

# Management of Safety, Health and Environment in South Africa



# Management of Safety, Health and Environment in South Africa:

*A Handbook*

By

Theo C. Haupt

**Cambridge**  
**Scholars**  
Publishing



Management of Safety, Health and Environment in South Africa: A Handbook

By Theo C. Haupt

This book first published 2021

Cambridge Scholars Publishing

Lady Stephenson Library, Newcastle upon Tyne, NE6 2PA, UK

British Library Cataloguing in Publication Data

A catalogue record for this book is available from the British Library

Copyright © 2021 by Theo C. Haupt

All rights for this book reserved. No part of this book may be reproduced, stored in a retrieval system, or transmitted, in any form or by any means, electronic, mechanical, photocopying, recording or otherwise, without the prior permission of the copyright owner.

ISBN (10): 1-5275-7370-2

ISBN (13): 978-1-5275-7370-3

# TABLE OF CONTENTS

<b>FOREWORD</b> .....	<b>xxi</b>
<b>PREFACE</b> .....	<b>xxii</b>
<b>PART 1 INTRODUCTION TO SAFETY, HEALTH AND ENVIRONMENT MANAGEMENT</b> .....	<b>1</b>
<b>CHAPTER 1</b> .....	<b>2</b>
<b>THE NEED FOR SAFETY, HEALTH AND ENVIRONMENTAL MANAGEMENT</b>	
<b>IN THE BEGINNING</b> .....	<b>2</b>
<b>INDUSTRIAL REVOLUTIONS AND THEIR IMPACT</b> .....	<b>2</b>
• BIG DATA AND ANALYTICS .....	5
• AUTONOMOUS ROBOTS .....	5
• SIMULATION .....	5
• HORIZONTAL AND VERTICAL SYSTEM INTEGRATION .....	5
• THE INTERNET OF THINGS (IoT) .....	5
• CYBERSECURITY .....	5
• THE CLOUD .....	5
• ADDITIVE MANUFACTURING .....	5
• AUGMENTED REALITY.....	5
• REASONS FOR SHE PROGRAMMES .....	6
• HEALTH AND SAFETY AS A VALUE .....	7
• HEALTH AND SAFETY AS A COST FACTOR .....	7
• HEALTH AND SAFETY AND THE WORKPLACE .....	7
• HEALTH AND SAFETY AS A ZERO ACCIDENT VISION .....	7
• POLICY OF THE ORGANIZATION .....	8
• CORPORATE GOVERNANCE .....	8
• REVIEW QUESTIONS .....	8
• REFERENCES.....	9
<b>CHAPTER 2</b> .....	<b>10</b>
<b>GENERAL HEALTH AND SAFETY PRINCIPLES</b>	
<b>THEORIES</b> .....	<b>10</b>
• INTRODUCTION .....	10
• KEY CONCEPTS/DEFINITIONS .....	11
• ACCIDENT VERSUS INCIDENT .....	11
• RELATIONSHIP BETWEEN ATTITUDE, BEHAVIOUR AND CONDITIONS (ABC).....	11
• ACCIDENT OR INCIDENT CAUSATION .....	12
• ACCIDENT PRONENESS THEORY.....	14
• GOAL-FREEDOM-ALERTNESS THEORY .....	14
• ADJUSTMENT-STRESS THEORY .....	14
• DISTRACTIONS THEORY .....	15
• H W HEINRICH'S CHAIN OF EVENTS (DOMINO THEORY) .....	16
• AN UPDATED DOMINO THEORY .....	18

• DR WILLIAM HADDON'S TEN STRATEGIES .....	18
• MULTIPLE CAUSATION MODEL .....	19
• REASON'S EPIDEMIOLOGICAL MODEL .....	19
• CONSTRAINT-RESPONSE THEORY FOR CONSTRUCTION ACCIDENTS .....	21
• HUMAN ERROR THEORIES .....	23
• SYSTEMIC ACCIDENT MODELS .....	24
• INCIDENT INVESTIGATION .....	27
• AIMS OF INVESTIGATIONS .....	28
• THE INVESTIGATION PROCESS .....	28
• REVIEW QUESTIONS .....	31
• REFERENCES.....	31
<b>CHAPTER 3.....</b>	<b>34</b>
<b>SYSTEMATIC MANAGEMENT OF SAFETY, HEALTH AND THE ENVIRONMENT</b>	
<b>WHY SHE MANAGEMENT IS NECESSARY.....</b>	<b>34</b>
<b>SHE MANAGEMENT SYSTEM ELEMENTS .....</b>	<b>34</b>
• SHE POLICY STATEMENT .....	34
• KEY PERSON OR STAKEHOLDER RESPONSIBILITIES .....	34
• HEALTH AND SAFETY REPRESENTATIVES AND COMMITTEES .....	35
• RISK ASSESSMENT.....	35
• SAFE WORK OR OPERATION PROCEDURES.....	35
• WORKER ORIENTATION .....	35
• TRAINING.....	35
• WORKPLACE INSPECTIONS .....	36
• CERTIFICATIONS.....	36
• MEDICALS .....	36
• REPORTING, RECORDING, AND INVESTIGATING ACCIDENTS.....	36
• EMERGENCY PROCEDURES.....	36
• FIRST AID .....	37
• SHE CULTURE .....	37
• CONTRACTOR MANAGEMENT .....	37
• MATERIAL AND MACHINERY HANDLING .....	37
• HEALTH AND SAFETY AUDIT .....	38
<b>IMPLEMENTING SHE MANAGEMENT.....</b>	<b>38</b>
• INTRODUCTION .....	38
• DEVELOPING STANDARD DOCUMENTATION.....	39
• IMPLEMENTATION PHASE .....	40
• EVALUATION OF THE PROGRAMME .....	49
• SHE TRAINING AND AWARENESS.....	53
• CONTRACTOR CONTROL.....	54
• BUDGETING FOR SHE.....	55
• REVIEW QUESTIONS .....	61
• REFERENCES.....	61

<b>CHAPTER 4.....</b>	<b>62</b>
<b>POLICY AND RESPONSIBILITIES</b>	
<b>SHE POLICY.....</b>	<b>62</b>
<b>CONTENTS OF THE SHE POLICY.....</b>	<b>62</b>
• ORGANIZATION OF THE SHE POLICY.....	63
• ACCOUNTABILITY AND RESPONSIBILITY IN THE SHE POLICY.....	64
• HOW TO DRAFT A SHE POLICY.....	64
• COMPILING A SHE PROCEDURE.....	67
• ADHERENCE TO SHE POLICIES AND PROCEDURES.....	70
• COMMUNICATION OF SHE POLICIES TO WORKERS.....	70
<b>INFORMATION AND TRAINING THE EMPLOYERS MUST PROVIDE FOR THEIR WORKERS.....</b>	<b>71</b>
• OHS ACT SECTIONS 8 AND 13.....	71
• INDUCTION TRAINING.....	71
• WORK PROCEDURE TRAINING.....	71
• SPECIFIC TRAINING.....	71
• SHE OBJECTIVES AND TARGETS.....	72
• RESPONSIBILITIES OF EMPLOYERS.....	72
• RESPONSIBILITIES OF SUPERVISORS.....	72
• RESPONSIBILITIES OF WORKERS.....	72
• REVIEW QUESTIONS.....	72
• REFERENCES.....	73
<b>CHAPTER 5.....</b>	<b>74</b>
<b>COMMUNICATION</b>	
<b>INTRODUCTION.....</b>	<b>74</b>
• 11 PRINCIPLES OF EFFECTIVE COMMUNICATION.....	74
• GROUP MEETINGS.....	75
• PERSONAL COMMUNICATION.....	75
• COMMUNICATION STRUCTURE.....	77
• REVIEW QUESTIONS.....	79
• REFERENCES:.....	79
<b>CHAPTER 6.....</b>	<b>80</b>
<b>IMPORTANCE OF RISK MANAGEMENT</b>	
<b>INITIAL THOUGHTS.....</b>	<b>80</b>
• FUNDAMENTAL PRINCIPLES OF RISK MANAGEMENT.....	80
• PLANNING.....	80
• OBJECTIVE OF RISK MANAGEMENT.....	83
• DEFINITION OF PURE RISKS.....	83
• PROVISION OF FUNDS.....	83
• DEFINITION OF RISK.....	84
• DEFINITION OF FREQUENCY.....	84
• DEFINITION OF SEVERITY.....	84
• CLASSIFICATION OF RISK.....	84
• BENEFITS OF RISK MANAGEMENT.....	85
• CAUSES OF RISK MANAGEMENT FAILURES.....	86
• RISK VERSUS UNCERTAINTY.....	86
• DISTRIBUTION OF RISK.....	86

• HAZARD .....	86
• PERIL .....	86
• PROBABILITY .....	86
• RISK MANAGEMENT PROCESSES .....	86
• RISK IDENTIFICATION .....	87
• HAZARD IDENTIFICATION, RISK ASSESSMENT AND CONTROLS .....	87
• RISK IDENTIFICATION METHODS.....	87
• RISK IDENTIFICATION TECHNIQUES .....	87
• HAZARD IDENTIFICATION AND RISK ASSESSMENT (HIRA) .....	88
• RISK EVALUATION OR QUANTIFICATION .....	90
• RISK CONTROL .....	93
• RISK CONTROL MEASURES: GENERAL PRINCIPLES.....	93
• RISK CONTROL TECHNIQUES AND OPTIONS .....	93
• PRACTICAL EXAMPLES OF RISK CONTROL.....	94
• RISK EXPOSURE PREVENTION PRINCIPLES .....	95
• RISK CONTROL AREAS .....	95
• STATUTORY RISK CONTROL REQUIREMENTS.....	95
• APPLYING RISK MANAGEMENT PRINCIPLES.....	96
• RISK CONTROL COSTS .....	96
• ASPECTS TO CONSIDER .....	96
• THE COST- BENEFIT APPROACH .....	97
• RISK CONTROL STANDARDS.....	97
• RISK CONTROL DISCIPLINES .....	97
• RISK FINANCING.....	98
• SELF FUNDING .....	98
• TRANSFER (INSURANCE) .....	98
• INSURABLE RISKS .....	98
• TYPES OF INSURANCE .....	98
• REVIEW QUESTIONS .....	99
• REFERENCES.....	100
<b>CHAPTER 7.....</b>	<b>101</b>
<b>LEGAL CONCEPTS AND PRINCIPLES</b>	
<b>INTRODUCTION .....</b>	<b>101</b>
• LEGAL TERMINOLOGY .....	101
• COMMON LAW .....	103
• BASIC PRINCIPLES OF COMMON LAW .....	104
• STATUTORY LAW .....	104
• STATUTORY SOURCES OF SOUTH AFRICAN LAW .....	104
• LEGAL HIERARCHY.....	105
• THE SUPREME LAW.....	105
• CRIMINAL LAW .....	106
• THE REQUIREMENTS FOR A CRIME.....	106
• LEGALITY.....	106
• REGULATIONS.....	107
• CODES OF PRACTICE .....	107
• STANDARDS .....	108



<b>CONTRAVENING THE LAW .....</b>	<b>108</b>
• LEGAL LIABILITY .....	108
• CIVIL LAW AND CIVIL LIABILITY .....	108
• CRIMINAL LIABILITY .....	109
• VICARIOUS LIABILITY .....	109
• STRICT LIABILITY .....	110
• REASONABLY PRACTICABLE .....	110
• EXAMPLES OF DISTINCTION BETWEEN CIVIL AND CRIMINAL LEGAL PROCEEDINGS.....	111
• REVIEW QUESTIONS .....	111
• REFERENCES.....	111
<b>CHAPTER 8.....</b>	<b>113</b>
<b>STATUTORY REQUIREMENTS</b>	
<b>OCCUPATIONAL HEALTH AND SAFETY ACT 85, 1993 AS AMENDED.....</b>	<b>113</b>
• THE ACT AND REGULATIONS .....	113
• THE PURPOSE OF THE ACT .....	113
• THE ACT .....	113
• OBJECTIVES OF THE ACT .....	113
• RESPONSIBILITIES.....	114
• EMPLOYER RESPONSIBILITIES .....	114
• CHIEF EXECUTIVE OFFICER (CEO).....	114
• GENERAL DUTIES OF EMPLOYER: SECTION 8 .....	114
• ARTICLES.....	114
• SUBSTANCES .....	115
• DUTY TO INFORM WORKERS: SECTION 13.....	115
• EMPLOYER LIABILITIES .....	115
• OFFENCES, PENALTIES AND SPECIAL ORDERS OF COURT .....	115
• WORKER RESPONSIBILITIES .....	115
• GENERAL DUTIES OF WORKERS AT WORK (SECTION 14).....	115
• DUTY NOT TO INTERFERE WITH, DAMAGE OR MISUSE THINGS (SECTION 15) .....	116
• THE RIGHTS OF WORKERS .....	116
<b>CONSEQUENCES OF NON-COMPLIANCE .....</b>	<b>117</b>
• NEAR-MISSES OF INCIDENTS.....	117
• COST OF INCIDENTS.....	117
• SOCIAL IMPACT.....	117
• FINANCIAL IMPACT .....	118
• NON-COMPLIANCE: (SECTION 38) .....	119
• CLOSING OF OPERATIONS.....	121
• LABOUR DEPARTMENT SHUTS DOWN COMPANY, ISSUES WARNINGS .....	121
• APPLICABLE LEGISLATION .....	122
• DEPARTMENT OF LABOUR.....	122
• CHIEF DIRECTORATE OF OCCUPATIONAL HEALTH AND SAFETY .....	122
• INSPECTIONS .....	122
• INSPECTORS.....	123
• DESIGNATION OF INSPECTORS BY MINISTER.....	123
• FUNCTIONS OF INSPECTORS.....	123
• SPECIAL POWERS OF INSPECTORS .....	123

• HEALTH AND SAFETY REPRESENTATIVES (SECTION 17) .....	124
• FUNCTIONS OF HEALTH AND SAFETY REPRESENTATIVES .....	125
• HEALTH AND SAFETY COMMITTEES.....	125
• FUNCTIONS OF HEALTH AND SAFETY COMMITTEES.....	125
• PURPOSE OF HEALTH AND SAFETY COMMITTEES.....	126
• ESTABLISHMENT OF HEALTH AND SAFETY COMMITTEES .....	126
• MEMBERSHIP OF A HEALTH AND SAFETY COMMITTEE .....	126
• FREQUENCY OF HEALTH AND SAFETY COMMITTEE MEETINGS .....	126
• PROCEDURE OF THE MEETINGS.....	126
• CONSULTATION WITH EXPERTS FOR ADVICE.....	126
• DEDUCTIONS .....	127
• REPORT TO THE CHIEF INSPECTOR REGARDING OCCUPATIONAL DISEASES.....	127
• CO-OPERATION WITH THE INSPECTOR .....	127
<b>WORK PROCEDURES.....</b>	<b>128</b>
• LEGISLATIVE PROCEDURES .....	128
• COMPANY PROCEDURES .....	128
• RESPONSIBILITIES OF MANAGEMENT.....	129
• FINANCIAL.....	129
• LEGAL.....	129
• MORAL.....	129
• FUNCTIONS OF MANAGEMENT .....	129
• INFORMATION AND TRAINING ABOUT DANGERS .....	129
• REDUCING DANGERS IN THE WORKPLACE.....	130
• HEALTH AND SAFETY REPRESENTATIVES .....	130
• PROCEDURES FOR DEALING WITH ACCIDENTS.....	130
• REPORTING ACCIDENTS OR INCIDENTS .....	130
• THE CHIEF EXECUTIVE OFFICER (CEO).....	130
• LEGAL RESPONSIBILITY OF SUPERVISORS .....	131
• REQUIREMENTS FROM THE SUPERVISORY STAFF (SECTION 8).....	131
<b>REGULATIONS OF THE ACT .....</b>	<b>131</b>
• GENERAL ADMINISTRATIVE REGULATIONS 2003.....	133
• EXAMPLES OF FACILITY REGULATIONS .....	133
• EXAMPLES OF ENVIRONMENTAL REGULATIONS FOR WORKPLACES.....	133
• NOISE INDUCED HEARING LOSS REGULATIONS .....	133
• GENERAL SAFETY REGULATIONS.....	134
• OTHER RELATED LEGISLATION .....	134
• REVIEW QUESTIONS .....	135
• REFERENCES.....	135
<b>CHAPTER 9.....</b>	<b>137</b>
<b>RECORDKEEPING, REPORTING AND DOCUMENT CONTROL</b>	
<b>RECORD KEEPING .....</b>	<b>137</b>
• KEEPING MINUTES AND RECORDS.....	137
• COMPANY POLICY.....	137
• PROPERTY DAMAGE INCIDENTS REGISTERS AND REPORTS.....	138
• REPORTING OF INCIDENTS.....	138
• REPORTING OF INJURIES.....	138

• PROCEDURE WHEN REPORTING AN INJURY TO COMMISSIONER .....	139
• DOCUMENTS TO BE SUBMITTED IN CASE OF A FATALITY .....	139
• REPORTING OF INJURIES TO THE RELEVANT PERSONS .....	139
• INVESTIGATING AND RECORDING OF ACCIDENTS OR INCIDENTS.....	139
• INCIDENT REPORTS .....	140
• EXAMPLE OF INCIDENT / INJURY REPORT .....	140
• PROCEDURE WHEN REPORTING AN OCCUPATIONAL DISEASE .....	144
• DOCUMENT CONTROL .....	144
• CONTROL OF RECORDS .....	145
• REVIEW QUESTIONS .....	148
• REFERENCES.....	148
<b>PART 2: MANAGEMENT OF OCCUPATIONAL SAFETY .....</b>	<b>151</b>
<b>CHAPTER 10.....</b>	<b>152</b>
<b>WORKPLACE INSPECTIONS AND AUDITS</b>	
<b>WORKPLACE INSPECTIONS .....</b>	<b>152</b>
• CONSIDERATIONS: .....	152
• PURPOSE:.....	152
• BENEFITS:.....	153
• TYPES OF WORKPLACE HAZARDS:.....	153
• IMPROVING EFFECTIVENESS OF HEALTH AND SAFETY INSPECTIONS: .....	153
• WORKPLACE INSPECTIONS .....	154
• SAMPLE WORKPLACE INSPECTION CHECKLIST .....	155
<b>INSPECTION SYSTEMS.....</b>	<b>157</b>
• INTRODUCTION .....	157
• PRINCIPLES OF INSPECTIONS .....	158
• INFORMAL INSPECTIONS .....	158
• PLANNED OR PERIODIC INSPECTIONS.....	159
• CRITICAL PARTS/ITEMS INSPECTIONS .....	159
• HOUSEKEEPING INSPECTIONS .....	159
• GENERAL INSPECTIONS.....	159
• FREQUENCY AND DURATION OF INSPECTIONS.....	160
• COMPOSITION OF THE INSPECTION TEAM .....	160
• INCLUSION OF SUPERVISORS .....	160
• INSPECTION STEPS .....	161
• DEVELOP REMEDIAL ACTIONS .....	161
• REPORTING ON HAZARDS AND UNSAFE CONDITIONS.....	162
• REPORTING PROCEDURE .....	162
• REPORTING DISCREPANCIES .....	162
• SUGGEST CORRECTIVE ACTION THAT CAN BE TAKEN .....	162
• REPORT DISCREPANCIES TO THE HEALTH AND SAFETY COMMITTEE.....	162
• FOLLOW UP .....	162
• METHODS OF REPORTING .....	162
• CONTENTS OF FINAL REPORT .....	163
• GUIDELINES FOR WRITING A REPORT .....	163
• CONTROL MEASURES (CORRECTIVE ACTION) .....	165

• COMPLIANCE AUDITS .....	170
• TYPES OF AUDITS .....	171
• HEALTH AND SAFETY AUDIT PARTICIPANTS.....	172
• HEALTH AND SAFETY AUDITS AND THEIR BENEFITS .....	172
• HEALTH AND SAFETY AUDIT CHECKLIST.....	172
• REVIEW QUESTIONS .....	175
• REFERENCES.....	175
<b>CHAPTER 11.....</b>	<b>176</b>
<b>HOUSEKEEPING, STACKING, STORAGE AND LOCK OUT</b>	
<b>DEFINITION OF HOUSEKEEPING.....</b>	<b>176</b>
• POOR HOUSEKEEPING .....	176
• WORK AREA HOUSEKEEPING .....	176
• STACKING AND STORAGE .....	177
• GENERAL SAFETY REGULATION 8.....	177
• PACKING STORES .....	177
• ADDITIONAL CONSIDERATIONS .....	179
• SAFE USE OF SHELVES, RACKS AND PALLETS .....	180
• STORAGE METHODS .....	181
• STORAGE OF DANGEROUS OR HAZARDOUS MATERIALS.....	182
• CHEMICALS .....	183
• LOCKOUT SYSTEMS.....	184
• DEFINITION OF A LOCK OUT (TAG OUT).....	184
• NEED FOR A LOCK OUT .....	184
• LOCKOUT/TAGOUT PROCEDURE .....	184
• STEP 1: PREPARATION– LOCKOUT/TAGOUT .....	184
• STEP 2: SHUT DOWN – LOCKOUT/TAGOUT .....	184
• STEP 3: ISOLATION – LOCKOUT/TAGOUT.....	185
• STEP 4: LOCKOUT/TAGOUT.....	185
• STEP 5: STORED ENERGY CHECK – LOCKOUT/TAGOUT .....	185
• STEP 6: ISOLATION VERIFICATION – LOCKOUT/TAGOUT .....	185
• REVIEW QUESTIONS .....	186
• REFERENCES.....	186
<b>CHAPTER 12.....</b>	<b>187</b>
<b>HEALTH AND SAFETY SIGNAGE AND MACHINE GUARDING</b>	
• ROLE OF HEALTH AND SAFETY SIGNS .....	187
• SAFETY SIGN CATEGORIES .....	188
• HEALTH AND SAFETY SIGNS.....	189
• HEALTH AND SAFETY COLOURS .....	189
• INDICATOR LIGHTS, BUTTONS AND CONTROL POINTS .....	190
• PIPING SYSTEMS .....	190
• OTHER APPLICATIONS FOR SAFETY COLOURS .....	190
• OTHER TYPES OF SIGNAGE.....	191
• POWER TOOLS AND MACHINE GUARDING.....	191
• MACHINE GUARDING .....	191
• SAFEGUARDING MACHINERY AND EQUIPMENT.....	191

•	PURPOSE OF MACHINE GUARDING .....	192
•	NEED FOR MACHINE GUARDING .....	192
•	RESPONSIBILITY FOR MACHINE GUARDING.....	193
•	CLASSES AND TYPES OF MACHINE GUARDS.....	193
•	REQUIREMENTS OF MACHINE GUARDS.....	193
•	PREVENTATIVE MEASURES .....	193
•	REVIEW QUESTIONS .....	194
•	REFERENCES.....	194
<b>CHAPTER 13.....</b>	<b>195</b>	
<b>LIFTING EQUIPMENT, LADDERS, SCAFFOLDS AND CONVEYORS</b>		
•	LIFTING EQUIPMENT.....	195
•	GENERAL PRINCIPLES.....	195
•	POWERED INDUSTRIAL TRUCK.....	195
•	CRANES.....	195
•	LADDERS .....	196
•	LEGAL REQUIREMENTS WHEN USING LADDERS AND STEPLADDERS.....	199
•	SCAFFOLDS .....	199
•	HEALTH AND SAFETY REGULATIONS FOR SCAFFOLDS .....	200
•	TYPICAL COMPONENTS OF A SCAFFOLD.....	201
•	SCAFFOLDING HAZARDS .....	202
•	FALL PREVENTION MEASURES FOR SCAFFOLDS.....	203
•	SCAFFOLD DESIGN RATIO .....	204
•	LOADING OF THE SCAFFOLD .....	205
•	SIGNS FOR SCAFFOLDS.....	206
•	LOADING CHARTS .....	206
•	CONVEYORS.....	207
•	TYPICAL HAZARDS ASSOCIATED WITH CONVEYORS .....	207
•	SAFE OPERATING PROCEDURES FOR CONVEYORS.....	208
•	ADDITIONAL PRECAUTIONS FOR DIFFERENT TYPES OF CONVEYORS:.....	208
•	REVIEW QUESTIONS .....	209
•	REFERENCES.....	210
<b>CHAPTER 14.....</b>	<b>211</b>	
<b>WORKING WITH EQUIPMENT UNDER PRESSURE</b>		
•	COMPRESSED GAS CYLINDERS.....	211
•	GAS CYLINDER VALVES AND CONNECTIONS .....	211
•	GAS CYLINDER SAFETY-RELIEF DEVICES .....	212
•	IDENTIFICATION OF CONTENTS OF COMPRESSED GAS CYLINDERS .....	212
•	RECEIVING GAS CYLINDERS.....	212
•	TRANSPORTATION OF GAS CYLINDERS .....	212
•	GENERAL MANAGEMENT AND STORAGE OF COMPRESSED GAS CYLINDERS .....	213
•	USE OF COMPRESSED GAS CYLINDERS .....	213
•	GUIDELINES REGARDING STORAGE OF CYLINDERS IN STOREROOMS.....	214
•	EQUIPMENT USED WITH COMPRESSED GAS .....	214
•	EMERGENCY PROCEDURES ASSOCIATED WITH GAS CYLINDERS.....	215
•	MANAGING EMPTY CYLINDERS .....	215

•	PRESSURE EQUIPMENT LEGISLATIVE REQUIREMENTS .....	216
•	DUTIES OF USERS OF PRESSURE EQUIPMENT– REGULATION 6.....	217
•	REGISTRATION OF A STEAM GENERATOR – REGULATION 5 .....	217
•	PRESSURE EQUIPMENT MARKING – REGULATION 9 .....	217
•	PRESSURE AND SAFETY ACCESSORIES – REGULATION 10 .....	218
•	PRESSURE EQUIPMENT RECORDS – REGULATION 14 .....	218
•	TRANSPORTABLE GAS CONTAINERS – REGULATION 18.....	218
•	FIRE EXTINGUISHERS – REGULATION 19 .....	218
•	OXY/FUEL GAS AND WELDING .....	218
•	PREVENTING FIRE FROM HEAT, SPARKS, MOLTEN METAL OR DIRECT CONTACT .....	219
•	EXPLOSION WHEN CUTTING UP OR REPAIRING TANKS AND DRUMS .....	219
•	BACKFIRES AND FLASHBACKS .....	220
•	FUMES CREATED DURING FLAME CUTTING.....	220
•	FIRE/BURNS FROM MISUSE OF OXYGEN.....	221
•	CONTACT BURNS WHEN WELDING.....	221
•	CRUSHING OR IMPACT INJURY .....	221
•	WELDING TRAINING.....	221
•	PERMIT-TO-WORK FOR WELDING .....	221
•	HOT WORK.....	222
•	DEFINITION OF A HOT WORK MANAGEMENT PROGRAM .....	222
•	ALTERNATIVES TO HOT WORK.....	222
•	GENERAL GOOD PRACTICES BEFORE PERFORMING HOT WORK.....	222
•	SPECIAL CONSIDERATIONS WHEN DOING HOT WORK .....	224
•	REVIEW QUESTIONS .....	224
•	REFERENCES: .....	224
<b>CHAPTER 15.....</b>	<b>225</b>	
<b>PERSONAL PROTECTIVE CLOTHING AND EQUIPMENT</b>		
•	MAINTENANCE OF PPE .....	227
•	CLEANING OF PPE .....	227
•	STORAGE OF PPE .....	227
•	PROTECTION PROVIDED BY PPE.....	227
•	HEAD PROTECTION .....	229
•	POTENTIAL HAZARDS.....	229
•	HARD HATS .....	230
•	WEARING A HARD HAT .....	230
•	CARING FOR A HARD HAT .....	230
•	HARD HAT HEALTH AND SAFETY SIGNS .....	230
•	EAR AND HEARING PROTECTION .....	230
•	TYPES OF EAR PROTECTION .....	232
•	WEARING EAR PROTECTION .....	233
•	CARING FOR EAR PROTECTION .....	234
•	HEARING PROTECTION HEALTH AND SAFETY SIGNS.....	234
•	EYE AND FACE PROTECTION .....	234
•	HAZARDS INVOLVING THE EYES.....	234
•	EYE PROTECTION MEASURES.....	235
•	TYPES OF EYE PROTECTION.....	235

• CONTACT LENSES.....	236
• CARE OF EYE PROTECTION EQUIPMENT .....	237
• EYE PROTECTION HEALTH AND SAFETY SIGNS.....	237
• RESPIRATORY PROTECTION / FACE MASKS.....	237
• POTENTIAL RESPIRATORY HAZARDS .....	237
• SELECT THE CORRECT RESPIRATOR.....	238
• TEST THE RESPIRATOR .....	238
• MONITOR THE RESPIRATOR.....	239
• CARE FOR THE RESPIRATOR .....	239
• STORING A RESPIRATOR .....	240
• BODY PROTECTION .....	240
• POTENTIAL HAZARDS.....	240
• PROTECTIVE SUITS, OVERALLS OR COVERALLS .....	240
• CARE FOR PROTECTIVE CLOTHING.....	241
• HAND PROTECTION .....	241
• POTENTIAL HAZARDS INVOLVING HANDS .....	241
• TYPES OF HAND PROTECTION.....	242
• WEARING AND USING GLOVES .....	242
• OTHER HAND PROTECTION MEASURES .....	243
• HAND HEALTH AND SAFETY SIGNS .....	243
• SOME GENERAL GUIDELINES FOR USING GLOVES .....	243
• FOOT PROTECTION .....	243
• POTENTIAL FEET-RELATED HAZARDS .....	244
• PREVENTATIVE MEASURES FOR FOOT HEALTH AND SAFETY .....	244
• FEATURES OF FOOTWEAR.....	244
• TYPES OF PROTECTIVE FOOTWEAR.....	245
• WEARING AND USING SAFETY FOOTWEAR .....	245
• WORKPLACE SIGNAGE PERTAINING TO PPE .....	246
• REVIEW QUESTIONS .....	248
• REFERENCES.....	248
<b>CHAPTER 16.....</b>	<b>249</b>
<b>WORKING IN CONFINED SPACES</b>	
• EXAMPLES OF CONFINED SPACES FOUND IN THE CONSTRUCTION SECTOR.....	250
• TRENCH.....	250
• MANHOLE .....	252
• TUNNEL.....	252
• DUCTS.....	253
• WATER TABLE .....	254
• DEPRESSION.....	255
• BASEMENT .....	255
• HAZARDS THAT OCCUR IN CONFINED SPACES.....	256
• CONFINED SPACE WORK IS MORE HAZARDOUS THAN OTHER WORKPLACES .....	259
• REVIEW QUESTIONS .....	260
• REFERENCES.....	260

<b>PART 3 MANAGEMENT OF OCCUPATIONAL HEALTH .....</b>	<b>261</b>
<b>CHAPTER 17.....</b>	<b>262</b>
<b>INTRODUCTION TO OCCUPATIONAL HEALTH MANAGEMENT</b>	
• IMPORTANT OCCUPATIONAL HEALTH RELATED DEFINITIONS AND CONCEPTS.....	263
• RELATIONSHIP BETWEEN WORK AND HEALTH.....	263
• OCCUPATIONAL HEALTH CHALLENGES .....	264
• OCCUPATIONAL HYGIENE STRESSORS .....	264
• OCCUPATIONAL HEALTH SERVICES.....	265
• THE NEED FOR OCCUPATIONAL HEALTH .....	265
• OBJECTIVES OF OCCUPATIONAL HEALTH.....	266
• ROLE OF THE OCCUPATIONAL HEALTH NURSE .....	266
• HEALTH RISK ASSESSMENT .....	266
• THE OCCUPATIONAL HEALTH MODEL.....	267
• PRIMARY HEALTH CARE .....	267
• OCCUPATIONAL HEALTH (OH) .....	267
• EMPLOYEE ASSISTANCE PROGRAM (EAP).....	269
• HEALTH BENEFIT MANAGEMENT.....	269
• MEDICAL SCHEME AND CURATIVE CARE .....	269
• THE ROLE OF THE OCCUPATIONAL HYGIENIST.....	269
• REVIEW QUESTIONS .....	270
• REFERENCES.....	270
<b>CHAPTER 18.....</b>	<b>271</b>
<b>THE OCCUPATIONAL HEALTH CLINIC AND ITS FUNCTIONS</b>	
• PHYSICAL ASPECTS OF THE CLINIC .....	271
• BASIC AND SPECIALIZED EQUIPMENT NEEDED FOR A CLINIC .....	271
• RECORDKEEPING IN THE OCCUPATIONAL HEALTH CENTER.....	272
• HEALTH MONITORING AND SURVEILLANCE .....	272
• OCCUPATIONAL HEALTH SURVEILLANCE .....	272
• PRE-PLACEMENT/PRE-EMPLOYMENT MEDICAL EXAMINATION .....	273
• FITNESS-TO-WORK AND DISABILITY EVALUATION .....	273
• DISABILITY.....	274
• INCAPACITY IN TERMS OF THE LABOUR RELATIONS ACT, 1995 AS AMENDED (LRA) .....	274
• EXPEDITING THE PROCESS .....	274
• DISABILITY CLAIM APPROVAL .....	275
• PERIODIC MEDICAL EXAMINATION.....	275
• EXECUTIVE MEDICAL EXAMINATIONS.....	275
• EXIT MEDICAL EXAMINATION .....	275
• REVIEW QUESTIONS .....	276
• REFERENCES: .....	276
<b>CHAPTER 19.....</b>	<b>277</b>
<b>HEALTH CHALLENGES IN THE WORKPLACE</b>	
• MUSCULOSKELETAL AND SENSORY EFFECTS .....	277
• MIGRANT WORKERS.....	277
• CORONAVIRUS INFECTIONS.....	277
• BACKGROUND ON HUMAN CORONAVIRUSES.....	277



• VACCINES AND VACCINATION .....	286
• BIOLOGICAL HAZARDS .....	289
• VIBRATION .....	289
• ALCOHOL AND DRUGS IN THE WORKPLACE .....	290
• CANNABIS IN THE WORKPLACE .....	291
• LEGALIZATION OF CANNABIS.....	291
• COMMON TERMS USED FOR CANNABIS.....	292
• HEALTH EFFECTS OF CANNABIS .....	292
• IMPACT OF CANNABIS ON THE BRAIN .....	292
• IMPACT OF CANNABIS ON THE BODY .....	293
• WAYS OF USING CANNABIS .....	294
• REPORTED THERAPEUTIC BENEFITS OF USING CANNABIS.....	294
• REASONS FOR USING CANNABIS.....	294
• SYMPTOMATIC SIGNS OF HAVING USED CANNABIS.....	295
• PARAPHERNALIA AND HIDEAWAY PLACES .....	295
• IMPACT OF CANNABIS ON WORKPLACES .....	296
• RECOMMENDATIONS FOR CONTROL IN THE WORKPLACE.....	296
• ERGONOMICS .....	296
• ERGONOMIC HAZARDS.....	298
• ERGONOMIC CONSIDERATIONS.....	298
• REVIEW QUESTIONS .....	299
• REFERENCES: .....	299

## **CHAPTER 20..... 301**

### **ADDITIONAL HEALTH CHALLENGES IN THE WORKPLACE**

• HIV AND AIDS IN THE WORKPLACE .....	301
• WELDING .....	302
• MANAGING ASBESTOS IN BUILDINGS.....	302
• ASBESTOS-RELATED DISEASES .....	303
• TYPES OF ASBESTOS IN BUILDINGS.....	303
• MOST AT RISK WORKERS TO ASBESTOS EXPOSURE.....	303
• COMMON PLACES WHERE ASBESTOS CAN BE FOUND IN BUILDINGS .....	303
• DUTY TO MANAGE ASBESTOS.....	303
• STEPS TO CONSIDER WHEN ASSESSING RISK OF ASBESTOS EXPOSURE.....	304
• CHECKLIST ON MANAGING RISK OF ASBESTOS EXPOSURE.....	305
• ASBESTOS-RELATED RECORD KEEPING .....	305
• SKIN DISEASE .....	305
• LEAD EXPOSURE.....	305
• SLEEP DEPRIVATION AND FATIGUE.....	306
• RADIATION.....	306
• ELECTROMAGNETIC FIELDS (EMF'S) .....	306
• STRESS .....	307
• REVIEW QUESTIONS .....	308
• REFERENCES.....	308

<b>CHAPTER 21.....</b>	<b>310</b>
<b>HEALTH PROMOTION</b>	
• EMPLOYEE ASSISTANCE PROGRAMS .....	310
• ABSENTEEISM .....	311
• CAUSES OF ABSENTEEISM.....	311
• CONSEQUENCES OF ABSENTEEISM.....	312
• STRATEGIES TO REDUCE ABSENTEEISM .....	312
• HEALTH PROMOTION .....	314
• HEALTH RISK ASSESSMENT (HRA) .....	315
• BENEFITS OF CONDUCTING PERSONAL HEALTH RISK ASSESSMENTS .....	315
• PRIMARY HEALTH CARE .....	316
• OFF-THE-JOB HEALTH AND SAFETY.....	316
• REVIEW QUESTIONS .....	316
• REFERENCES.....	317
<b>PART 4 MANAGEMENT OF THE ENVIRONMENT.....</b>	<b>319</b>
<b>CHAPTER 22.....</b>	<b>320</b>
<b>INTRODUCTION TO ENVIRONMENTAL PRODUCTION MANAGEMENT</b>	
• ENVIRONMENTAL ACTS, REGULATIONS AND GUIDELINES .....	321
• ENVIRONMENTAL IMPACT OF TOURISM .....	323
• ENVIRONMENTAL IMPACT OF ENERGY.....	324
• ENVIRONMENTAL IMPACT OF TRANSPORT .....	324
• ENVIRONMENTAL IMPACT OF HOUSEHOLDS .....	324
• TRADE IMPACT ON ENVIRONMENT .....	324
• SOCIAL RESPONSIBILITY .....	324
• ENVIRONMENTAL TRAINING AND AWARENESS .....	325
• REVIEW QUESTIONS .....	326
• REFERENCES.....	327
<b>CHAPTER 23.....</b>	<b>329</b>
<b>ENVIRONMENTAL POLLUTION AND EFFECTS</b>	
• HUMAN INDUSTRIAL ACTIVITIES.....	329
• AIR POLLUTION .....	331
• SOURCES OF AIR POLLUTION .....	331
• HARMFUL EFFECTS OF AIR POLLUTION .....	334
• PREVENTION AND CONTROL OF AIR POLLUTION .....	334
• WATER POLLUTION.....	335
• SOIL POLLUTION .....	340
• OPT FOR BIODEGRADABLE.....	342
• NOISE POLLUTION .....	343
• ILLUMINATION OR LIGHT POLLUTION .....	344
• OTHER FORMS OF POLLUTION .....	345
• REVIEW QUESTIONS .....	345
• REFERENCES.....	346

<b>CHAPTER 24.....</b>	<b>348</b>
<b>COMMON ENVIRONMENTAL CHALLENGES</b>	
• VENTILATION .....	348
• THERMAL STRESS.....	348
• ENERGY OPTIMISATION .....	350
• PASSIVE ENERGY EFFICIENCY .....	350
• ACTIVE ENERGY EFFICIENCY.....	351
• WASTE MANAGEMENT .....	351
• ARTIFICIAL INTELLIGENCE AND ENVIRONMENTAL CHALLENGES .....	354
• REVIEW QUESTIONS .....	354
• REFERENCES: .....	355
<b>CHAPTER 25.....</b>	<b>356</b>
<b>DISASTER MANAGEMENT</b>	
• TYPES OF DISASTERS .....	357
• PRINCIPLES OF DISASTER MANAGEMENT .....	357
• THE ROLE OF MUNICIPALITIES IN DISASTER MANAGEMENT .....	358
• IDENTIFYING POTENTIAL LOCAL DISASTER HAZARDS .....	359
• DISASTER MANAGEMENT IN THE ORGANISATION.....	359
• EMERGENCY PREPAREDNESS AND RESPONSE .....	359
• WHEN A LOCKDOWN IS NECESSARY – A RECENT EXAMPLE .....	360
• WHAT IS A LOCKDOWN?.....	360
• PURPOSE OF THE LOCKDOWN .....	360
• RESTRICTIONS ON WORKING? .....	360
• PERMISSABLE ACTIVITIES.....	360
• PREPARATION FOR AN EMERGENCY.....	361
• EMERGENCY PLANS .....	362
• CO-ORDINATION .....	362
• CO-ORDINATING ACTIONS.....	363
• TESTING THE PLAN.....	363
• LOCATION OF EMERGENCY EQUIPMENT .....	363
• SEQUENCE OF AN EVACUATION .....	364
• GENERAL AND PARTIAL EVACUATION .....	365
• ENSURING SAFETY FOR DRIVERS IN PROTESTS .....	365
• HAZARDS EVALUATION AND CONTROL .....	365
• PHYSICAL HAZARDS .....	366
• CHEMICAL HAZARDS.....	366
• BIOLOGICAL HAZARDS .....	366
• ERGONOMIC HAZARDS.....	366
• PSYCHOSOCIAL HAZARDS .....	367
• RISKS.....	367
• PRACTICAL HAZARD IDENTIFICATION .....	367
• CLASSIFICATION OF HAZARDS.....	367
• SEVERITY.....	367
• FREQUENCY .....	368
• EXPOSURE.....	368
• REVIEW QUESTIONS .....	368

• REFERENCES: .....	368
<b>CHAPTER 26.....</b>	<b>370</b>
<b>ENVIRONMENTAL MANAGEMENT SYSTEMS (EMS)</b>	
• BENEFITS OF AN EMS.....	371
• ENVIRONMENTAL IMPACT ASSESSMENT.....	374
• SETTING UP PERFORMANCE INDICATORS .....	374
• ENVIRONMENTAL AUDITING .....	375
• GUIDELINES FOR ENVIRONMENTAL AUDITING.....	376
• ENVIRONMENTAL SPECIFIC TRAINING AND AWARENESS.....	376
• ENVIRONMENTAL REPORTING.....	377
• USE OF CONSULTANTS IN ENVIRONMENTAL MANAGEMENT .....	377
• REVIEW QUESTIONS .....	378
• REFERENCES.....	378
<b>Some web sites with health and safety information.....</b>	<b>380</b>
<b>INDEX .....</b>	<b>381</b>

## FOREWORD

'Prof Theo clearly did not sleep while putting this handbook together. A health and safety handbook of this magnitude will change the way that South African, and African health and safety practitioners see the subject. A very necessary addition to all practitioners' reference material when navigating the health and safety space. While it is set up for the South African health and safety industry, it can be used internationally. There are really well thought out supporting documents that can be adapted for all workplaces, ready to use. A mix of theory and a very practical approach that will assist in meeting good standards in the workplace for those just entering the field, or the seasoned practitioner who needs to brush up on their practices. A broad range of subject areas relating to health and safety are needed by a health and safety practitioner, and the handbook really delivers with the range needed. Areas generally not well managed, specifically in my field of occupational health will be extremely important in managing employee well-being, primary health care and limiting occupational diseases. Prof Theo has included his knowledge, and decades of experience across many countries into the textbook and enriched the South African health and safety industry in so doing.'

Dr Claire Deacon  
Johannesburg  
June 2020

## PREFACE

The global performance track record of the management of safety, health and the environment (SHE) by industries has been persistently poor. I was inspired to conduct extensive research over many years by my interest in trying to understand the reasons for this poor performance and through that effort contribute to its improvement. My research interest led me to study at the University of Florida in the USA where I obtained a PhD. My doctoral dissertation examined a performance approach to construction safety and health given the dismal performance track record of this particular sector which regularly kills and maims a large cohort of people each and every year. My research activities in SHE over time have gained me both a national and international reputation of expertise in the SHE space. For example, about SHE I have addressed a wide range of audiences as an invited speaker, presented a large number of conference papers, published several journal papers, wrote a number of book chapters, served on the Occupational Health and Safety Advisory Committee advising the Minister of Labour and presented many SHE-related workshops across South Africa.

However, for many years I have had the desire to compile a comprehensive text or handbook on the management of safety, health and the environment (SHE) in South Africa considering that there very few if any such texts available. I wanted to use my expert knowledge and experience to fill this perceived vacuum. However, work on the actual text only began after presenting several iterations of a series of nine-day long SHE training workshops in KwaZulu-Natal in South Africa. The national lockdown due to COVID-19 in 2020 provided the space to accelerate progress on the final text. I used the workshop material and the various visual presentations to inform the content.

The handbook is divided into four parts, namely introduction to SHE management, management of safety, management of health, and management of the environment. It consists of 26 chapters that cover a wide range of relevant and current aspects of SHE management within the context of the South African legislative and regulatory framework and better practice. However, the principles of management are the same since the focus is not on mere compliance but on better practice which should be the goal of all SHE practitioners and all businesses irrespective of the sectors that they operate in. For example, the book covers the occupational health and safety legislative and regulatory framework, the need for SHE management, use of current technology, risk management, hazard identification and risk analysis, cannabis in the workplace, management of asbestos, COVID-19, disaster management and SHE management systems just to mention a few topics.

I believe the handbook is an important one that will help not only SHE practitioners, but anyone interested in wanting to know how better to manage SHE in the workplace. It is not intended to be exhaustive but rather to provide guidance on key aspects and principles that can be applied in any workplace in any industry. Writing the book was challenging given the dynamic nature of SHE management especially in the South African context to ensure that the content was current and user friendly. To remain abreast of the latest developments I consulted many online resources for detailed information, some of which are listed at the end of each chapter as references for further reading. In some cases, the references are extensive while in others they are not. Each chapter has a series of simple review questions which are useful for training and evaluation purposes. The book can be read cover to cover through each consecutive chapter from beginning to end or by referring to relevant sections in any order of preference.

I am thankful to Patric Pantelis of FTS Safety who insisted that I develop and present SHE training in the KwaZulu-Natal Province of South Africa and initially provided me with a collection of anonymously authored notes some of which I reworked, adapted and used. Where I used online sources, I attempted to contact the sources for permission to include them in this text. In every case I cited the source both in-text and in the reference list to ensure that the contribution was duly acknowledged and fully recognized providing for readers to visit the sites themselves and familiarise themselves with the author/s firsthand. I acknowledge the University Extended Learning (UEL) unit of the University of KwaZulu-Natal in Durban, South Africa for allowing me to conduct several series of SHE management training courses. I am particularly thankful to my postgraduate students, Mariam Akinlolu and Mohlomi Terah Raliile who assisted me in critiquing and reviewing the text as I compiled it. I acknowledge that this handbook would not have been possible without part funding from the National Research Foundation (NRF) and that opinions expressed and conclusions arrived at are mine and are not necessarily to be attributed to UEL or the NRF.

Prof. Theo C Haupt  
Durban, South Africa  
June 2020

## **PART 1**

# **INTRODUCTION TO SAFETY, HEALTH AND ENVIRONMENT MANAGEMENT**

This section comprises 9 chapters that introduce key aspects of safety, health, and environment management in general industry in South Africa. Chapter 1 highlights the importance of effectively managing occupational safety, occupational health and the environment during general industrial activities. Chapter 2 outlines the general principles governing occupational health and safety. Chapter 3 discusses a systematic approach to managing safety, health, and the environment. Chapter 4 covers the importance of policy and the effective distribution of responsibilities for managing safety, health, and the environment at various levels. The critical role of communication and communication strategies as part of managing safety, health and the environment are discussed in Chapter 5. Chapter 6 deals with the importance of risk management and introduces various risk management concepts and approaches. Chapters 7 and 8 deal with broad legal concepts and principles that govern the South African legislative and regulatory framework and specifically addresses the various statutory requirements in the occupational safety, health, and the environment spaces. This section concludes in Chapter 9 with the operational management aspects of keeping and preserving records, reporting and control of important documents.

# CHAPTER 1

## THE NEED FOR SAFETY, HEALTH AND ENVIRONMENTAL MANAGEMENT

The effective management of safety, health and environment in all workplaces has many benefits. These benefits include, for example, the improved overall wellbeing of the workforce, increased productivity, reduced work-related accidents, injuries and fatalities, and a positive public impression of the organization and its management.

### IN THE BEGINNING

Since the beginning of time man needed shelter and to survive and provide for his family – a notion captured by Maslow in his seminal Hierarchy of Needs. To be able to satisfy this very basic human need he had to work. However, he had to look for raw materials in his daily natural environment to use as ‘tools’ to perform tasks that he could not do entirely by himself. As a result, he was able not only to shorten the time it took to do some tasks but also do so much more in a much shorter time than he could without these ‘tools. However, many of these rudimentary tools and implements could potentially hurt and even kill him because of their crude and rough shapes, heavy and awkward handling, and the type of material that they were made of. As man developed over time, he adapted his tools so that he could use them under safer and healthier conditions. Consequently, he became less ill from the activities he was engaged in and avoided unnecessary injuries. Some have suggested that these adaptations driven by his immediate needs for shelter and survival were the earliest beginnings of basic occupational health, safety and environment management.

Several key inventions over time influenced the development of man as a productive and industrious person at work. One such invention was the wheel which had a profound effect on the human economy and society. Since the introduction of wheels, it has become easier to travel and move about. A world with no wheels around is hard to imagine.

The invention of the wheel around 3,000 years ago, resulted in a revolt in the manufacturing industry. New tools and operating procedures were developed to cope with the demand created by new inventions and their use. As a means of efficiently carrying goods for long distances, vehicles, and modes of transport with wheels allowed for the broadening of trade networks. With access to a wider market, craftspeople could more easily specialize in specific crafts or trades and communities could expand if there was no longer any need to live close to areas where food was processed.

Man, slowly continued to develop additional new tools and machines, enabling him to achieve even more than what was previously possible and more efficiently. In this process he used existing tools to make and develop new ones. Certain specific trades were established and standards were set to promote uniformity. Safe practices became standard.

Further, the introduction of innovations generally taken for granted such as making running water available on tap and hygienic ablution facilities contributed substantially to the health and prosperity of man and society in general. Because of activities such as farming and mining, man was also starting to have a serious impact both directly and indirectly on the environment.

### INDUSTRIAL REVOLUTIONS AND THEIR IMPACT

Before the Industrial Revolution began in 1760, it was normal to make a living through agriculture or the making and selling of products from the home. The pressure of the resultant new developments in machinery and manufacturing processes resulted in mass production and the establishment of the factory system. Urbanization increased as workers came to the cities seeking employment within these new mills and factories. This increase in the size of the available workforce and demand for work led to poor pay, hazardous factory working conditions and an increase in child labour. Although child labour offered a cost-effective solution because of the low wages that were paid, the lack of industrial experience resulted in serious accidents when working with foreign or unfamiliar machines or chemical substances. Working hours were invariably long and conditions dangerous for the workers, with many of them losing their lives at work. Further, a general lack of health and safety at work led to many of the child workers developing occupational diseases such as terminal lung cancer and early deaths.

Because of growing concerns relating to the effects of worker health and illness on productivity the Factory Acts in the UK was formed, for example. As the number of other work-related accidents increased, including mining fatalities, and the unknown effects of working with chemicals, the Government came under pressure to act against organizations who did not protect their employees effectively. Sir Robert Peel, who was a factory owner himself in Britain introduced the Health and Morals of Apprentices Act 1802, commonly known as the Factory Act which is generally regarded as the beginning of health and safety regulation and which required, for example:



- Sufficient windows and openings for ventilation
- Cleaning at least twice yearly with quicklime and water
- Limited working hours to no more than 12 hours a day (excluding time taken for breaks)
- Elimination of night-time work from 21h00 to 06h00
- Provision of suitable clothing and sleeping accommodation to workers

Consequently, various laws were introduced that included the significant appointment of factory inspectors initially to prevent injury and child labour. For the first time ever, an external set of rules was now governing the health and safety of workers in the workplace and being monitored. The main duty of factory inspectors was to prevent injury and overworking of child workers but also to formulate new regulations and laws to ensure the Factories Act could be suitably enforced.

The introduction of ‘duty of care’ provisions that were later introduced established that an employer was not responsible to ensure higher safety standards for an employee than he ensured for himself. A kind of ‘treat others the way you would treat yourself’ approach – the so-called Golden Rule.

As time passed mechanisms were introduced for workers to claim compensation for injury or death caused by a defect in equipment or machinery or negligence of a person given authority over the worker by the employer. Workers were eventually only required to prove that the injury occurred on the job, namely that it was work-related.

Progressively additional health and safety regulations were developed, introduced, implemented and enforced which included

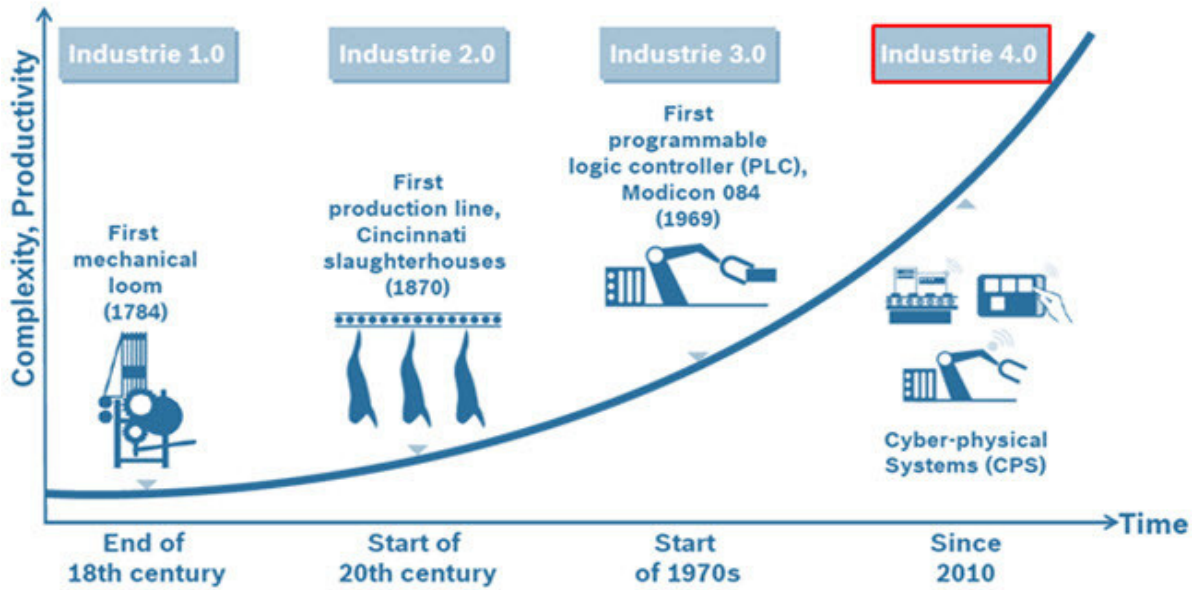
- Requirements to provide safeguarding for machinery
- Raising the legal working age
- Increasing numbers of inspectors appointed across industries

Generally mass production, the use of machinery and the availability of cheap labour resulted in health and safety at work to unfortunately not be regarded as important. Sadly, it was commonly believed that it was cheaper to replace a dead or injured worker than to implement health and safety measures. After World War II, legislation was introduced to ensure employers provided their workers with a work environment free from hazards including exposure to toxic chemicals, excessive noise levels, mechanical dangers, heat or cold stress and unsanitary conditions.

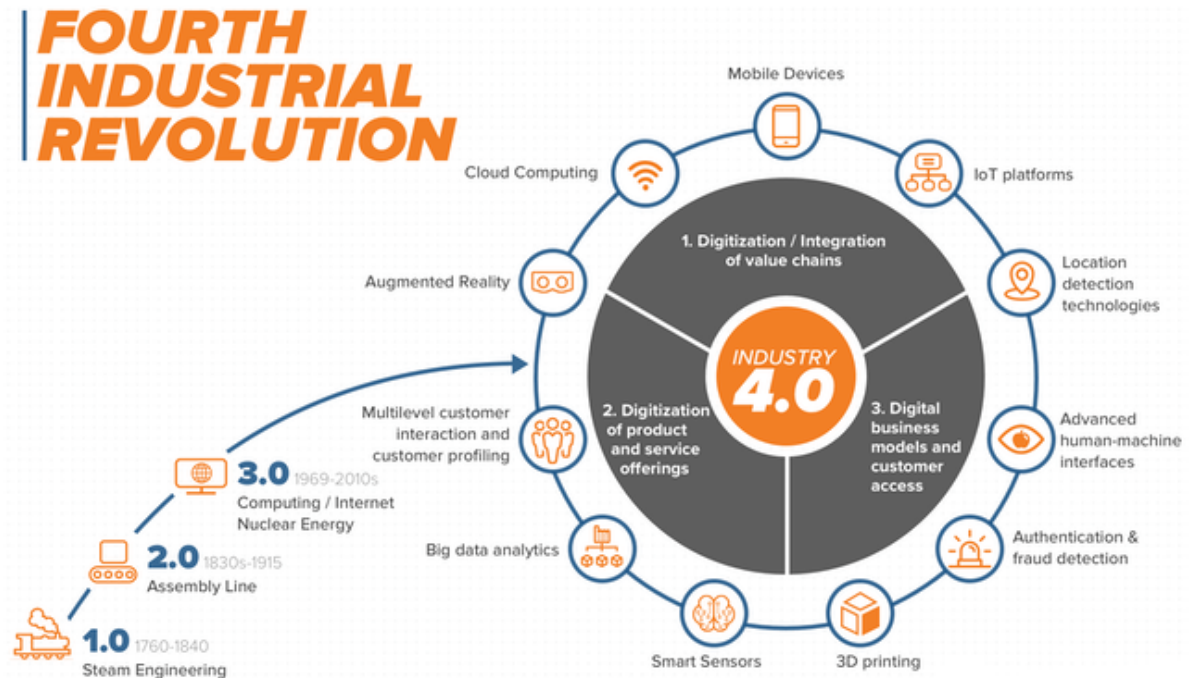
**A good and informative read is ‘Two steps forward, one step back’ A brief history of the origins, development and implementation of health and safety law in the United Kingdom, 1802–2014 by David Eves**

It was important for employers to motivate their workforces to achieve higher levels of effectiveness, while gaining their trust and cooperation in the process. One way to achieve this level of performance on a sustainable basis was to improve the working and living conditions of workers to mutually negotiated and acceptable standards. This process included the improvement of health and safety standards of work activities themselves and the workplace and environment. Through ongoing research, health and safety standards have subsequently been implemented and adapted to meet industry demands.

Vast amounts of effort and money have been invested into the study of the effects and impacts of technological advancement on the environment. Research has shown that industrial activity has had devastating effects on the environment. Measures to protect the environment against the negative effects of human exploitation needed to be devised and adapted according to the ever-changing need to do so.



The Fourth Industrial Revolution also referred to as 4IR presents new challenges in the workplace. This new digital industrial technology makes it possible to gather and analyse data across machines, enabling faster, more flexible, and more efficient processes to produce higher-quality goods at reduced costs. This manufacturing revolution will increase productivity, shift economics, foster industrial growth, and modify the overall profile of the—ultimately changing the competitiveness of companies and regions. As a result, new threats to safety, health and the environment will emerge – some of the work activities which will present these threats are not even identifiable yet. This industrial revolution introduces challenging and interesting times ahead for entrepreneurs, employers, and workers as they adapt, survive, or die!



Source: <https://cdn.shockoe.com>

Advanced digital technology is already being used in manufacturing, but with 4IR, it will significantly transform product production and service delivery. It will lead to greater efficiencies and change traditional production relationships among all stakeholders in the supply chain that includes suppliers, producers, and customers—as well as between humans themselves and machines. It will challenge ideas of what being human actually means. Nine technology trends form the building blocks of Industry 4.0 (4IR) and are transforming industrial production. These are:

---

- BIG DATA AND ANALYTICS

In an Industry 4.0 context, the gathering and evaluation of data comprehensively from a large number of different sources such as production systems and equipment as well as the management systems of enterprises and customers will become universally standard to support real-time decision making.

---

- AUTONOMOUS ROBOTS

It is already possible for robots to interact with other robots and work safely alongside humans while learning from them. The benefits of this development are that these robots will be less expensive and have a greater range of capabilities than those already currently used in present manufacturing.

---

- SIMULATION

Simulations will be used more extensively than presently in plant operations to leverage real-time data. These simulations will effectively mirror the physical world in a virtual model. This model could include machines, products, and humans. This increased usage of simulations will allow operators to test and optimize the machine settings for the next product in line in the virtual world before the physical changeover, thereby driving down machine setup times and increasing quality, health, and safety. Simulations therefore provide an effective and efficient form of ‘what if’ scenarios.

---

- HORIZONTAL AND VERTICAL SYSTEM INTEGRATION

Within the context of 4IR, it is possible for organisations, departments, functions, and capabilities to become increasingly cohesive, due to the evolution of cross-company and universal data-integration networks and enable truly automated value chains.

---

- THE INTERNET OF THINGS (IOT)

The 4IR context means that more devices which may sometimes including unfinished products, will be enriched with embedded computing. Consequently, this embedded computing will allow field devices to communicate and interact both with one another and with more centralized controllers. IoT will also decentralize analytics and decision making and enable responses in real-time.

---

- CYBERSECURITY

Given the increased connectivity and use of standard communications protocols that is facilitated within the context of 4IR, there will be an increased need to protect critical industrial systems and manufacturing lines from cybersecurity threats. Therefore, it is essential to have secure, reliable communications and sophisticated identity and access management of machines and users.

---

- THE CLOUD

4IR will result in production-related undertakings require high levels of data sharing across organizational sites and boundaries. Simultaneously, cloud technology performance will improve, achieving reaction times of mere milliseconds. Consequently, machine data and functionality will be deployed to the cloud increasingly, enabling more data-driven services for production systems.

---

- ADDITIVE MANUFACTURING

Additive manufacturing such as 3-D printing, is being increasingly used in organizations to prototype and produce individual components. With 4IR, these additive-manufacturing methods will be used more often to produce small batches of customized products to offer, for example, construction advantages, such as complex, lightweight designs.

---

- AUGMENTED REALITY

Augmented-reality-based systems support a variety of services. It is likely that organizations will use of augmented reality on a much broader basis in the context of 4IR to provide their workers with real-time information to improve their on-the-job decision making and work procedures.

Given the recent global challenges presented by the COVID-19 pandemic the opportunity is presented to expand research into technologies which will prevent or at least limit the exposure of all industry stakeholders to potential infection of not only the current COVID-19 but also increase preparedness for any future pandemic or global disaster. The efficacy of social distancing between workers in the workplace of around 2m places challenges in the way work activities are traditionally executed. Core work activities will be increasingly examined in the future and technologies

will be developed that can execute them either without the physical involvement of workers themselves or involvement from a distance from other workers. Further, pre-workplace entry screening and detection technologies will be developed as early warning mechanisms to prevent possible infection at the point of entry to work premises. Protocols to promote off site and working from remote locations while still monitoring work activities and production progress will receive attention. Issues of cybersecurity will be addressed when using virtual communication platforms for meetings. Fully automated operator-less plant and equipment will be developed. Innovative logistical management of the supply chain and material delivery will be investigated and improved under the conditions of the 'new norm.' The legislative and regulatory framework that govern industries will be adapted to suit new contractual, working and labour employment conditions that include provisions for the use of new technologies, training of workers to use them as well as revisiting definitions of *force majeure*. The opportunities are endless given the vast amount of effort to improve overall health and safety performance using innovative and advanced technologies at worker, project, sector, national and global levels.

As a result, organizations will face formidable challenges in the adoption of these new technologies. To build and sustain competitiveness in the race to full implementation, they will need to broaden and deepen their practical knowledge about innovative digital and advanced technologies and their related uses. At the same time, they will need to manage SHE in this new and ever-rapidly-changing environment. The goal and principles of managing SHE will remain constant and the SHE operating framework will have to be adaptable enough to accommodate occupations that have not even been invented yet.

---

- REASONS FOR SHE PROGRAMMES

### **Legal considerations**

In South Africa several laws influence and affect the employer/worker relationship. The Occupational Health and Safety Act, No. 85 of 1993 (OHS Act), the Mine Health and Safety Act, No. 29 of 1996 and the Compensation for Occupational Injuries and Diseases Act, No. 130 of 1993 (COID Act) are the pieces of legislation involved. It is imperative that SHE practitioners must familiarise themselves fully with all sections and regulations applicable to health, safety and the environment. Failure to comply with Acts, which regulate health and safety in industry and in the mines, can result in unnecessary delays in production, legal liability claims and possible criminal prosecution.

The following are, inter alia, other Acts regulating safety, health and the environment in South Africa, namely

- ✓ The Constitution,
- ✓ Basic Conditions of Employment Act,
- ✓ Explosives Act,
- ✓ Labour Relations Act,
- ✓ National Building Regulations Act,
- ✓ Hazardous Substances Act,
- ✓ Nuclear Act,
- ✓ Road Ordinance Act,
- ✓ Fire Act,
- ✓ Pollution Act, and
- ✓ Certain SABS codes of practices.

### **Moral and social considerations**

Management and workers have, apart from their legal responsibilities, a moral and a social obligation towards other workers and themselves to ensure effective health, safety and environmental management and protection. Management also has a moral and social responsibility towards safeguarding the public, contractors and visitors who may be affected by the activities of their operations and the use of their products. Organizations must act responsibly regarding the hazards of the articles or substances they produce, process, use, handle, store, or transport. Social and moral obligations interlink with legal and financial considerations.

### **Economic considerations**

According to Peter Drucker, the well-known Austrian-born American management consultant, educator, and author, "The first duty of an organization is to survive, and the guiding principle of business economics is NOT the maximization of profit, it is the avoidance of loss." The direct costs of incidents are according to the latest report of the Compensation Commissioner more than R450, 000, 000.00. The indirect costs can be as high as 50: 1 depending on the type of business and other factors.

If an organization experiences an annual incident loss of R200 000.00 and they sell their products at a 5% margin, then 20 times the amount must be sold to make up for the loss incurred. Business enterprises or public institutions must be financially viable by making profits to survive. In the case of the public sector, or other service orientated institutions and organisations, the profit refers to providing "optimum service levels at least cost".

---

- HEALTH AND SAFETY AS A VALUE

What an organisation believes to be morally correct and justifiable when questioned on the health and safety of its workers is a reflection on how it values its people. Many organizations make health and safety their number 1 priority. Sadly, priorities change from time to time. Instead, if health and safety was an organizational core value it is not subject to change. That is what organizations should be striving for.

---

- HEALTH AND SAFETY AS A COST FACTOR

Serious work-related injuries and diseases have an enormous cost implication on the economy of South Africa. The following are therefore important, namely:

- ✓ The financial implications of injuries or health problems for the worker.
- ✓ The potential suffering for the injured or sick worker and his / her family.
- ✓ The potential effect on the career and future employment opportunities of the worker.
- ✓ Loss in productivity associated with workers who are absent from work due to occupational injuries or illness.
- ✓ The loss in needed skills if the worker is no longer able to perform the duties, he / she previously performed.
- ✓ The cost of re-training workers if they are to be accommodated in an alternative position within the organization.
- ✓ The cost of recruitment and employment of replacement staff.
- ✓ Disruption of the normal flow of work and delivery of services if key staff are lost or if operations have to stop due to workplace accidents.
- ✓ The effect on the general morale of other workers when workplace accidents occur.

---

- HEALTH AND SAFETY AND THE WORKPLACE

Risks are accepted as a part of daily life. Working cannot be stopped just because there are risks associated with the work, but the risks and exposure to them can be effectively managed. There is no perfect workplace without risks. However, health and safety in the workplace is both a state of mind as well as a way workers work and act towards each other.

- ✓ Joint responsibility and self-regulation are necessary. All the role players in an organisation such as the employer, workers and trade unions, should work together and accept joint responsibility to make the workplace a safer place.
- ✓ Effective communication channels are critical. Communication channels should be available and regularly revised to ensure that health and safety issues and risks are communicated effectively. Communication should not only be focused on enforcing policies and procedures but also on reporting potential problems. Therefore, all workers should know to whom they must report these problems or improvement suggestions as well as the rules for reporting injuries sustained on duty.

Occupational health and safety legislation specifies that a workplace must ensure that persons other than those employed in the workplace and who are directly and indirectly affected by the activities of the workplace may not be exposed to health and safety risks. The implication is that, for example:

- ✓ A workplace may not pollute the natural environment or discard any material that may cause a health risk to others such as industrial toxic effluence and waste into rivers and canals.
- ✓ Persons who use products manufactured by the workplace must be informed of any health or safety risk they could be exposed to by using those products.

---

- HEALTH AND SAFETY AS A ZERO ACCIDENT VISION

It has long been argued in some quarters that accidents happen by chance. Consequently, accidents therefore cannot be influenced because one cannot affect chance. Because one cannot change chance trying to do so is wasting energy, time, and resources. Accidents are then perceived as an inevitable and integral part of life and work and caused by 'bad luck'. This argument and attitude create the situation where nothing is done, or a minimum effort is made to prevent accidents. The fact is that accidents are not fate or chance but unfortunate events that can be prevented. Everyone can do something about SHE. Prevention is the responsibility of everyone. Many organizations around the world have shown that having a profitable business does not require accidents to occur. These organizations have adopted a high standard SHE culture and the zero accident vision by accepting that accidents are preventable.



---

- GOVERNMENT OBJECTIVES

Government, like any business, sets objectives to be effective. These objectives are formulated and published. Measures are then implemented to achieve these objectives and the private sector is motivated to assist government in its efforts.

In terms of health and safety government may aim to increase the awareness of health and safety by training more people to a certain level of competence. To motivate trade and industry to participate in the effort, government may offer various incentives, such as, for example, subsidizing part of the health and safety training fee, and other tax incentives for having a consistent annual positive performance record.

---

- POLICY OF THE ORGANIZATION

The policy of the organization will determine its specific objectives regarding safety, health and environmental protection procedures. In addition to these objectives the organisation may set its own standards and procedures within the law. Notably, the Act and associated regulations prescribe the minimum requirements necessary to conform to the law.

For example, the law prescribes that the minimum depth of the tread on the tyres of a vehicle must be 1mm. The organisation may decide that, because of the distances travelled and the general condition of roads used the tyres on its vehicles should be replaced when the tread depth is 2mm, both to promote safety and to avoid the cost of a breakdown due to tyre failure.

---

- CORPORATE GOVERNANCE

Corporate governance has been defined as 'an internal system that includes the policies, processes and people, which serves the needs of shareholders and other stakeholders, by directing and controlling management activities with good business sense, objectivity, accountability and integrity.'

Key elements of good corporate governance principles include:

- ✓ honesty,
- ✓ trust and integrity,
- ✓ openness,
- ✓ performance orientation,
- ✓ responsibility and accountability,
- ✓ mutual respect, and
- ✓ commitment to the organisation.

Commonly accepted principles of corporate governance concerning health and safety in the workplace include:

- ✓ Interests of stakeholders, including workers: Organisations should recognise that they have legal and other obligations to all legitimate stakeholders.
- ✓ Integrity and ethical behaviour: Ethical and responsible decision making is a necessary element in risk management and avoiding lawsuits. Organisations should develop a code of conduct for their directors and executives that promotes ethical and responsible decision making.
- ✓ Disclosure and transparency: Organisations should clarify and make publicly known the roles and responsibilities everyone employed by the organisation and establish a level of accountability.

Compliance with health and safety legislation and regulations should form part of good corporate governance and not be the sole objective of OHS interventions.

---

- REVIEW QUESTIONS

1. Why should companies comply with health and safety legislation and regulations?
2. What is your view when it is claimed that accidents happen by chance?
3. How does health and safety save money?
4. Why would you encourage your organisation to have a SHE program?
5. How would you use the latest technology to improve SHE performance at your organisation?