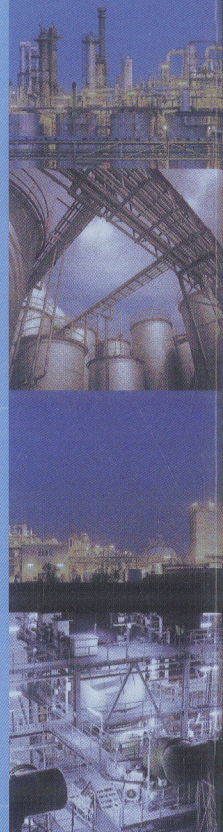
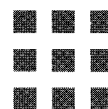


# CHEMICAL AND PROCESS PLANT COMMISSIONING HANDBOOK

A PRACTICAL GUIDE TO PLANT SYSTEM AND EQUIPMENT  
INSTALLATION AND COMMISSIONING

MARTIN KILLCROSS





# Contents

Acknowledgment	ix
Introduction	xi
What is Commissioning?	xiii
Safety and Environmental Considerations	xvii
A Simplified Commissioning Logic	xix
Intent and Use of the Handbook	xxi
The Commissioning Approach	xxiii
1. Commissioning Phase One – Prepare	1
Appointing the Commissioning Manager	5
Commissioning Scope and Contracts	9
Contracts	11
Budget Estimation	22
Prioritized Asset Systemization	24
Support Design	29
Develop an Initial Commissioning Plan or Philosophy	37
Appointment, Composition of the Commissioning Team, Roles, Responsibilities and Organization Chart	39
Documentation and Sign-Off Requirements, the Library and Electronic Filing	44
Devise Assignment Details, Site and Office Requirements, Consumables and Procure Commissioning Chemicals	48
Create Commissioning Documents and the System File	52
Control, Instrument, Electrical Commissioning Document Preparation	63
Mechanical Commissioning Document Preparation	80
Develop Training Materials	86

Develop Standard Operating Procedures (SOPs)	93
Develop Commissioning Schedule	100
Devise Handover Procedure	104
Devise Commissioning Tagging System	107
<b>2. Commissioning Phase Two – Implement</b>	<b>109</b>
Factory Acceptance Testing	111
Check Construction and Quality of Build	117
Tracking Progress and System Status	119
Cleaning Procedures and Drying	121
Pre-Commissioning Procedures	129
Vessel Check Sheets	136
Instrument Loop, Electrical and Control System Testing	137
Commissioning Punchlisting	141
Handover from Construction to Commissioning	147
Introduction of Safe Chemicals	149
Pre-Commissioning HAZOP Studies or Pre-Start-Up Safety	152
Commissioning Leak Testing	155
Commissioning and Initial Start-Up Plus Procedures	166
Handover to Operations	176
<b>3. Commissioning Phase Three – Close-Out</b>	<b>181</b>
Close Out Reservations	181
Complete Commissioning Documentation	182
Complete Training and Update Documents to “As Commissioned”	182
Update Operating Procedures to “As Commissioned”	183
Assist Continued Operation, Troubleshooting and/or De-bottlenecking Projects	183
Close Down the Commissioning Team	183
Complete Close-Out Hazard Study	184

4. The Commissioning System File, a Full Catalogue of Blank Commissioning Documents	185
Commissioning System File	186
Commissioning System File System	186
System P&IDs	187
Decontamination Procedure and Isolation Register	187
System Cleaning Checklist and Procedures	189
Hazard Study Actions	191
Equipment Check Sheets, Off- and On-Site Checks	191
System Punchlists	207
Action Upon Alarm Sheet	211
Handover Certificate Construction to Commissioning	212
Project Documentation Check Sheet Prior to Introduction of Safe Chemicals	213
Safe Chemical Commissioning Authorization and Pre-Commissioning Procedures	216
Leak Test Check List and Procedure	219
Instrument Check Sheet	221
Motor Check Sheet	222
Interlock Check Sheet	223
Emergency Shut-Down Check Sheet	224
DCS Sequence Test Procedure	225
Relief Stream Check Sheets	226
Critical Insulation Checks	227
Critical Gasket Checks	228
Lubrication Check Sheet	229
PSSR and Plant Check-Out Prior to Introduction of Hazardous Chemicals	230
Documentation Requirements for Ongoing Maintenance Group	235

viii Contents

Authority to Introduce Process Chemicals, Check Sheet and Certificate	236
Commissioning Procedures	237
Standard Operating Procedures (SOPs)	239
Commissioning to Operations Handover Certificate	240
Glossary of Terms	243
Appendices	245
About the Author	281
Index	283