

Index

b

battery limit table 53, 54, 71
 blinds 114
 block flow diagrams (BFD) 31–32
 crude and vacuum distillation units
 32
 develop 31
 UBFD 31, 32
 Bluebeam 37, 72, 74, 104
 Bluebeam session 72, 74, 98, 102, 104,
 111
 budget preparation 81, 82–86
 burner management system (BMS) 8
 buyers or purchasing team 160

c

CAD coordinator 77–78, 102, 104
 cause and effect table 105, 117
 change cost and cost of design vs. different
 phases of the project 164
 change order template and example of
 63, 64
 check performance test 116
 chemical engineers 21, 23–26, 137
 chemical process engineers 3, 14–15
 civil engineers 4, 5, 8, 20, 39, 142
 closeout checklist 101
 columns 9, 26–27, 33, 39–40, 44, 52, 54,
 56, 57, 61–63, 67, 75, 116, 122, 165
 commissioning 3–5, 13, 14, 21, 23, 37,
 53, 98, 109, 110, 113–118, 121, 137,
 159, 161
 communication 4, 7, 15, 19, 37, 61–62,
 69–70, 74, 88, 103
 competency guide table 123–135
 competency rating scale 122

compressor's function 169
 construction 3, 8, 21, 23, 31, 37, 53, 61,
 92, 95–96, 98, 114, 118, 121, 137,
 161
 construction and support
 original design 110
 P&IDs 111
 procedures and manuals, preparation of
 109
 steam trap requirements 111
 tie-in execution 109
 construction team 4, 13, 16, 102,
 109–111, 143
 contents 26, 27
 control system engineers 4–5, 10, 39,
 66, 69–70, 98–100, 116–117, 141,
 162
 control system loop testing 116–117
 cost estimate 11–13, 31, 37, 40–42, 44,
 45, 66, 80, 162–163
 cost estimating 37, 39–40, 80, 143

d

demo P&IDs 72–73, 89–90
 design parameters 41, 116
 design pressure design temperature
 (DPDT) diagram 75–76, 95
 design safety margin 53
 distillation columns 9, 26, 33, 39–40,
 116, 122
 document control 10, 11, 25, 27, 70, 146,
 160

e

electrical engineers 4–5, 8, 10, 11, 40–41,
 79, 101, 137, 142, 173

engineering 3–11, 15, 17, 19–21, 23–28, 37, 39–40, 42, 46, 51–53, 57, 61, 63, 66–67, 69–70, 79, 81, 87–92, 95–96, 98–99, 101–103, 109, 116, 118, 121–122, 137, 140, 141, 159–162, 173–176

engineering procurement and construction (EPC) project 21, 161

engineering, procurement, construction, and commissioning (EPCC)

- construction 4
- engineering 3
- industry
 - commissioning 4
- operating industry or customers 15
- procurement 4
- project types of
 - cost of a project 5–7
 - engineering needs 8
 - licensor's need 8
 - profit based 9
 - purpose of a project 7–8
 - schedule based 9

engineering project

- phases
 - commissioning and start-up 13–14
 - construction and support 13
 - detailed design 13
 - scope definition 12
 - scope development 12–13
 - scope feasibility 12

entry level process engineers 121–122

equipment arrangement drawings 169–171

exchanger 116

f

fouling factors 55

g

gas compressor 7, 116

gas loops 117

grassroot project 5–6, 34

h

Hazard and Operability Analysis (HAZOPs) 10, 49, 51, 95

- action item close out and hold items 95–96
- closeout checklist 101

- follow up and implementation of 72
- participate in 71
- project support 96

heat and material balance (H&MB) 45, 173, 175

heater 8, 9, 26, 38, 39–41, 116

heat exchanger 24, 26, 27, 54–56, 75, 99, 148, 173

heat transfer research institute (HTRI) 55

hydraulics

- battery limit table coupled 53–54
- description of 52
- design safety margin 53
- examples of criticality of 52–53
- line sizing criteria for 54

i

IFC P&IDs 102

inline instruments

- controls system 66
- control valves and pressure regulators
 - instrument data 65
- data checking and work process 66
- flow meter instrument data 64, 65
- ON-OFF valve instrument data 64, 65
- process engineers 64

instrument sizing 10, 41

interaction with vendors 16–17

interactive schedule planning meetings 81

issued for approval (IFA) 69, 99

issued for design (IFD) 69, 71, 72, 74–75, 91, 99–100

IFD HMBs 75

- quality design basis document 74

issued for estimate (IFE) 36–38, 45–47, 50

issued for HAZOP (IFH) 51, 72

j

junior process engineer 121

k

KG tower 40

l

Layer of protection analysis (LOPA) 49–50, 148, 152

lead process engineer, 6 7, 49, 80, 81, 84, 87, 88, 91, 122, 147, 151

lead workshare meetings 87, 88, 102
 level indicator and level transmitter
 (LI/LT) instrument data 96, 153
 licenser 5, 8, 44, 45, 47, 51, 70, 75, 137,
 144, 163
 line list
 input and output tree 57–63
 piping design responsibility columns
 61–62
 piping engineering responsibility
 columns 61, 63
 process engineer responsibility
 columns of 61–62
 process responsibility and description
 58–61
 line-by-line P&ID review 73
 liquid loops 117
 liquid service safety valves 113

m

management of change (MOC)
 13, 102–105, 111, 139,
 148, 153
 material selection diagrams (MSD)
 72–73, 76–77, 84, 148
 mechanical engineer 4, 5, 8–10, 15,
 39–40, 42, 51, 52, 55, 68, 69, 70, 88,
 113, 139
 mechanical engineering, estimate
 39–40, 42, 70, 88
 metallurgy
 importance 44
 refinery operations 43
 selection 42–44
 special consideration 43
 mid-level process engineer
 121–122

n

net positive suction head (NPSH) 69,
 104

o

off-line instrument data 96–98, 102
 oxygen freeing 118

p

pH analyzer instrument data 96–97
 physical testing 113
 pipe service index (PSI) 90–91

piping and instrumentation diagrams
 (P&IDs) 10, 36, 37, 38, 41, 50, 51,
 67, 69, 72–74, 95, 96, 104–106, 117,
 173, 174, 176
 demo or demolition 89–90
 help instrumentation 173
 importance of 173–176
 tie-in 89
 piping design 4, 5, 8, 13, 21, 39, 52, 57,
 61, 67, 70, 72, 79, 80, 90, 91, 93,
 100, 103, 106, 140, 160, 173
 piping designers 4, 5, 8, 10, 173
 piping engineer 4, 5, 8, 10, 51, 57, 61, 63,
 70, 91, 103, 141
 piping engineering 57, 61, 63, 70, 91,
 103, 141
 piping engineering team 103
 piping systems 117
 planning 23
 flowchart 25
 interaction with customer 25
 perform feasibility studies
 duration 24–25
 types 23
 preliminary scope reports preparation
 assumptions 26
 design document 26–28
 technology selection 28–30
 plant visits 88
 plot plan layout, unit 167
 plot space 38, 39, 52, 170
 pre-startup 114–115, 118
 preliminary equipment design 40
 preliminary horsepower 41–42
 pressure gauge and pressure transmitter
 (PG/PT) instrument data 96–97
 pressure safety valves (PSV) 36, 66–68,
 96, 100, 111, 113, 114, 162
 process audit 91–93
 process engineer 10, 14, 51, 57, 68,
 159–161
 with CAD and drafting coordinator
 145
 with civil engineer 142
 with construction team 143
 with control system engineer 141
 with cost estimating 143
 with customer 138–139
 with document control 146
 with electrical engineer 142
 with EPCC engineer 145

process engineer (*contd.*)
 with licensor 144
 with mechanical engineer 139
 with piping design 140
 with piping engineering 141
 with project controls 144
 with project management 140
 process engineer participates 89, 101
 process engineer vs. different phases of
 the project 161–162
 process flow diagram (PFD) 15,
 32–36, 71, 73, 75, 76, 93,
 173, 175
 example of 173, 175
 procurement 3, 4, 8–11, 21, 23, 37,
 53, 98, 109, 118, 121,
 137, 161
 project administration 10, 11
 project budget vs. project timeline graph
 159, 160
 project controls 10, 11, 81, 84, 144
 project estimate uncertainty vs. different
 phases of the project 162–163
 project management 4, 5, 28, 61,
 63, 70, 73, 81, 95, 102, 137,
 140, 164
 project managers 11, 32
 project schedule template 166
 project staffing report 84
 project status 84–87
 project status tracking 87
 project tree 137
 pump 4, 7, 23, 27, 33, 36, 39, 52, 54, 56,
 69, 71, 75, 90, 92–93, 95, 99, 104,
 116, 121–122, 162
 hydraulics 40, 53

r

relief valve design 99, 100, 111
 revamping 6, 7

s

safety integrated systems (SIS)
 39, 75
 safety valves design 99–101
 schedule and dates 81
 scope definition 12

scope development 12, 13
 scope feasibility 12, 31, 152
 senior process engineers 122
 shell and tube design exchangers 55
 sight glass instrument data 97
 simulations 24, 27, 33, 34, 40,
 45–46, 75
 sizing column trays 40
 specialty (SP) items 106
 Squad check 10, 66, 80, 96, 98, 99
 staffing plan 81–87
 startup assistance 118
 steam trap requirements 111
 sulfur recovery unit (SRU) 8, 57
 Sulzer 40

t

technology companies 29
 tie-in execution 109
 tie-in form 106, 109
 tie-in P&IDs 89–91
 total installed cost (TIC) 5, 80
 tracking spreadsheet 28, 67

u

uninterrupted power supply (UPS)
 39
 utility block flow diagram (UBFD)
 31, 32
 utility summary 47–48, 75
 utility summary table 47, 71

v

value plus suggestion 47–48
 vapor service safety valve 113
 vessel 26, 33, 41, 52, 54, 56–57, 75, 76,
 92, 110, 116

w

workshare with multiple offices
 engineering team 20
 labor shortages 18
 level the workload 18, 19
 low-cost services 17–18
 piece of project 19
 time differences in countries 18–19
 workshare with an individual 19