, 145, 149, 153, 154, 156, 164, 165, 166, 167, 172, 188, 189, 212, 213, 266, 267, 268, 291, 355, 361, 368, 369, 376, 377, 388, 439

AWWA C901 164, 179, 188, 189, 267, 376

AWWA C906 164, 179, 186, 188, 267

AWWA M55 388

Axial Bending Stress 478

Axial Tensile Stress 61, 460, 464, 480

В

Backfill 25, 30, 31, 211, 236, 237, 285, 286, 287, 288, 290, 293, 295, 296, 297, 299, 301, 303, 306, 307, 309, 310, 311, 312, 313, 315, 319, 364, 386, 392, 400, 442, 488, 503, 508, 509, 568, 570, 571, 577, 579, 598

Ballast 304, 381, 382, 383, 386, 388, 389, 390, 391, 392, 393, 394, 396, 397, 399, 400, 401, 402, 403, 412, 413, 414, 415

Barbed Mechanical Fittings 514 Barrel 128, 129, 130, 135, 136, 143, 309, 314

Bead Removal 349

Beam Analysis 342, 343

Beam Deflection 340, 341, 342

Bedding 231, 282, 287, 289, 290, 295, 303, 304, 305, 307, 309, 310, 319, 380, 382, 392, 521

Bell and Spigot 7, 26, 263, 265, 266, 313, 320, 372, 373, 430, 432, 433 535

Below Ground Installations 502 Bend Radius 20, 289, 311, 312, 315, 488, 505, 508, 509

Bend-Back Test 142

Bending Radii 399, 506

Bending Strain Development 338

Bending Stress 232, 341, 364, 388, 464, 478

Bent Strap Test 29

Berm 329, 337

Biological Resistance 91

Blowing 516, 517

Bolt Type Mechanical Flange Adapter 365

Bolting 361, 365, 390

Bore 130, 133, 138, 190, 193, 199, 205, 206, 208, 281, 361, 364, 415, 441, 442, 443, 444, 446, 460, 461, 463, 464, 475, 477, 478, 480, , 488, 495, 500, 502, 504

Borehole 443, 444, 446, 448, 449, 450, 451, 452, 455, 456, 459, 460, 461, 462, 463, 465, 469, 471, 475

Bowles 250, 253, 268

Box 306, 354, 355, 515, 548, 587

Bracing 289, 301, 304, 587

Branch Saddles 372, 428, 436

Breaker Plate/Screen Pack 130

Bridge Structures 523

Buckling 182, 183, 211, 212, 213, 214, 215, 216, 230, 239, 240, 241, 242, 243, 244, 246, 247, 252, 253, 254, 258, 259, 260, 282, 383, 386, 398, 399, 419, 420, 421, 437, 454, 456, 457, 458, 470, 472, 473, 474, 475, 476, 477, 481, 503

Building Code 524

Bundling 135

Buoyant Force 254, 255, 281, 383, 384, 385, 404, 461, 462, 475

Burial of Fabricated PE Fittings

Buried PE Pipe Design 211

Buried Piping Systems 265

Butt Fusion 5, 26, 27, 28, 29, 35, 36, 37, 159, 321, 348, 349, 377, 379, 392, 402, 403, 430, 432, 500, 513, 515, 545, 586

C Factor 10

Cable 38, 133, 403, 433, 434, 435, 446, 493, 494, 495, 496, 498, 499, 500, 501, 502, 504, 506, 508, 509, 511, 512, 513, 514, 515, 516, 517, 518, 519, 520, 521, 522, 523, 524, 525, 526, 527, 556, 557, 558, 559, 562, 566, 585, 586, 598

California Bearing Ratio 319

Canadian Standards Association 145, 166, 172

CANDE 231, 268, 292

Capstan 443, 459, 460, 461, 462, 511, 517

Casing 28, 168, 224, 258, 488, 500, 504, 537

Cast Iron 192, 357, 364, 379, 425, 556, 561, 593, 596

Category 10, 65, 149, 152, 213, 230, 357, 487, 496, 497

Catenary 338

Cell Classification 496

Cement Mortar Relined 192

Cement Stabilized Sand 296

Chemical Resistance 8, 41, 54, 87, 496, 497

CIC 495

Class 45, 67, 74, 95, 98, 165, 177, 181, 182, 186, 294, 295, 296, 297, 299, 300, 304, 307, 309, 310, 316, 323, 361, 368, 572, 577, 582, 589

Class II material 296, 297

Class III 309, 310

Clay 21, 90, 198, 200, 207, 209, 235, 237, 240, 290, 297, 303, 316, 317, 318, 328, 421, 438, 443, 444, 449, 504, 561, 562, 565, 570, 589, 596

Cleaning 27, 38, 210, 237, 430, 445, 543, 582, 585

Coarse Grain Soils 317

Coefficient of Linear Expansion 328

COF 496, 518, 519, 520

Cohesion 317, 318

Cold Weather Handling 25

Collapse 297, 303, 383, 398, 421, 441, 443, 449, 454, 455, 458, 459, 477, 478, 480, 481, 580

Color 82, 84, 127, 128, 141, 148, 495, 496, 498, 499

Colorants 45, 55, 498

Combustion Toxicity 93, 94

Compaction 215, 230, 233, 234, 236, 286, 290, 297, 298, 299, 300, 309, 310, 313, 317, 318, 374, 503, 508, 568, 571

Compressed Air 400, 402, 516, 517, 518, 557

Compressible Gas Flow 188, 202

Compression Fittings 159, 347, 357, 514, 539, 593

Compression Nut 356

Compressive Ring Thrust 239, 247

Compressive Stress 211, 212, 236, 239, 240, 241, 244, 247, 248, 249, 265, 283

Concrete 139, 192, 207, 296, 303, 311, 313, 322, 328, 332, 337, 364, 372, 374, 379, 380, 389, 412, 413, 425, 493, 508, 517, 561, 562, 565, 568, 570, 596, 598, 601

Conduit 2, 168, 172, 214, 356, 441, 446, 447, 457, 472, 493, 494, 495, 496, 498, 499, 500, 501, 502, 504, 505, 506, 508, 510, 512, 513, 516, 518, 523, 524, 525, 526, 527, 533

Conduit Entry Issues 524

Conduit Wall Determination 500

Connection to Rigid Structure 336

Connections 11, 263, 266, 308, 311, 313, 320, 322, 347, 353, 357, 361, 363, 364, 368, 371, 372, 418, 426, 427, 428, 429, 436, 437, 488, 559, 563, 564, 565, 566, 568, 569, 576, 577, 582, 585, 586, 590, 593, 594, 595

Construction of the Land-to-Water Transition 392

Continuous Beam Analysis 342, 343

Continuous Support 335, 345

Contract Documents 25

Contraction 76, 80, 103, 160, 263, 311, 312, 313, 323, 328, 331, 372, 374, 375, 465, 471, 488, 511, 512, 513, 514, 516, 523, 537, 592

Cooling 311, 353, 392, 483, 484, 488, 520

Copper Tubing Sizes 188, 356

Corrugated Duct 522

Cracking 142, 319, 330, 389, 413, 490, 497, 526

Cradle 344, 421

Creep Rupture 94

Critical Velocity 198

Crown 31, 215, 216, 223, 224, 226, 229, 237, 238, 239, 242, 244, 245, 251, 258, 260, 283, 293, 304, 305, 306, 310, 374, 419, 445, 449, 451, 453, 461

Crush 216, 230, 239, 503, 504, 522, 525

CSA 86, 145, 149, 153, 154, 166, 172, 177, 180, 181, 182, 189

CTS 351, 356, 357, 369

Culvert Analysis and Design 231

Cumulative Deflection Effects 342

Currents 380, 384, 389, 391, 397, 399, 400, 403, 406

Curvature 237, 238, 240, 259, 443, 460, 462, 464, 470, 471, 478, 499, 520, 521, 548

D3350 147, 149, 150, 156, 157, 429, 439

Damage 11, 19, 20, 21, 22, 25, 27, 28, 38, 44, 56, 75, 76, 79, 87, 92, 170, 172, 181, 210, 286, 293, 309, 310, 329, 330, 335, 391, 393, 396, 401, 403, 417, 418, 441, 442, 445, 489, 490, 494, 502, 535, 536, 537, 538, 539, 541, 544, 546, 547, 551, 553, 555, 571, 598

Deep Fill 319

Deep Fill Installation 214, 217, 230, 240, 246

Definitions of Symbols 527

Deflection 28, 30, 31, 192, 230, 231, 232, 234, 236, 237, 238, 249, 268, 282, 286, 287, 288, 291, 292, 293, 294, 295, 297, 304, 305, 315, 319, 335, 338, 339, 340, 341, 342, 343, 344, 356, 388, 398, 402, 406, 420, 454, 455, 456, 457, 473, 476, 496, 501, 502, 503, 504, 505

Deformation Factor 250, 251

Density 30, 126, 127, 141, 147, 148, 150, 171, 172, 180, 181, 191, 216, 232, 233, 234, 237, 248, 255, 256, 281, 283, 290, 341, 374, 379, 383, 384, 385, 389, 405, 406, 412, 421, 422, 423, 456, 461, 479, 493, 494, 496, 501, 526, 556, 561, 571, 572, 584

Design 6, 10, 11, 12, 13, 15, 16, 28, 33, 35, 36, 40, 43, 44, 45, 46, 56, 57, 63, 64, 65, 67, 69, 74, 79, 80, 83, 88, 95, 97, 99, 101, 128, 129, 130, 132, 141, 145, 147, 148, 149, 150, 151, 154, 155, 156, 158, 160, 161, 164, 165, 175, 177, 178, 179, 180, 188, 192, 196, 211, 212, 213, 214, 230, 231, 238, 254, 262, 263, 265, 266, 267, 268, 281, 282, 325, 326, 327, 330, 331, 332, 334, 336, 341, 343, 344, 346, 347, 353, 356, 357, 365, 366, 368, 369, 371, 376, 380, 381, 382, 383, 387, 388, 389, 390, 392, 395, 399, 400, 401, 402, 403, 406, 407, 408, 411, 413, 418, 426, 439, 440, 441, 442, 443, 444, 446, 447, 448, 450, 451, 454, 456, 458, 459, 464, 471, 483, 485, 486, 489, 490, 491, 501, 502, 503, 505, 512, 514, 516, 519, 522, 523, 537, 540, 566, 568, 602

Design Window 212, 213, 266

DF 65, 67, 88, 95, 155, 156, 158, 179, 180, 249, 251, 281

Diameters 7, 9, 95, 96, 125, 151, 152, 154, 165, 196, 199, 230, 254, 308, 336, 337, 352, 354, 392, 418, 419, 420, 500, 561, 583, 588, 599

Digging 305, 506, 507, 525, 588, 600

Dimension Ratio 33, 95, 152, 154, 178, 231, 239, 242, 250, 259, 281, 282, 286, 382, 384, 420, 447, 457, 458, 465, 472, 477, 500, 503

Dimensions 31, 76, 77, 86, 132, 136, 142, 154, 162, 164, 165, 176, 188, 189, 226, 228, 283, 331, 335, 352, 412, 413, 431, 434, 499, 573, 577, 578

DIPS 152, 165, 188, 323, 467, 469, 546, 583

Direct Plow 495, 502

Directional Bores 510

Directional Drilling 6, 9, 44, 168, 172, 214, 403, 441, 442, 444, 445, 446, 447, 457, 460, 472, 493, 497, 503, 505, 522, 560

Disinfecting Water Mains 37, 41

Disinfection 169, 577

Dissipation Factor 103

Distributed Loads 225, 228

DR 24, 33, 34, 68, 95, 96, 152, 153, 154, 178, 179, 182, 183, 184, 188, 189, 196, 209, 212, 213, 215, 217, 230, 231, 232, 233, 237, 238, 239, 240, 241, 242, 243, 244, 247, 248, 250, 258, 259, 260, 267, 269, 270, 271, 272, 273, 274, 275, 276, 277, 278, 279, 280, 281, 286, 288, 291, 312, 319, 322, 323, 346, 349, 366, 382, 383, 384, 385, 398, 399, 404, 420, 421, 422, 431, 509, 510, 544, 545, 546, 571, 579

Drag Resistance 461

Drawn Tubing 192

Dredging 94, 381, 392, 402, 403 Drilling Mud 443, 444, 448, 449,

Drilling Process 442

456, 469

Ductile 6, 7, 11, 12, 25, 26, 64, 65, 69, 72, 73, 74, 77, 139, 152, 157, 165, 175, 188, 207, 319, 320, 327, 356, 357, 361, 368, 448, 542, 559

Ductility 8, 11, 12, 39, 47, 51, 73, 79, 84, 149, 380, 495

Duncan 233, 235, 268

Ε

E' 212, 213, 215, 230, 231, 233, 234, 235, 236, 237, 242, 243, 246, 249, 267, 268, 281

E'N 235, 236, 237

Earth and Groundwater Pressure 450, 453, 456

Earth Load 215, 216, 231, 232, 237, 239, 240, 247, 282, 288, 459

Earth Pressure 213, 239, 319, 448, 449, 451, 452, 453, 454, 459, 583,

Effluent 379, 380, 395, 400, 403

Electrofusion 7, 26, 138, 139, 159, 160, 314, 347, 353, 354, 355, 371, 428, 432, 513, 515, 536, 539, 546, 547, 548, 593

Elevation Changes 194

Elongation 86, 434

Embankment 213, 230, 439

Embedment 20, 30, 31, 60, 212, 215, 217, 230, 232, 233, 234, 235, 236, 237, 241, 243, 245, 246, 248, 252, 253, 258, 262, 286, 287, 288, 290, 291, 292, 293, 294, 295, 296, 297, 298, 299, 300, 301, 302, 303, 304, 305, 306, 307, 309, 310, 311, 314, 315, 316, 317, 318, 319, 371, 456, 484, , 507, 521

End Restrained Thermal Effects

Engineering Properties 6, 13, 76, 149, 262, 326, 457, 458, 464, 496, 498

Enveloping Soil 292

Environmental Stress Crack Resistance 126, 168

Equipment 7, 9, 20, 21, 22, 25, 26, 27, 28, 29, 32, 34, 35, 36, 37, 39, 129, 135, 163, 215, 218, 221, 237, 290, 329, 347, 351, 355, 361, 372, 376, 379, 392, 393, 396, 401, 403, 429, 431, 435, 445, 491, 506, 509, 510, 511, 515, 516, 517, 521, 522, 539, 542, 572, 574, 586, 598

Equivalent Length of Pipe 193 ESCR 126, 147, 168, 497, 498

Existing Pipe 208, 418, 419, 421, 423, 424, 427, 429, 430, 432, 433, 435, 436, 438, 545, 548, 555, 558, 559, 564, 565, 568, 569, 570, 571, 572, 586, 596, 601

Expansion Joints 263, 514

Exposure to UV and Weather 24

External Hydraulic Load 480

External load 188, 450, 451, 453, 454, 504

External Pressure 26, 183, 239, 241, 242, 259, 398, 421, 447, 448, 449, 450, 452, 457, 458, 459, 469,

Extruded Profile Pipe 31

Extruder 128, 129, 130, 134, 135,

Extrusion 26, 28, 30, 47, 52, 83, 126, 127, 128, 129, 143, 430, 432, 436, 526

Fabricated Fittings 171 Factory Mutual Research 166 Fat Clays 316 FDA 92

Features 2, 6, 77, 128, 379, 402, 403, 486, 495, 569

Field Effects of Friction 520

Field Fusion Joining 27

Field Handling 20

Field Joining 28, 56

Fine Grain Soil 318

Finish 132

Fire Protection 166, 313, 314

Fittings 7, 8, 13, 15, 16, 18, 22, 43, 44, 45, 55, 65, 79, 92, 125, 135, 136, 137, 138, 139, 140, 142, 145, 152, 155, 159, 160, 161, 162, 163, 164, 166, 188, 193, 197, 311, 313, 314, 315, 320, 321, 347, 348, 355, 356, 357, 365, 368, 369, 371, 372, 376, 379, 395, 400, 402, 403, 436, 437, 486, 487, 498, 513, 514, 515, 536, 539, 540, 541, 548, 553, 568, 569, 589, 590, 593, 595, 601

Flame Retardant 92, 523

Flammability 92

Flange Adapter 321, 360, 362, 363, 365, 544, 546

Flange Assembly 364, 395

Flange Gasket 363

Flanges 26, 159, 314, 320, 347, 361, 363, 364, 368, 395, 402, 437, 513, 545, 593

Flat-bottomed Ballasts 389

Flattening 237

Flexibility 8, 39, 43, 192, 286, 376, 379, 483, 489, 490, 493, 495, 496, 510, 520, 522, 561, 562

Flexible Pavement 220, 221

Flexible Pipe 218, 286, 315, 316, 319, 440

Flexural Modulus 82, 83, 47, 148, 496

Float 254, 297, 303, 381, 385, 386, 391, 392, 395, 397, 400, 401, 403, 461, 212, 214, 230, 254

Flotation 214, 230, 253, 254, 255, 257, 260, 300, 402

Flow Capacity 54, 188, 192, 208, 210, 398, 418, 419, 424, 425, 426, 439, 447, 562, 563

Flows for Slipliners 208, 209

Flushing 488

FM 139, 166

Fold and Form 438

Food and Drug Administration 92

Forklift 21, 22

Foundation 30, 225, 287, 315, 364, 402

Fracture Mechanics 93, 156, 157

Freeze Tolerant 490

Friction 43, 85, 89, 190, 191, 193, 195, 196, 197, 198, 202, 205, 206, 209, 245, 254, 281, 282, 284, 332, 339, 393, 424, 452, 461, 462, 463, 480, 495, 496, 500, 505, 516, 517, 518, 519, 520, 521, 522, 527, 556, 562, 570, 571, 578, 579, 580, 581, 584, 586, 588, 601

Frictional Forces 526, 579

Fuel Oil 87, 179

Fusion 5, 19, 26, 27, 28, 29, 30, 35, 36, 37, 44, 55, 82, 91, 125, 138, 139, 146, 159, 160, 195, 208, 263, 291, 293, 312, 321, 329, 347, 348, 349, 350, 351, 352, 353, 354, 355, 360, 361, 362, 371, 376, 379, 391, 392, 401, 402, 403, 417, 427, 428, 430, 432, 436, 437, 444, 483, 487, 500, 513, 515, 516, 535, 538, 546, 585, 596

Galvanized Iron 192

Gas Flow 40, 188, 202, 536

Gas Permeation 89, 204

Gaube 214, 246, 249, 250, 251, 252, 268

General Guidelines 170, 289, 304, 444, 487, 535

Geotechnical 216, 248, 249, 250, 251, 300, 446, 576, 587

Geotextile Separation Fabrics 296

Geothermal Heat Pump Systems 492

Glass Transition Temperature 56, 497

Grade Beam 336

Gravel 200, 237, 290, 294, 316, 408, 410, 589, 598

Gravity 1, 82, 170, 172, 188, 198, 202, 203, 205, 206, 208, 209, 210, 241, 266, 283, 291, 293, 294, 315, 319, 376, 417, 418, 419, 424, 425, 427, 429, 436, 437, 445, 479, 491, 562, 563, 571, 583, 589, 595

Ground Source Heat Pump Systems 483

Ground Water 212, 230, 240, 241, 242, 243, 247, 250, 252, 254, 255, 256, 258, 261, 281, 282, 287, 295, 297, 299, 317, 437, 449, 503, 555, 584

н

H2O 203, 222, 282, 454

Handling 1, 2, 11, 13, 20, 21, 25, 41, 43, 85, 126, 134, 135, 139, 156, 158, 260, 290, 315, 327, 348, 379, 444, 497, 577

Hardness 47, 363

Haunching 287, 295, 298, 309, 310 Hazen-Williams 195, 196, 202, 206,

281, 424, 425 HDB 66, 148, 155, 156, 157, 158, 159, 161, 169, 171, 179, 180, 282

HDD 6, 9, 44, 168, 172, 214, 441, 442, 444, 445, 446, 447, 448, 450, 451, 452, 454, 456, 457, 459, 460, 470, 471, 472, 505, 560, 561

HDPE 6, 68, 94, 170, 171, 172, 179, 181, 395, 402, 403, 407, 408, 410, 413, 455, 484, 485, 486, 487, 493, 561, 579

HDS 177, 178, 179, 180, 181, 265

Head Loss 188, 195, 196, 202

Health Effects 92, 93, 164

Heat Pump Systems 483, 492

High Pressure 38, 46, 130, 135, 202, 327, 364, 489, 517

High Temperature 489, 490, 491

Hoop 66, 70, 71, 150, 155, 211, 239, 247, 249, 312, 322, 457, 459, 470

Horizontal Directional Drilling 44, 214

Howard 230, 233, 234, 236, 267, 268, 292, 315

HSB 158, 161

HVAC 2, 483

Hydrokinetic 459, 460, 463, 464, 469, 470, 480, 481

Hydrostatic Design Basis 66, 67, 93, 95, 98, 143, 147, 149, 151, 155, 156, 499

Hydrostatic Design Stress 33, 57, 65, 67, 69, 74, 95, 97, 177, 178, 179, 265, 330, 382, 419, 420, 421

Hydrostatic Pressure 34, 64, 66, 99, 155, 157, 158, 240, 254, 383, 443, 447, 448, 451

Hydrostatic Strength 57, 65, 66, 67, 74, 75, 86, 87, 147, 497 Hydrostatic Stress Board 127, 158, 161

Hydrostatic Testing 32, 34, 344

ı

ICC 165

ID Controlled Pipe 189

IGSHPA 486, 487, 489

IGT Distribution Equation 203

Immersion Test 86

Impact 9, 25, 29, 53, 56, 77, 79, 82, 86, 168, 217, 218, 219, 220, 221, 222, 223, 224, 225, 245, 247, 264, 282, 286, 288, 298, 299, 300, 310, 325, 326, 327, 330, 403, 409, 424, 483, 494, 495, 496, 497, 498, 556, 568, 572, 578, 586

Infiltration 297, 417, 426, 427, 437, 439, 513, 555

Influence Value 225, 226, 228, 282 Infrastructure 417, 439, 442, 573

Injection Molded Fittings 125

Innerducts 493, 499, 500, 502, 504, 505, 519, 525

Inspection 2, 18, 30, 238, 288, 293, 315, 325, 355, 404, 417, 429, 430, 444, 568, 578, 585, 586, 594

Installation 1, 2, 6, 7, 8, 9, 11, 13, 15, 18, 19, 22, 25, 26, 28, 29, 30, 37, 40, 41, 43, 44, 63, 65, 73, 79, 80, 85, 139, 155, 158, 159, 165, 208, 211, 212, 213, 215, 217, 233, 236, 244, 249, 260, 263, 267, 286, 288, 289, 291, 292, 294, 296, 302, 306, 312, 316, 319, 325, 326, 329, 330, 331, 334, 335, 336, 337, 344, 345, 346, 349, 359, 372, 376, 381, 387, 388, 392, 394, 397, 401, 402, 423, 428, 429, 431, 432, 433, 435, 436, 437, 439, 441, 442, 446, 447, 448, 451, 456, 459, 460, 469, 470, 471, 475, 483, 485, 486, 487, 488, 489, 492, 493, 495, 496, 497, 498, 499, 500, 501, 503, 505, 506, 507, 508, 509, 510, 511, 512, 513, 514, 515, 517, 518, 521, 522, 523, 524, 525, 526, 536, 537, 539, 547, 548, 549, 553, 570, 571, 577, 581, 583, 586, 589, 594

Intermittent Support 335

Internal Pressure 32, 39, 149, 155, 160, 179, 188, 195, 196, 204, 206, 238, 239, 241, 282, 312, 322, 326, 382, 383, 423, 448, 449, 457, 459, 497, 499, 512, 583

Internal Pressure 63

International Ground Source Heat Pump Association 486, 489, 492

International Organization for Standardization 93

International Plumbing Code 165 Iowa Formula 213, 231, 232, 236, 456, 503

IPC 165

IPS 39, 139, 141, 152, 165, 188, 196, 273, 347, 356, 357, 367, 410, 412, 413, 466, 468, 472, 474, 546, 583

Iron Pipe Size 165, 347

ISO 147, 151, 152, 162, 163, 165, 166, 177

Izod 77, 78, 79, 498

J

Janson 268, 386, 390, 398, 404, 407, 410

Jetting 300, 517

Joining 5, 16, 19, 26, 27, 28, 56, 82, 138, 141, 146, 156, 159, 160, 302, 329, 347, 352, 355, 356, 358, 376, 381, 391, 393, 402, 403, 417, 430, 442, 445, 486, 487, 500, 512, 513, 514, 515, 516, 541, 546, 547, 553, 577, 590

Joint 26, 28, 29, 32, 35, 36, 37, 90, 138, 139, 159, 160, 208, 263, 311, 312, 314, 320, 321, 322, 325, 345, 379, 401, 402, 432, 436, 442, 460, 486, 487, 500, 513, 515, 516, 518, 536, 538, 542, 545, 546, 548, 593

K

Katona 231, 268 K_{BULK} 184, 282 Kinetic COF 518

Knight 456, 472

L

L/D ratio 130

Lag Factor 231, 236, 282, 297 Land-to-Water Transition 382, 392, 401

Landfill Gas 203 Lateral Connections 429, 436, 563, 564, 565, 566, 568, 569, 576, 577, 582, 586, 594 Lateral Deflection 338 Launching 38, 381, 391, 393, 395, Leak 26, 28, 32, 33, 34, 35, 36, 37, 535, 537, 546 Leak Free 7, 417, 535, 546 Leak Test 32, 33, 34, 35, 36, 37, 536 Load Per Unit Length 341, 342, Loading 11, 12, 13, 43, 44, 60, 61, 63, 64, 66, 73, 75, 77, 84, 99, 135, 158, 160, 181, 213, 216, 217, 218, 219, 220, 221, 222, 224, 230, 241, 242, 243, 262, 290, 291, 292, 297, 301, 308, 310, 326, 344, 380, 386, 388, 396, , 420, 421, 422, 423, 437, 450, 451, 452, 453, 455, 461, 473, 475, 476, 498, 501, 502, 503, 504, 505, 506, 519, 520, 521, 579 Long-Term Hydrostatic Strength 65, 67, 75, 86, 87, 155, 158 Long-Term Loading 243, 455, 502 Longitudinal Force vs. Temperature Change 333 Longitudinal Stress vs. Temperature Change 332 Loose Storage Stacking Height 24 Love's Equation 419, 420, 421 Low Pressure 16, 35, 36, 37, 46, 203, 291, 517, 537 Low Temperature 55, 327, 490, 495 LPG 87, 88, 180 LTHS 57, 65, 66, 67, 68, 69, 70, 71, 72, 74, 75, 155, 158, 170 Lubricants 516, 517, 519, 520

Manhole Placements 427 Manning 206, 207, 424, 425, 562, Manual 39, 72, 98, 141, 142, 143, 165, 208, 291, 441, 442, 445, 472, 506, 588, 601 Marking 134, 162, 498, 568 Marston 247, 268 Material Properties 1, 12, 43, 455

Make-Up Water 489

Material Selection 496, 511 Maxwell Model 59 MDPE 7, 179, 181, 455, 556, 561, Measuring Density 318 Mechanical Connections 320, 322, 347, 357, 372, 395, 418, 487 507, 521 Mechanical Couplings 26, 139, 170, 172, 311, 513, 540 Mechanical Fittings 7, 159, 347, 356, 379, 403, 436, 487, 513, 514, 536, 540, 541, 593 Mechanical Impact 300, 325, 326 Mechanical Properties 44, 50, 501 Mechanical Protection 493 281, 420 Mechanical Pulling Heads 434 Mechanical Stress 494, 498, 506 505, 507 Melt Index 52, 82, 83, 126, 147, 148, 496 Mesh 130, 200 Migration 294, 295, 296, 303, 306, 307, 309, 316, 437, 589 Mining 266, 326 MJ Adapter 320, 321, 365, 367, 369, 370, 372, 593 Model Specifications 159 Modulus 50, 57, 58, 61, 62, 63, 64, 75, 80, 82, 83, 99, 101, 147, 148, 184, 215, 231, 232, 233, 235, 241, 242, 243, 247, 248, 249, 250, 251, 252, 253, 259, 260, 261, 262, 263, PE 2406 102 264, 265, 281, 282, 327, 328, 330, 333, 334, 342, 343, 419, 422, 450, 454, 455, 457, 458, 464, 469, 470, 473, 474, 475, 496, 579 Modulus of Soil Reaction Values 332, 339 268 Molded Fittings 16, 125, 135, 138, 139 PE Plastics 45 Moody Diagram 190, 193 Moore-Selig Equation 214, 241, 252, 253 Mounting 138, 382, 393, 492

MRS 143, 158, 159, 161, 169, 177 Ms 247, 248, 282 MS-3 172 Mueller Equation 202, 203 Multi-Cell Conduit 525

Native Soil 212, 287, 293, 301, 302, 304, 307, 310, 456, 471, 570, 571

Open Trench 289, 300, 309, 493, Organic Silts 256, 304, 316, 317 Original Line 418, 424, 429 Ovality 31, 142, 259, 260, 281, 419, 420, 458, 473, 474, 476, 481, 507 Ovality Compensation Factor 260, 419, 458, 473, 474, 481 Ovality Correction Factor 259, Ovalization 398, 455, 501, 502,

Packing List 19 Particle Size 197, 198, 290, 296, 316, 392, 490, 498 Particle Size 80 Passive Resistance 211, 291, 502 Path Profile 477 Pavement (Rigid) 219 PC 67, 68, 86, 87, 95, 96, 97, 98, 177, 181, 182, 186, 187, 231, 282 PDB 143, 158, 159, 161, 169, 177 PE 3408 186, 244 PE 3710 102, 178 PE 4710 54, 68, 102, 178, 237, 330, PE Pipe to PVC 366 PE Pipe to Steel 370 Performance Limits 211, 213, 216, 239, 246, 355, 454 Permeability 55, 88, 204, 282, 295, 303, 318 Permeation 8, 53, 89, 90, 94, 204, PEX 1, 158, 161, 170 Physical Properties 2,9, 11, 47,

50, 53, 54, 81, 126, 128, 141, 176,

Physical Property Tests 142

Pilot Hole 442, 443, 445

496, 497

Pipe Bursting 9, 25, 214, 438, 495, 586, 593, 599, 600, 602, 555, 557, 561, 562, 564, 565, 570, 573, 582

Pipe Deflection 28, 30, 192, 268, 291, 293, 295, 388, 398, 422, 456

Pipe Deformation 262, 287, 291

Pipe Directly Beneath a Surcharge Load 225

Pipe Embedment 230, 233, 286, 290, 293

Pipe Extrusion 30, 126, 143

Pipe Hanger 344

Pipe ID for Flow Calculations 188

Pipe Installation 19, 29, 233, 286, 316, 335, 392, 471, 487, 571

Pipe Joining Methods 486

Pipe Length vs. Temperature Change 331

Pipe Liner Diameter 418

Pipe Restraint 356

Pipe Specifications and Requirements 486

Pipe Splitting 438, 559, 560

Pipe Support in Transition 308

Pipe Trench 287

Pipe Wall Buckling 240, 258

Pipe Wall Buckling 458

Pipeline Being Floated Out 396

PL 222, 223, 224, 225, 226, 228, 229, 231, 239, 245, 282

Placement Planning 521

Plastometer 52, 83

Plenum 524

Plow 9, 302, 488, 495, 501, 502, 509

Plowing 302, 493, 503, 507, 509, 510, 523, 525

Plumbing Codes 165

Pneumatic Testing 35

Poisson's Ratio 76, 102, 312, 419, 458, 473, 474, 475

Polymer Characteristics 47

Polymeric Water-Soluble 519

Portable Trench Shield 305, 306

Post-Installation Survey 401

PPI 1, 2, 3, 20, 26, 27, 41, 71, 72, 82, 86, 87, 88, 90, 92, 93, 94, 97, 127, 141, 143, 145, 150, 158, 159, 160, 161, 169, 170, 171, 172, 177, 178, 181, 263, 267, 268, 326, 344, 349, 351, 377, 406, 490, 491, 497, 514, 515, 538, 545

PR 67, 68, 86, 87, 95, 96, 97, 151, 152, 153, 154, 171, 177, 178, 179, 180, 181, 182, 183, 186, 187, 267

Pre-Installation Storage 22

Preparing the Land-to-Water Transition Zone 382

Pressure 1, 5, 8, 10, 11, 16, 26, 28, 32, 33, 34, 35, 36, 37, 38, 39, 41, 43, 44, 46, 47, 48, 53, 54, 55, 62, 63, 64, 65, 66, 67, 69, 70, 71, 72, 74, 75, 76, 79, 84, 86, 88, 95, 98, 99, 101, 102, 127, 129, 130, 131, 132, 133, 134, 135, 136, 138, 139, 142, 145, 149, 150, 151, 152, 153, 154, 155, 157, 158, 159, 160, 161, 164, 165, 170, 173, 175, 177, 178, 180, 181, 182, 183, 185, 186, 187, 195, 197, 202, 203, 212, 215, 220, 221, 225, 226, 231, 239, 248, 267, 268, 282, 283, 288, 289, 290, 291, 293, 297, 300, 303, 312, 315, 319, 320, 321, 322, 323, 326, 327, 330, 344, 348, 355, 356, 357, 361, 363, 364, 369, 375, 377, 382, 383, 392, 398, 400, 415, 417, 419, 420, 421, 423, 428, 429, 436, 437, 438, 440, 443, 447, 448, 449, 450, 451, 452, 453, 454, 455, 456, 457, 458, 459, 462, 463, 469, 470, 471, 473, 474, 475, 476, 477, 480, 481, 486, 487, 488, 489, 490, 492, 497, 499, 502, 507, 512, 514, 515, 517, 518, 522, 536, 554, 555, 558, 563, 570, 571, 578, 580, 581, 583, 584, 587, 588, 589, 595, 602, 603

Pressure Capability 327, 330, 428

Pressure Capacity 175

Pressure Class 67, 74, 95, 98, 177, 181, 182, 186

Pressure Flow 80, 195, 197

Pressure Pipe 26, 39, 64, 69, 71, 72, 75, 127, 150, 151, 155, 158, 164, 165, 175, 238, 241, 262, 289, 290, 297, 319, 320, 363, 392, 456, 487, 507, 536

Pressure Rating 35, 36, 65, 67, 74, 76, 88, 95, 102, 134, 139, 145, 151, 152, 154, 157, 160, 177, 180, 181, 186, 283, 326, 327, 328, 330, 382, 400, 447, 571

Pressure Surge 177, 183, 184, 185, 322

Pressure Test 142

Pressure Testing 321

Primary Initial Backfill 287, 299, 307, 310

Prism 213, 216, 217, 233, 236, 237, 242, 243, 248, 249, 251, 301, 449, 452, 453, 473

Proctor 212, 234, 237, 248, 290, 298, 299, 300, 307, 309, 313, 314, 318, 374

Product Design 447

Profile Pipe 125, 133, 214, 215, 217, 232, 233, 239, 240, 241, 244, 245, 246, 248, 250, 258, 281, 432, 433

Profile Wall 1, 17, 125, 126, 130, 133, 145, 149, 231, 232, 238, 239, 240, 244, 247, 248, 281, 291, 422

Proofing 510

Proper Transition 309

Properties of Gases 205

Properties of Water 196

Protection 22, 25

Pull-line construction 520

Pulling 20, 44, 63, 99, 134, 266, 305, 312, 315, 396, 399, 430, 431, 433, 434, 443, 444, 447, 455, 459, 460, 461, 462, 463, 464, 469, 470, 474, 480, 495, 497, 499, 505, 506, 508, 510, 511, 511, 513, 516, 517, 519, 520, 521, 526, 527, 556, 557, 558, 559, 561, 566, 568, 569, 570, 571, 572, 576, 577, 578, 579, 581, 582, 583, 585, 586, 587, 588, 589, 590, 596, 598, 601

Purchase Order 19

Purging 488

Push 320, 396, 400, 433, 435, 461, 499, 508, 521, 557

Pushing Technique 435

PVC 7, 9, 10, 13, 26, 41, 45, 93, 158, 170, 177, 181, 182, 186, 187, 231, 267, 268, 282, 313, 320, 357, 358, 365, 366, 367, 368, 370, 375, 377, 425, 439, 493, 494, 498, 502, 504, 507, 520, 524, 542, 592, 593, 595, 596, 599, 601

0

Quality Assurance 28, 141, 143, 430, 498, 577

154, 577 Radius of Curvature 259, 443, 462, 464, 470, 471, 478, 499 Railroad Loading 225 Rapid Crack Propagation 56, 77, 79 327 Rate Process Method 170 Ravine Crossing 335 Raw Materials 127 RCP 79, 327, 559, 561, 562, 573, 582, 599 Reaming 442, 443, 470, 471, 560 Receiving Report 19 Reduction Factor 33, 34, 67, 155, 235, 242, 243, 283, 384, 470, 474, 481, 585 Reel Method 511, 512 Rehabilitation Methods 437 Repair Clamps 537, 568 Repair Operations 494 Repairs 2, 35, 36, 494, 496, 510, 516, 535, 536, 537, 553, 561, 565, 566, 570, 576 Reporting Damage 19 Required Strength 177 Required Weighting 383, 387 Resistance to External Collapse 470 Restrained Joints 7, 313, 320, 372 Restrained Pipelines 336 Restraining 7, 321, 332, 336, 369, Reynolds Numbers 198 Rigid Pavement 219, 220 Rigidity Factor 250, 251 Ring Compression 240 Ring Stiffness 231, 232, 283, 292, 297, 383, 422 Riser Raceways 524 River Crossings 214, 396, 397 Riveted Steel 192, 425 Roadway 218, 329 Rock Trench Bottom 309 Rodent and Mechanical Protection

525

Rolldown 438

Ouality Control 125, 126, 127, 141,

Saddle Fusion 19, 26, 137, 160, 169, 171, 350, 351, 371, 538 Safe Deflection Limits for Pressurized Pipe 238 Safe Pull Load 455, 579 Safe Pull Stress 455, 465, 477, 579 Safe Pull Tensile Stress 455 Safety 2, 6, 15, 32, 65, 74, 85, 86, 88,135, 143, 154, 155, 163, 183, 211, 212, 224, 234, 238, 242, 245, 246, 253, 259, 260, 282, 289, 290, 293, 300, 304, 306, 312, 347, 376, 380, 381, 382, 383, 400, 421, 422, 431, 488, 499, 510, 536, 564, 573, 577, 584, 587, 588, 589, 598 Safety Factor 65, 211, 212, 234, 238, 242, 245, 246, 253, 259, 260, 282, 293, 380, 382, 383, 421, 422 Sand Stabilized with Cement 313, 314 Saturated and Dry Soil Unit Weight 256 Scale 37, 53, 85, 200, 403, 501 Scrapes 19, 28 Screen Mesh 200 Screen Pack 130 Screw 39, 128, 129, 130, 134, 135, 138 SDB 134, 159, 161, 169, 177 SDR 96, 134, 152, 153, 154, 161, 586, 587, 592 309, 310

500, 555

237, 281 Soil Tests 28, 308 165, 169, 171, 184, 186, 189, 238, 243, 252, 253, 267, 272, 293, 297, Soil Type 215, 292 330, 332, 339, 360, 381, 382, 384, Soil Unit Weight 256 385, 457, 470, 471, 477, 500, 502, Solar 170, 483, 489, 490 503, 505, 507, 522, 550, 582, 583, Solid Wall 1, 6, 24, 125, 126, 130, 132, 145, 149, 231, 233, 242, 253, Secondary Initial Backfill 287, 297, 291, 313, 419, 420, 421, 425, 430, 432, 433, 435, 496, 500, 526, 595 Seismic 8, 43 Spacing Of Ballasts 388 Select a Pipe Liner Diameter 418 Span 155, 341, 342, 343, 363, 521, Selection of an Appropriate Site for Staging, Joining and Spangler 230, 231, 232, 233, 236, Launching The Pipe 381 238, 246, 268, 292, 456, 472, 503 Service and Lateral Connections

Sheathing 303, 304, 305

Sheeting 303, 304, 305

Shield 25, 27, 305, 306

SIDR 152, 153, 154, 171, 267, 356,

Silt 198, 200, 303, 317, 392, 423, 513

Sizing 126, 132, 133, 134, 152, 188,

443, 500, 501, 521, 588

Sloping The Trench Wall 289

147, 148, 157, 168, 497, 526

202, 209, 283, 325, 403, 508

Smooth Pipe(S) 10, 192

Soil Classification 233, 316

454, 471, 502, 570, 581

Soil Pressure 211, 221, 448, 450,

Soil Reaction 215, 233, 235, 242,

Soil Support Factor 231, 235, 236,

Special Applications 2, 10, 44, 495

Soft Pigs 38

Softening 55

Soil Arching 246

249, 281, 299

Slurry 46, 79, 188, 197, 198, 199,

Slow Crack Growth 53, 54, 57, 64,

66, 69, 70, 71, 73, 74, 76, 87, 126,

Slipliners 208, 209

Sliplining 208

Shipping Claims 20

500, 522

Silo 17, 22, 452

Specific Gravity 82, 198, 202, 203, Service Connections 427 283, 479 Service Life 7, 9, 67, 73, 74, 79, 91, Specific Heat 81, 103 167,197, 328, 39, 40, 448, 497, 498, Specifications 2, 11, 15, 25, 29, 30, 57, 67, 125, 134, 141, 142, 145, Service Temperatures 178 159, 160, 161, 167, 212, 289, 355, Shallow Cover 212, 216, 241, 244, 486, 492, 493, 535, 537, 566, 568, 245, 254, 258, 291, 297, 309 576, 577, 578, 581

Spitzglass Equation 203

Springline 235, 238, 258, 293, 299, 302, 305, 435, 453

Stab Type Fitting 357

Stability 23, 30, 91, 211, 237, 239, 289, 293, 299, 301, 303, 304, 307, 308, 387, 391, 423, 427, 430, 495, 587, 598

Stabilization 24, 384, 91, 03, 392, 437, 498, 598

Stabilizer 84, 90, 91, 92, 496

Stable 91, 212, 249, 289, 301, 302, 303, 304, 306, 307, 319, 326, 364, 400, 402, 403, 421, 450, 451, 488, 508, 581

Stacking Heights 23

Staging 22, 381, 391, 443, 569, 586

Standard Mesh 200

Standard Practice 160, 162, 168, 171, 172, 294, 392, 595

Standard Proctor 212, 237, 248, 290, 298, 299, 307, 309, 313, 314, 318, 374

Standard Specification(S) 57, 67, 145, 159, 232, 267

Standard Test Method 52, 73, 79, 80, 83, 84, 92, 101, 142

Static Charge 40, 85

Static COF 518

Stationary Reel 508, 511, 512

Steel 9, 12, 79, 81, 130, 139, 141,192, 207, 304, 305, 333, 334, 357, 359, 361, 367, 390, 400, 414, 425, 437, 439, 442, 462, 471, 504, 539, 549, 559, 571, 587, 595

Stiffener 320, 356, 357, 358, 359, 360, 361, 365, 366, 367, 371, 375, 539, 540, 542, 543, 548, 549

Stiffness 25, 50, 57, 82, 149, 150, 181, 211, 215, 216, 230, 232, 235, 244, 246, 247, 249, 250, 253, 262, 264, 286, 288, 292, 293, 294, 297, 316, 318, 319, 383, 421, 422, 450, 454, 455, 456, 496, 503, 504, 505, 572

Storage 2, 15, 22, 23, 24, 25, 40, 43, 55, 84, 85, 135, 315, 391, 445, 489, 491, 492, 498, 577

Strain 11, 12, 44, 57, 58, 59, 60, 61, 63, 64, 73, 75, 76, 77, 83, 84, 99, 101, 237, 238, 251, 252, 263, 284, 338, 346, 355, 380, 388, 398, 402, 455, 460, 465, 470, 478, 501, 503, 579, 580

Strength Design Basis 177

Strength of Embedment Soil 294

Stress 10, 11, 12, 32, 33, 41, 44, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 77, 80, 83, 84, 85, 95, 97, 99, 101, 102, 126, 139, 149, 150, 151, 154, 155, 156, 157, 158, 160, 161, 173, 177, 178, 179, 240, 248, 262, 265, 268, 293, 312, 320, 322, 328, 330, 332, 333, 335, 336, 338, 339, 341, 364, 377, 382, 388, 390, 394, 415, 448, 449, 451, 455, 457, 458, 459, 460, 461, 464, 470, 471, 474, 478, 480, 481, 486, 488, 494, 496, 497, 498, 499, 501, 502, 503, 506, 510, 511, 548, 570, 579, 580, 581, 583

Stress Distribution 583

Stress Rating 74

Stub Ends 135, 139, 360

Submarine Outfalls 386

Submerged 9, 255, 256, 258, 260, 376, 379, 380, 383, 384, 385, 386, 387, 388, 389, 392, 394, 395, 396, 400, 401, 402, 404, 406, 407, 475

Sudden Velocity Change 184, 281, 284

Sunlight 32, 90, 147, 311, 326, 329, 331

Support 8, 11, 43, 75, 183, 210, 214, 237, 241, 243, 254, 258, 262, 286, 287, 288, 289, 291, 294, 295, 297, 300, 301, 302, 303, 305, 307, 308, 309, 310, 313, 314, 319, 325, 334, 340, 341, 342, 344, 356, 357, 361, 364, 374, 375, 379, 388, 392, 400, 402, 423, 443, 444, 457, 473, 476, 492, 503, 504, 505, 508, 512, 523, 524, 548, 562

Surcharge Load 216, 225, 226, 227, 228

Surface damage 27, 441, 547, 596

Surface Resistivity 103

Surface Roughness 190, 191, 210, 281

Suspended From Rigid Structure 335

Suspended Pipelines 340, 388

Suspension Spacing 340

Sustained Pressure 65, 74, 76,142, 175, 177, 181, 182, 183

Swagelining 438

Swelling 86, 584

Swivels 460, 506, 510

Symbols 173, 234, 294, 317, 527

Т

Take-Off Equipment 129

Tamping 290, 298

Temperature 10, 44, 45, 46, 52, 55, 56, 60, 61, 64, 66, 67, 68, 69, 70, 71, 72, 73, 76, 77, 79, 80, 81, 82, 83, 85, 86, 89, 91, 95, 96, 97, 98, 100, 101, 102, 129, 130, 142,157, 158, 175, 177, 178, 180, 182, 183, 184, 195, 204, 232, 240, 242, 259, 262, 263, 264, 265, 266, 282, 283, 284, 325, 326, 327, 328, 330, 331, 332, 333, 334, 335, 337, 338, 339, 340, 341, 342, 343, 344, 348, 350, 351, 352, 355, 36, 382, 392, 393, 422, 455, 465, 471, 483, 484, 488, 489, 490, 491, 492, 495, 497, 498, 501, 505, 513, 514, 515, 579, 590

Temporary Floating Lines 403

Temporary Repair 537

Tensile Creep 63

Tensile Properties 84, 101

Tensile Strength 55, 82, 83, 142, 147, 363, 430, 431, 455, 464, 471, 496, 497, 507, 522, 578, 586

Tensile Stress 12, 59, 63, 264, 265, 284, 320, 455, 458, 460, 464, 470, 471, 481, 501, 579

Terminal Connections 429, 437

Test Duration 33, 34, 35, 36, 147

Test Pressure 32, 35, 88

Test Procedure 35, 53

Testing 10, 15, 25, 30, 32, 34, 35, 36, 37, 40, 41, 47, 71, 93, 94, 101, 127, 142, 157, 158, 160, 161, 162, 165, 166, 231, 247, 248, 249, 250, 290, 344, 346, 488, 492, 495, 504, 514, 518, 577, 582, 595

Thermal Conductivity 81, 103,484

Thermal Expansion 80, 103,169, 263, 313, 323, 334, 336, 342, 372, 374, 471, 514, 516, 537, 540, 562

Thermal Heat Fusion Methods 347

Thermal Properties 80, 103, 331, 332

Thermal Stability 91

Thermoformed Fittings 139

Threaded Mechanical Fittings 514

Thrust Anchor 266

Thrust Block 266, 587, 588, 598 Timoshenko 222, 224, 245, 583 Titeliner 438 TN 36 377 TN 38 361, 377 Torsion Stress 471 Toxicological 92 TR 33 160 TR 41 160

Traffic 213, 217, 221, 230, 297, 301, 329, 391, 392, 396, 397, 399, 403, 418, 439, 441, 442, 452, 504, 555, 564, 569, 577, 581, 583, 587

Transition 56, 83, 190, 191, 308, 313, 321, 336, 347, 369, 372, 373, 382, 392, 401, 415, 418, 437, 478, 487, 497, 513, 521, 525, 593

Transport 16, 79, 85, 86, 87, 197, 205, 325, 327, 330, 402, 403, 443, 491, 497, 526

Trench 9, 20, 29, 175, 214, 230, 235, 237, 246, 249, 285, 286, 287, 289, 290, 293, 295, 297, 299, 300, 301, 302, 303, 304, 305, 306, 307, 308, 309, 310, 311, 312, 314, 315, 319, 386, 392, 400, 401, 402, 428, 451, 456, 488, 493, 503, 507, 508, 509, 521, 564, 565, 566, 568, 570, 571, 587,601

Trenching 289, 379, 380, 386, 453, 488, 493, 495, 507, 508, 509, 510, 525

Trenchless 7, 214, 438, 442, 472 Truckload 17, 18

Turbulent 190, 191, 197, 198, 199, 209, 210, 487

Typical Electrofusion Joint. 353 Typical Impact Factors For Paved Roads 219

Ultraviolet 24, 90, 325, 329, 490, 498

Unconfined Compressive Strength 236, 289, 303

Unconstrained Buckling 243, 258, 457

Unconstrained Pipe Wall Buckling 258, 458

Undercut 307, 508

Underwater Bedding 382

Uniform Particle Size 198

Unloading 19, 20, 21, 22, 135, 139, 454

Unloading 602

Unpaved 219, 220, 221, 222, 245

Unrestrained Thermal Effects 263 USBR 234, 268

Vacuum 128, 132, 133, 134, 183, 187, 206, 241, 242, 243, 247, 258, 447, 448, 449, 450, 454, 459, 483, 560, 568, 601

Valve 182, 183, 185, 187, 193, 314, 364, 368, 395, 544, 545, 546, 547

Vehicle Loading 218, 222

Vehicle Loads 219

Vehicles 217, 218, 219, 220, 221, 223, 232, 310, 329, 453

Velocity 38, 40, 79, 80, 177, 181, 182, 184, 185, 186, 187, 190, 191, 197, 199, 206, 207, 209, 210, 281, 283, 284, 407, 409, 411, 424, 444, 471, 489, 500, 574

Vertical Arching Factor 247, 283 Vertical Deflection 30, 211, 237, 251, Deflection 293, 502

Vertical Soil Pressure 215, 216, 219, 220, 222, 223, 225, 226, 232, 239, 252, 282

Vertical Surcharge 227, 229

Viscoelastic 59, 93, 197, 242, 259, 319, 450, 454, 460, 465, 501

Viscoelasticity 247

Voids 136, 309, 312, 570

Volume Resistivity 103

Wall Buckling 215, 216, 244, 246, 247, 258, 259, 260, 282, 458

Wall Compressive Stress 239, 240, 244, 283, 458

Wall Determination 500, 533

Wall Thickness 8, 28, 79, 88, 95, 134, 139, 142, 150, 151, 152, 155, 165, 178, 269, 270, 271, 272, 273, 274, 275, 276, 277, 278, 279, 280, 329, , 383, 384, 398, 404, 405, 418, 419, 420, 447, 460, 464, 477, 484, 497, 500, 503, 507, 577, 596

Water Service 164, 172, 177, 376, 539

Water-Base Slurry Specific Gravities 201

Watkins 211, 214, 231, 244, 246, 249, 250, 251, 252, 268, 292, 315, 456, 472

Watkins And Spangler 292 Weatherability 90, 169

Working Pressure Rating 182, 186, 187, 447

Workmanship 513

WPR 182, 183, 186, 187, 283

Yield Strength 50, 244, 283, 319, 356, 357, 431,0455, 497

Zero-Leak-Rate 442