

CONTENTS

	Pages
• Preface.....	1
• Introduction	3
• Explanatory Notes	4-40
• Metal Piping	41-128
• Pipelines	129-146
• Structural Steel and Platework	147-188
• Railways.....	189-196
• Tanks	197-224
• Duct Fabrication.....	225-240
• Civil Construction.....	241-252
• Mechanical Services	253-436
• Electrical, Instrumentation, Actuated Valves and Inline Instruments	437-458
• Plastics.....	459-526
• Index	527-533

INDEX

A

A1, 309, 353, 381
 ABS pipe installation times, 526
 Accumulators, safety showers and eyewashes, 430
 Accuracy, 7, 26, 27, 33, 42, 314
 Actuated valves, 438, 507-513
 AFC, 13
 Africa, 36
 Agitator installation, 356, 357
 AGO workbook, 39
 Ahlstrom APP horizontal centrifugal, 260
 Air valve installation, 494-495
 Air valve recommendations, 495
 Alarms, 396, 440
 Alignment, 264-267, 274, 282, 28-289, 292, 293, 204, 205, 313-315, 356, 360, 384, 402-412, 475
 Allocated hours, 21
 Alloy 20, MONEL, CU-NI, INCOLOY, 58-61, 290
 Alumina refineries, 226, 527
 Aluminium, 450, 471
 Amdel AM870 nuclear density gauge, 441
 American Association of Cost Engineering, 7
 Anchoring of polyethylene pipe in cross country installations, 492
 ANFO, 39
 Angles, 150, 151, 168, 169
 ANSI, 123-126, 259, 400
 Apron feeder, 269
 Aqua, 259
 ARO diaphragm pump, 259
 AS 1110-1984, 290
 AS 1111-1980, 290
 AS 1112- 1980, 290
 AS/NZS, 14
 Association of cost engineers, 7
 Assoma AMIC-EPESSV-G horizontal centrifugal mag drive, 260
 ASTM, 14
 Australian labour productivity, 3

B

Back welding of joints, 490, 491
 Backfilling, 143
 Backhoe excavation, 243
 Ball mill, 272, 301, 404, 422
 Ball mill skid unit / log washer, 420
 Ball mill structural & civil, 275
 Barred tees, 401
 Base line, 11
 Base plates, 274, 285, 287, 304, 313, 315, 408
 Basic building blocks, 11
 Basic principals of project management, 10

Bearings, 274, 278-288, 292, 313-316, 404, 407
 Before planning the project, 10
 Belt drives, 411
 Belt weigher, 419
 Bend 2D x 45°, 228, 232, 236, 239
 Bend 2D x 90°, 227, 231, 235, 238
 Bending ovens, 497, 498
 Bending the pipe, 499, 500
 Bins and hoppers, 150, 155
 Blast gate plates, 229, 233
 Blow through rotary valve, 403
 Bolt locations, 282, 313
 Bolting down, 264-267, 399
 Bolt-up, 376, 377, 381, 382, 391
 Boring inside of pipe to fit vane straighteners, 401
 Boss welding, 467-470
 Bottom manhole, 203
 Bottom up planning, 16, 33
 Bottlenecks, 18, 20
 Bracing angles and channels, 151
 Brackets, 151, 300, 303, 311, 321, 322, 324, 349, 350, 354, 396, 397
 Brake, 280, 420
 Branch reducer, 228, 232, 236, 239
 Branch weld, 47, 51, 55, 59, 63, 67, 71, 75, 79, 83, 87, 206, 506, 508, 510, 512
 Bridging, culverts and underground bores, 133
 Brownfield, 3, 27, 190, 242
 Budget, 7, 198-205, 413
 Budget estimate, 7
 Budget references, 148
 Budgeted costs, 15
 Building, 360
 Building work, 386, 387
 Butt weld, 47, 51, 55, 59, 63, 67, 71, 75, 79, 83, 87, 93, 126, 127, 151, 375, 506, 508, 510, 512-519
 Butt weld joint field, 375, 376
 Butt weld valves, 126
 Butt welding, 465, 473-476, 502505
 Butt welding rates, 514-519

C

Cable box, 308, 318
 Cable carriers, 457, 458
 Cable ladder, 310, 311, 324, 349, 354, 355, 360, 456
 Cable ladder galvanised, 354
 Cable trays, 299, 300
 Cable, 299, 323, 354, 363, 450-455, 466
 Cabling yard, 364-371
 Camflex pressure control valve, 443
 Carbon equivalent, 42
 Carbon steel, 42, 44-82, 90-93, 208, 212, 216, 220, 222, 226, 401, 420, 434, 484
 Carbon steel and glavanised duct, 227-230
 Carbon steel pipe 30-40, 334

Carbon steel schedule 40, 44, 46-49
 Carbon steel schedule 80, 44, 50-53
 Carbon steel schedule 160, 44, 54-57
 Cash flow forecast, 29
 Centrifugal exhaust and blower fans, 411
 Certificates for materials, 30
 Chain drives, 291
 Chain trenching, 136
 Change, 11, 13, 15, 16, 21, 26, 28, 30
 Chemical attack, 407, 461
 Chemical process, 22, 255, 438
 Chemical process plants, 438
 Chemical resistance charts, 524-526
 Chemical weld, 465
 Chiller circulation pump, 259
 Chromel alumel 110kv, 453, 454
 Chutes and hoppers, 155, 420
 Circular screen support bolted mount, 200, 201
 Civil construction, 241-252
 Civil structures, 282, 313, 406
 Civil works, 34, 35, 359, 360, 362, 383
 Cladding, 150, 155, 224
 Clean set, 5
 Clear, grub and grade, 131
 Clerical employees, 42
 Climatic problems, 4
 Clips, stop plates, fish plates, 151
 Coating, 133, 138, 139, 141, 142, 473, 490, 498
 Commissioning, 255, 256, 267, 287, 359, 405, 406
 Commissioning, inspection and testing, 292, 355
 Communication, 17, 130, 397, 440
 Compacted aggregate, 133
 Compensator plate, 206
 Complex cones, 201
 Compressor station GEA fuel gas system, 399
 Compressors, 134, 142, 145, 255, 359, 430
 Compressors electric driven, 358
 Concrete MTO 1500 vertical mill, 307
 Concrete weight coating, 133, 134
 Condenser, 409
 Conditions that impose delay, 31, 32
 Conduit, 297, 299, 300, 310, 311, 323, 324, 345-348, 353-355, 363, 364, 371, 372, 373, 387, 388, 458
 Cone 125, 178
 Configuration of reducing tees and equal tees for pressure applications, 503, 504
 Connection plates, 151
 Construction 1, 3, 4, 7, 12, 13, 16, 18, 19, 21, 22, 24, 25, 26, 28, 29, 30, 32, 33, 37, 38, 42, 135, 141, 144, 151, 246, 251, 291, 292, 430
 Contingency amount/sum, 15, 28, 36
 Contract, 13-16, 21-28
 Control cables CU PVC/SWA/PVC, 455
 Control equipment, 363, 364
 Control panel cable, 333-338
 Control room instruments, 439

Conveyor, 151, 161, 162
 Conveyor by components, 416, 417
 Conveyor installation, 418, 419
 Corrosion, 141, 256, 290
 Coriolis, 394, 395, 399, 442
 Country and location factors, 9
 Country efficiency, 2, 3, 9
 Coupling, 94, 256, 264-268, 274, 286, 289, 291, 292, 315, 351, 382, 408, 416, 419
 CPVC pipe installation times, 525
 Crane rails, 151
 Crashing, 17
 Credit checks, 23
 Credit reference association, 23
 Creep, 460
 Crew and equipment for polyethylene pipelines, 520, 521
 Critical path, 18-20
 Crushers, rock breakers, screens and feeders, 268-272
 CU Dekoron type O/A screen 110kv, 453, 454
 CU PVC/PVC, 261-263, 276-281, 295-299, 303, 309, 311, 317-333, 345-349
 CU PVC/SWA/nylon/PVC 60/1kv, 451, 452
 CU earth conductor bare, 453
 Culverts, 133, 192, 193, 247
 Cut, prepare and drill flanges, 230, 234, 237, 240

D

Damages clauses, 4, 24
 Dart plug valves, 430
 Decomposition of a project, 16, 19
 Delay in materials supply, 31
 Delineate physical progress, 21
 Design, 6, 13
 Design considerations for fabricated tees, 501, 502
 Diamond mine cleaning areas, 226, 527
 Di-ethylene glycol, 499
 Diesel fuel pump, 259
 Diesel generators, 358
 Differing interpretations, 11
 Direct labour, 42
 Directional change, 26
 Discipline, 33, 38
 Documentation, 5, 6, 10, 12, 14, 16, 25, 30
 Document control, 12, 13, 30
 Documents of currency, 5
 Double pinion drive, 272, 282, 287-290, 301, 404
 Double pinion 10mw ball mill, 274
 Downpipe, 198
 Draft tubes, 201, 202
 Drawing a branch, 470-472
 Drawing register, 4
 Drawing transmittal document, 4
 Drive frames, 150
 Drive motor, 270, 276-280

Drop through rotary valve, 403
 Dry commissioning, 287
 Dry powder transportation equipment, 403, 404
 Dual blade, 356
 Dual containment piping, 95
 Duct fabrication, 225-240
 Ducting, 226, 227, 231, 235-240
 Due diligence, 6

E

Earned value, 20-22
 Earthworks, 22, 34, 35, 37, 94, 190, 248-251, 275, 293, 302, 307
 Easement development, 135
 Educational standards, 3, 9
 Electrical, 10, 34, 35, 317-355, 359, 399
 Electrical hookup hours for a 7.5MW double pinion ball mill, 276-281, 303
 Electrical, Instrumentation, Actuated Valves and Inline Instruments, 437-458
 Electrofusion welding, 465
 Electronic instruments, 439
 Embedded metalwork, 245
 Emergency stop switches, 292
 Enclosure, 373, 374
 Engineering, 1, 7, 21, 33, 463
 Environmental stress cracking, 461
 EPCM, 36
 Equal and unequal angle, 168-170
 Equipment, 3, 7, 11, 17, 18, 27, 31-33, 42, 130, 132-146, 148, 194, 242, 244, 245, 255, 257, 276, 282, 284, 287, 288, 290-293, 299, 304, 305, 311-313, 323, 359, 362-364, 399, 402-410, 414, 420-435, 438, 440, 445-448, 465, 467, 469, 473, 474, 520, 521
 Erosion, 132, 146
 Escalation provision, 28
 Estimate classification system, 7, 8
 Estimated road transport lots, 435
 Estimating, 2, 6, 7, 16, 31, 33, 37, 38, 42, 43, 148, 359, 405, 420-433
 Estimating and planning elements, 3-6
 Estimating and planning for process, 3
 Estimating terminology, 25
 Estimator, 1, 3, 8, 26
 Excavation, 4, 94, 193, 194, 242, 243, 246, 249, 275, 293, 300, 302, 307
 Excavation for concrete pad, 360
 Excavation rates, 242
 Excavators, 135-137, 143
 Exhaust, 360, 384, 409, 411
 Exotic materials, 25
 Expansion rate for polyethylene pipe, 491
 Expatriate workforce, 3, 8, 9
 Explanatory notes, 1
 Explosion barrier valves, 404
 Exposing services, 242
 External laundry, 198

Extra over materials, 26
 Extraction, 226, 235-239, 291, 434
 Extrusion welding, 522, 523, 527

F

Fabricate pipe supports, 397
 Fabrication, 2, 4, 10, 25-27, 42-50, 94, 149-152, 156-187, 198-205, 226, 238-240, 273, 360, 388-391, 398, 399, 401, 413, 460, 461, 467, 484, 501, 502-512, 527
 Fabrication and installation times for polyethylene, 506-513
 Factoring and parametric estimating, 33
 Factors, 2-4, 9, 10, 15, 33-37, 39, 94, 149, 190, 460, 467
 Factors applicable to man-hours, 9, 10
 Fan diameter, 191
 Fans, 291, 411, 422, 434
 Fast track projects, 14, 16, 20, 24, 25
 FBE coatings, 141
 FCAW, 149
 Feasibility study, 7, 268-272, 349
 Feeders, 422
 Feeler gauges, 288, 408
 Fibre backed, 238-240
 Fibre optics, 195
 Field indirects, 36
 Field weld, 26
 Fillet weld, 148, 156-166, 481, 523
 Filters, 286, 287, 360, 400
 Final adjustments to alignment, 410
 Final submission, 5
 Financial status, 23
 Financing facility, 29
 Finder vacuum pump, 259
 First fill lubricants, 287
 First principals, 16
 Flange bolt up, 376, 377
 Flange set-up, 102, 123-127, 208-222, 373, 376, 377, 400, 404, 409, 524-526
 Flange weld, 230, 233, 234, 239
 Flanged outlets, 119
 Flanged valves, 123
 Flanges, 109, 116, 156-167, 230, 234, 237
 Flat bar, 170-174, 398
 Flat bottom plain strakes (or L ring), 203
 Float tolerances, 289
 Float/slack, 19, 20
 Flocculent, 420, 422, 424, 428, 432
 Flock mixing, 356
 Flog down, 274, 290, 313
 Floor plate checker plate, 150
 Flush systems, 287
 Footings, 193, 242, 275, 293, 302, 307
 Formal isometrics, 25
 Formwork, 193, 244
 Freight, 19, 34, 35, 435
 Frontline management, 11
 Fundamental objectives, 11

G

Galvanised, 195, 226, 299, 300, 311, 323, 324, 345-347, 353, 458
 Galvanised duct, 227-230
 Gantt chart, 17, 20
 Gas coalescing filters, 400
 Gas compressor station, 42, 362-385
 Gas engine generators/alternators, 399
 Gas fired generation based on 0.55 efficiency, 39
 Gas turbine compressors and generator sets, 359, 361
 Gas welded seams, 238-240
 Gear box, 274, 287, 406, 408, 416, 418
 Gear spray systems, 292
 Gearbox and coupling, 416
 GEHO TZPS, 267
 General installation requirements, 282-292, 416-433
 General purpose, 2, 44-57
 Generators, 358, 359, 399, 405
 Generic instruments, 439, 440
 Generic pump installation, 255, 256
 Girth gear, 274, 282, 284, 404
 Glands, 371, 438
 Glass reinforced duct, 238-240, 527
 Glossary of terms, 462, 463
 Gold tailings re-treatment plant, 226, 527
 Goulds, 259
 Grade and level, 132, 133
 Graphite, 290
 Grating, 150, 202, 275, 294, 302, 307
 Green, 11, 28
 Greenfields, 28, 190, 383
 Grinding mill installation, 282
 Grinding mills, 272
 Grout, 192, 264-267, 283, 304-306, 313, 373, 407, 421-433
 Grouting, 259, 267, 274, 290, 293, 402, 407, 409, 413
 Guard, 150, 155, 256, 267, 293, 304, 305, 315, 416, 419
 Gussets, 151, 502
 Gyrotary crusher electrical instrumentation, 295-300

H

Hand excavation, 243
 Hand rails, 418
 Handle and install personnel protection, 377, 378
 Haulage, 264-266, 356
 Hauling, 42, 94, 255, 259, 358, 399, 402, 411-413
 Hazop or hazid, 23
 Head frames, 151
 Heat exchangers, 286, 402, 403, 434
 High pressure grinding rollers, 270, 313-316

Historical data, 5
 Holdbacks, 418
 Hopper, 130, 155, 296, 298, 420, 424
 Horizontal boring, 133, 136
 Horizontal centrifugal, 257, 258, 260
 Horizontal vibrating screen, 268, 269, 434
 Hot air and gas welding, 482, 483
 Hot alignment check, 409
 Hot rolled sheet, 235-240
 HPGR belt feeders, 349
 HPGR screens, 350
 HV cable, 308, 317
 Hydraulic systems, 286
 Hydrostatic testing, 144, 145
 Hydrotesting, 42, 94, 118, 119, 526
 Hydrotesting flanged assemblies, 119

I

Idlers, 416, 418
 Implementation strategy, 16
 Industry demand, 32
 Industry standards, 8, 15, 31
 Inefficient workforce, 32
 Initial project funding, 8
 Inlet baffle, 203
 Inlet duct, 384
 Inlet filter, 360, 430
 Inlet pipe, 264-266
 Inspection and test plan (ITP), 24
 Inspection doors, 230, 234, 237, 240
 Installation rates, 150, 151
 Install inching drive / barring gear, 286
 Instrument cables, 298, 311, 351-355
 Instrument devices, 292, 298
 Instruments, 378-383, 385, 393, 439-444
 Instrumentation, 11, 144, 321, 400, 413
 Insulation, 11, 97-117, 224, 382, 392, 409, 434, 497
 Insurance, 25, 29, 37
 Intellectual property, 7
 Intercooled turbine, 361
 Introduction , 3
 ISO, 290
 Isometric drawings, 26
 ITPs, 20, 24

J

Jaw, 269
 Jaw crusher unit, 304, 305

K

Keystone, 442
 Kick plates, 150, 418

L

Labour hours, 28, 29, 34, 35
 Labour relations, 24
 Labour statistics, 39
 Labour, typical break up, 360, 361
 Lack of planning, 16
 Ladder, 96, 150, 299, 300, 310, 311, 324, 364, 386, 387, 450-454
 Law of diminishing returns, 18, 19
 Laydown area 255, 259, 304, 305 356, 358, 400, 411-413
 Level of difficulty, 4
 Levelling, 255, 259, 264-267, 282
 Levels of authority, 31
 Light and small power distribution boards, 344-347
 Light external walkway and stairs, 371
 Lightning agitator, 356
 Lights enclosure, 387, 388
 Liner plates, 150, 155
 Liners, 267, 274, 291
 Line pipe, 141
 Local stress relieving, 127
 Lowara water pumps, 259
 Lower support structure, 203
 Lowering in, 142
 Lube lines, 287, 304
 Lube oil cooler, 359, 361, 383
 Lubrication, 286, 287
 Lump sum, 8
 LV power and control cables, 309, 317

M

Machine butt welds, 93
 Magnetic separators, 303
 Major earthworks, 246-251
 Management, 11, 12
 Manhole, 203
 Manning-up, 17, 18
 Manpower, 9, 17, 31
 Margin, 6, 10, 28, 29, 42
 Marine application, 264-266
 Master copy, 5
 Match boring of pipe, 90
 Material cost, 10, 25
 Material specifications, 4, 5
 Materials, 31, 33-35, 37, 42, 90, 139, 143, 145
 Mechanical equipment, 17, 33, 242, 420-433
 Mechanical installation, 16, 38, 242, 254, 257, 267, 313, 313, 362, 384, 385, 402, 405-410
 Mechanical separation, 34, 37
 Mechanical services for gold room, 434
 Meeting minutes, 13
 Melt flow index, 464
 Mercury extraction duct, 226, 527
 Metal detector, 352, 419

Metal piping, 41-127
 Micropump, 260
 MIG, 149
 Mill discharge, 291
 Mill hydraulic pumps, 286
 Mill liners, 291
 Mill shell assembly, 283-285
 Mining, 16, 36, 255, 527
 Miscellaneous equipment, 422-427
 Mismanagement of manpower, 31
 Monetary exchange rates, 8
 Mono, 259, 428
 Mono rail, 291
 Monomers, 462
 Monte Carlo simulation/estimate, 7, 8
 Motor base, 256
 Motor installation, 256
 Motor and V-belt installation to skid fans, 412
 MP1000 or MP800 cone crusher, 302
 Multi stage vertical turbine pump, 260
 Multi tasking, 23

N

Non oil and gas project, 36
 Non-destructive testing, 42
 notional fuel usage chart, 414

O

Occupational health and safety, 5
 Office backup staff, 42
 Offshore, 3, 9, 10
 Off-site fabrication, 25, 38
 Off-site structural fabrication, 398
 Oil and gas specifications and pressure vessel applications, 212-215
 Oil and gas standard pipe, 42
 Oil and gas transmission standards and specifications, 78-87
 Oil and gas work, 94
 Oil reservoirs, 286
 Olet welds, 49, 53, 57, 61, 65, 69, 73, 77, 81, 83, 89, 91, 92
 One flex tyre, 289
 One-post fabrication layer, 238-240
 On-site buildings, 385
 Operational procedures, 30
 Order of magnitude, 7, 35, 37
 Organisation chart, 6, 19, 30
 Overflow launder large, 204
 Overflow launder small, 204
 Overhead costs, 27
 Overheads, 10, 11, 29, 42, 148
 Overheads and management, 10
 Overseas projects, 8

P

Padding machine, 143
 Painting, 10
 Painting pipework, 121
 Parallel flanged channel, 168
 Parallel socket joints, 490, 526
 Parametric estimating, 33
 Percentage of discipline, 34
 Percentages, 28, 29, 34, 39
 Peristaltic pump (bredel type), 259, 260
 Permits, 4, 242, 458
 Pin/wedge/nut, 199, 201, 202
 Pinion, 272, 274-282, 287
 Pinion installation, 288
 Pinion mount, 288
 Pipe bending, 138
 Pipe branches, 206
 Pipe corridors, 27
 Pipe extra heavy black, 178
 Pipe gang, 139
 Pipe heavy black, 174
 Pipe heavy galvanised, 175
 Pipe in buildings, 94
 Pipe light black, 175
 Pipe light galvanised, 175
 Pipe medium black, 176
 Pipe medium galvanised, 176
 Pipe offset for temperature difference, 492
 Pipe schedule 40, 176, 177
 Pipe schedule 80, 177
 Pipe standard weight, 177, 178
 Pipe support, 96, 120
 Pipe systems, 25
 Pipeline installation, 130-146
 Pipeline trenches, 242
 Pipework, 10, 25, 26, 42
 Pipework fabrication, 388, 389
 Pipework (install), 374, 375
 Piping, 41-128
 Piping layout drawing, 27
 Placing concrete, 245
 Plain strakes, 203
 Planning, 4-8, 12, 16-24
 Planning terminology, 31, 32, 38
 Plant air compressor, 358
 Plastic fabrication installation methods and techniques, 460, 461
 Plastics 459-527
 Plate stainless steel, 152
 Plate 250 grade, 152, 153
 Platework, 35, 36, 152, 153
 Platforms, 11, 150, 360, 385
 Plinths, 242, 255, 257, 275, 282, 313
 Plough, 195, 416
 Pneumatic instruments, 438
 Polycarbonate, 462
 Polyethylene (PE), 96, 118, 134, 135, 141, 460, 463, 464, 466, 470, 473, 474, 477-380, 482, 484, 487, 491-493, 495-500, 503-520, 523, 526
 Polyethylene plant pipework PN12.5, 506, 507

Polyethylene plant pipework PN10, 508, 509
 Polyethylene plant pipework PN8, 510, 511
 Polyethylene plant pipework PN6.3, 512, 513
 Polymer, 141, 460, 462
 Polypropylene (PP), 259, 463, 466, 482, 495-500, 523, 527
 Polypropylene fabricated ductwork, 235-237
 Polypropylene glass wrapped, 238-240
 Polyvinyl chloride (PVC), 463, 524, 525
 Polyvinyladenefluoride (PVDF), 463
 Poor boy crew, 144
 Power cables CU PVC/SWA/PVC, 454
 Power enclosure, 396, 397
 Pre-commissioning, 256, 300, 311, 355, 374, 413
 Pre-construction, 130
 Preface, 1
 Preparing the tender, 5, 6
 Pressure vessel, 212-215, 220-223
 Prevailing peercentage rate, 30
 Primary bulk orders, 27
 Primary gyratory crusher installation, 293, 294
 Primary scraper, 416
 Process and chemical pumps installation, 259, 260
 Process and instrument diagrams, 27
 Process and utilities, 38
 Process plants, 94
 Process pump installation, 259, 260
 Process water pump, 257, 259, 426
 Prochem control valve, 442, 443
 Prochem fcv flow control valve (actuated), 441
 Productivity, 4, 5, 9, 18
 Productivity factors, 4, 5
 Program evaluation and review technique (PERT), 19, 20
 Profit margin, 11, 29, 30
 Project, 1-24
 Project area percentage of total project cost, 38
 Project finance costs, 29, 30
 Project management, 12-15
 Project planning and scheduling, 16-25
 Project schedule, 3, 12, 17, 19, 24
 Provisional sums, 29
 Pulley, 404, 411, 412, 416
 Pulley installation, 411, 418
 Pump electrical hookup, 261-263
 Pump set, 255, 264-267
 Pumps, 257, 258
 Purlins and girts, 150

Q

QA/QC, 31
 Quality assurance, 5, 31
 Quality control, 31
 Quality management plan, 31
 Quality system, 31

R

Rack, 399
 Radial baffle braced, 204, 205
 Radiography, 42
 Raising of capital, 8
 Raw water pump, 257, 426
 Rectangular hollow section, 178-180
 Refinery and process, 58-89
 Refurbished mills, 282
 Register of superseded drawings, 6
 Rehabilitation, 131, 146
 Reinforced carbon steel, 216, 217
 Reinforced stainless steel, 218, 219
 Reinforcement, 244
 Remote country, 4
 Resource levelling, 20
 Resource loading, 21
 Resources, 16, 18, 19, 20, 23, 24, 33
 Reverse osmosis units, skid-mounted, 412, 413
 Rigging, 264-267, 284, 289, 293, 402
 Risk, 16, 24, 25, 30
 Risk assessment, 7, 25
 Rock breaker, 136, 137, 268-272
 Root gap, 208
 Rosemount, 441, 442, 444
 Rotary screw, 358, 430
 Rotary valves, 403
 Roto TDH, 260
 Round bar, 181, 182
 ROW, 131, 135
 Rubber mill liners, 282, 291

S

SAF2205 and SAF2207, 62-65
 Safe bearing loads for ground types, 486
 Safety, 5, 6
 Safety guards, 274, 291
 Sag mill, 272, 282
 Sandblast, 130, 141-144, 408
 Saw, 149, 374, 375, 387, 389, 390
 Schedule, 3, 12, 16, 21, 23-26, 30, 32
 Schedules of rates, 11, 15
 Scheduling, 5, 8, 12, 32
 Scheduling terminology, 4, 5
 Scope of the works, 5, 6, 14, 16, 20
 Scour valve installation, 494
 Screens, 268-270
 Scrubber, 257, 361, 422, 424, 428

Seals, 292, 409, 438
 Secondary scraper, 416
 Security equipment, 440
 708 control/marshalling panels, 338-344
 710 earthing and lighting protection, 348, 349
 712 instrumentation cabling, 351-353
 716 fire systems, 354
 722 commissioning, inspection and testing, 355
 Sewage treatment plants, 432
 Shell and tube heat exchangers, 402, 403
 Shoring and bracing, 244
 Simple cones, 201
 Single blade, 356
 Single stage vertical turbine pump, 260
 Site hydrotesting pipe systems 81
 Site management, 148
 Site mechanical installation, 384, 385
 Site run, 26
 Site specific productivity, 4, 5
 Skid-mounted, 405
 Slurry and sump pumps 428-431
 Slurry transportation, 42
 Socket welding, 376
 Soleplates, 284-290
 Solvent cement, 488, 489
 Solvent welded pipe and fittings, 524
 Specific instruments, 441-444
 Spectacle blinds and orifice plates, 124
 Splice plates, 151, 290, 300, 311, 324, 354
 Square bar, 184, 185
 Square hollow section, 182-184
 Stainless steel, 210-215
 Stainless steel 304 and 316 duct, 231-234
 Stair treads, 150
 Standard of tradesmen, 4, 10
 Static screen 199-202
 Statistical analysis, 12
 Statistics, 12, 39
 Steel clad insulation, 97-117
 Steel pipe supports, 154
 Steel structure and platework fabrication, 156-167
 Steel tank fabrication and installation 198-205
 Stick, 149
 Stress cracking of polyethylene, 460
 Structural, 11, 39, 275, 290, 294, 360, 362, 385, 398, 399, 418, 435, 498, 500
 Structural grade pipe, 185, 186
 Structural steel and platework, 148-187
 Stub legs, 150
 Submarine pipelines, 487
 Subsoil, 143, 146
 Substation earth bar assembly, 372
 Sump pumps, 258, 428-431
 Superintendent's direction, 14
 Superseded, 6
 Supervision, 3, 4, 10, 11, 17, 18, 28, 32, 39, 42, 148, 264-266, 460, 514
 Support spacing for polyethylene and polypropylene in metres, 495, 496
 Supports, 11, 94, 120, 154, 242, 267, 284, 285, 297, 299, 310, 323, 345-348, 353-358, 360, 362, 383-387, 397, 402

T

Take up frames, 151
 Tank and vessel nozzle, 208-223
 Tank insulation, 224
 Tank nozzles and pipe branches, 206
 Tanks, 197-224
 Taper flanged beams, 186
 Thermostat controlled oven, 499
 10MW Mars solar turbine gas compressor station, 362-385
 Tender and estimating terminology, 25-29
 Tender documents, 5
 Tender drawings, 14
 Tender submissions, 6, 7, 25
 Terminating spools, 27
 Terminations, 276, 358, 359, 399, 411-413
 Terminology, 26-30, 460, 461
 Test bump, 256, 259, 264, 267, 286, 289, 293
 Test point, 230, 234, 237, 240
 Thermostat oven, 499
 Thickeners and classifiers, 271
 Thickeners fabrication hours, 273
 Thrust blocks, 485
 Titanium pipework, 66-69
 Topsoil, 131, 132, 143, 146, 246
 Torqueing of hold-down bolts, 356
 Tower mill electrical, 308-311
 Tower mill krupp, 272
 Tower/Vertimill 1500, 306
 Tracking, 11, 16, 30
 Transmittals, 5
 Transport, 42, 150, 155, 403, 404, 435
 Trash screens, 268
 Trenches, 94, 136, 242, 244, 465
 Tubeline knife gate valve (actuated), 442
 Turfers, 285, 288, 291
 24/17 HPGR high pressue installation, 313-316
 24/17 HPGR electrical estimate, 317-324
 24/17 HPGR building electrical hookup, 325-355
 Turbine insulation, 409
 Twin pinion drive, 288
 Tying in, 359
 Type CC insulation (cold conversion), 111-117
 Type HC 50mm insulation (heat conversion), 97-110
 Typical application plant air supply, 358

U

Undercover work areas, 4
 Underestimated, 43
 Underground boring and submarine, 133, 134
 Unit of measure, 22
 Universal beams, 180, 181
 Universal columns, 181
 Unloading, 42, 135, 151, 156-167, 191, 246-251, 259, 293, 356, 358, 360, 399, 411-413, 418, 428, 430

UPVC pipe installation times solvent welded pipe and fittings, 524

V

Valves 25, 103, 110, 117, 123, 125, 126, 149, 349, 350, 362, 380-382, 391, 399, 403, 404, 430, 438, 445, 486, 494, 507-513
 Vandalism, 24
 Vane straighteners, 401
 Variations, 1, 24
 Variations to contracts, 1, 5, 11, 13, 15, 16, 20, 21, 24
 Verbal instructions, 13
 Verderflex, 260
 Vertimill, 272, 306
 Vessel penetration, 208-223
 Vibrating inclined screen, 268
 Vessels conventional, 224
 Victaulic pipework, 94
 Visco-elasticity, 462
 Visual inspection, 42

W

Wafer valves, 125
 Warman pump, 257, 258
 Water courses, 133, 136
 Water jets, 133
 Weather factors, 4, 8, 24, 290, 489
 Weighted by discipline, 21
 Weir and plate, 204
 Weir box, 205
 Weld set-up, 473
 Welded beams, 161, 186, 187
 Welded columns, 187
 Welding, 130, 133, 139-141, 143, 150, 155, 208-223
 Welding configurations fixed clamp butt welding machine, 293, 505
 Welding crew, 135, 139, 141
 Welding factors, 149
 Welding methods, 465-477
 Welding parameters for polyethylene, 478-480
 Welding pressure formula, 481
 Welding procedure, 42
 Welding standards, 27
 Wheel trenches, 136, 137
 Window, 462
 Work breakdown structure (WBS), 19
 Working copies, 5
 Working man-hours, 4, 38, 42
 Workshop earthing, 362, 372, 373
 Workshop supervision, 148, 149, 226

X

X-ray examination, 139
 X-ray welds, 391, 392

Z

Zero speed switches, 292