TTE Training Ltd.

Phase 1 Broad Base Record of Achievement

Academic Year: 2025-2026

Name: _____

2025 RoSPA Order of Distinction
British Safety Council Five Star Occupational Health and Safety Audit 2024
British Safety Council International Safety Awards 2025 Merit
Ofsted Outstanding Provider

For mapping to the relevant apprenticeship standards please see the individual index pages 19-41

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STATEMENT OF INTENT

THE COMPETENCIES RECORDED IN THIS DOCUMENT ARE FOR A RANGE OF TASKS PERFORMED AND ASSESSED IN A TRAINING ENVIRONMENT SUPPORTED BY ANY NECESSARY UNDERPINNING KNOWLEDGE AND UNDERSTANDING

THEY FORM THE BASIC FOUNDATION LEADING TO FULL ASSESSMENT WHEN ON SITE.

BROAD BASED
RECORD OF ACHIEVEMENT FOR THE APPRENTICESHIP STANDARDS

PHASE I

Name of Trainee:…….

VALIDATION

The above named trainee has completed all the training modules detailed in this Record of Achievement

Signed: ..... *Print:* .....

(Training Manager or delegated signatory)

Date: ……

For mapping to the relevant apprenticeship standards please see the individual index pages 19-41

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TTE TRAINING LTD.

PHASE I RECORD OF ACHIEVEMENT BOOK

GUIDANCE NOTES

1. COURSE MARK

Either a course average, pass, or not applicable (N/A) statement to be entered as appropriate, (where an average is entered, 70% is the required minimum standard). An entry is only made in this box when either the pass mark is achieved, or if no further opportunities are available, the acronym FTR may be used to denote 'further training required' to achieve the required standard. For course detail see the relevant success criteria.

2. ASSESSOR SIGNATURE

Demonstrates that the individual has successfully completed a subject, or an activity related to a particular subject, and has been assessed by the TO and confirms that the individual has achieved the required standard as set out in the ROA. An (R) entered into this box may be used to denote that a re-assessment was required to achieve the required standard.

In the event of the absence of a signature, or the presence of "FTR", the Trainee Mentor/Training Officer should consult the Training Manager prior to the completion of the Phase I training period. Should there be insufficient time available arrangements may be made with the relevant employer for the trainee to complete the work. Alternatively a cross is to be inserted to prevent any future alterations.

3. DATE OF ENDORSEMENT

Accompanies the Training Officer signature that indicates when the trainees' work was assessed as "Completed" or "Not completed".

4. VALIDATION

To be completed by the Training Manager (or a delegated signatory) when all relevant sections of the Record of Achievement have been completed, (note, there may be occasions when this training extends beyond the Phase I period).

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SECTION 1

INTRODUCTION TO TTE

BASIC HEALTH & SAFETY

EMPLOYABILITY SKILLS

PREVENT DUTY AND BRITISH VALUES

For mapping to the relevant apprenticeship standards please see the individual index pages 19-41

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MODULE TITLE:	**INTRODUCTION TO TTE**
MODULE No.	S1
SCOPE :	To introduce the new trainee to the TTE training scheme by completing training in the following subject areas (note: some are Regulatory whilst the remainder are TTE specific).

OBJECTIVE No.	SUCCESS CRITERIA
1.	**Introduction** • TTE, DFE, Apprenticeship Levy and Sector Skills Registration • TTE Rules and Regulations • Emergency Procedures • Quality Procedures • Outline of Training Programme (Skills, BTEC Diploma in in Advanced Manufacturing Engineering, Apprenticeship Standards, Employment Rights & Responsibilities, End Point Assessment and Behaviour Learning Outcomes • Introduction to Work Environment
2.	**Safety** • Basic Safety Input • Introduction to HASAWA • Introduction to ROSPA • Introduction to COSHH • Basic First Aid • Hygiene at Work • Use of Fire Extinguishers • Manual Handling • Issue and care of Personal Protective Equipment (PPE)
3.	**Personal Development** • Mentor Process • Monitoring and Review Procedures • Introduction to Personal Development • Introduction to Thinking Skills at Work • Employability Skills
4.	• Effective Communication Skills **Departmental Introductions** • Workshop Safety (area and workshop specific) • Basic Hand-tool and Equipment Safety (See Fabrication department) • TTE training course overview I *(trainee)* ……. have completed the above induction package. I confirm that the above named trainee has completed the TTE Induction Package. *Trainee Mentor(sign) ..... (print) .....* *Date .....*

MODULE TITLE:	**BASIC HEALTH AND SAFETY CERTIFICATE (ROSPA)**
MODULE No.	S2
SCOPE	Develop the trainee's knowledge and understanding in the subject of basic Health and Safety in accordance with the current training objectives.

OBJECTIVE No.	SUCCESS CRITERIA
	The trainee's level of knowledge and understanding will be assessed by the completion of a TTE assessment and a RoSPA approved examination for which the trainee will receive a certificate. Course Synopsis ▪ Principles of Accident Prevention ▪ Health and Safety Law ▪ Risk Assessment and Principles of Control ▪ Fire and Fire Prevention ▪ Human Factors ▪ Housekeeping ▪ Machinery and Mechanical Hazards ▪ Portable Tools, Equipment and Electrical Hazards ▪ Environmental Factors and Noise at Work ▪ Occupational Health, Hygiene and Industrial Disease ▪ C.O.S.H.H. ▪ PPE and RPE ▪ Safe Access and Egress, Work at Height and Confined Space Entry ▪ Lifting Operations and Lifting Equipment ▪ Safety Organisation ▪ First Aid ▪ Manual Handling RoSPA examination Mark ……..% Pass / Fail Signed *(Trainer)* ..... *(print)* ..... *Date* .....

ROSPA covers the following New Apprenticeship Standard Core Competences in both Maintenance and Manufacturing (S1-3)

- WBL ref 1: Understand and comply with foundations of health and safety including responsibility for health and safety under HASWA
- WBL ref 2: Understand the procedures for first aid relevant to your workplace
- WBL ref 3: Understand and comply with risk assessment and control
- WBL ref 4:Appropriate use of personal protective equipment i.e. Respirators, breathing air hoods, PVC suits etc
- WBL ref 5: Understand and practice site/plant safety requirements including for example - Fire, COSHH, working at height, WBL ref 1COMAH, confined space Permits to work

For mapping to the relevant apprenticeship standards please see the individual index pages 19-41

MODULE TITLE :	**EMPLOYABILITY SKILLS – Thinking Skills at Work**
MODULE No .	S4
SCOPE	Develop trainee knowledge and understanding of Employability skills, based on 'Thinking Skills at Work' in accordance with the current training objectives.

OBJECTIVE No.	**SUCCESS CRITERIA**
	Knowledge and understanding will be assessed by observation and participation based on the "Thinking Skills At Work" course which consists of the following: • Teamwork operations • Communication - Following/ giving instruction • Error analysis / Paying attention to detail • Seeing different Points of view • Design/ Ergonomics/ efficient practice • Time management/ Meeting deadlines • Managing more than one task/ Scheduling/ Planning • Accountability for my own Actions • Working with Others • Problem solving, with Systematic approach • Leadership/ accountability/ influencing others • Learning from mistakes/ Drawing from experience • Concern for Safety of Self and Others • Adding value to the team • Personal Impact on team performance The trainee has / has not* completed the above training Signed *(Trainer))* ..... *(print)* ..... *Date* ..... **(delete as applicable)*

MODULE TITLE:	**EMPLOYABILITY SKILLS - Learning to Learn, Attitudes and Behaviour**
MODULE No. :	S5
SCOPE :	Develop trainee knowledge and understanding of how to learn in different environments in accordance with the current training objectives.

OBJECTIVE No.:	SUCCESS CRITERIA
	Knowledge and understanding will be assessed by observation and participation on the "Sylvia Downs - Learning to Learn" course which consists of the following: • Workplace Attitudes and Behaviour • Identifying why we need to learn • Identifying personal strengths and weaknesses • What prevents me from learning, and how can we improve our learning • Overcoming Learning Blockages • The role of a trainer/ trainee • How we learn • Learning with Others , Learning from Others • Being a good listener • What body language can say about you • Taking Responsibility The trainee has / has not* completed the above training Signed *(Trainer)* ..... *(print)* ..... Date ..... * *(delete as applicable)*

Employability Skills covers the following New Apprenticeship Standard Core Competences in both Maintenance and Manufacturing (S1-3)
WBL ref 27: Demonstration of one or more problem solving techniques
WBL ref 29: Identify problems and apply appropriate methods to identify causes and achieve satisfactory solutions
S19: Demonstrate the required attitudes, behaviours and interpersonal skills associated with the professional workplace

MODULE TITLE:	**Prevent Duty and British Values (Identity and Belonging)**
MODULE No. :	S7
SCOPE :	Develop knowledge and understanding of the importance of Identity and Belonging as a resilience tool against Extremism in accordance with the current training objectives

OBJECTIVE No.:	**SUCCESS CRITERIA**
	To Safeguard learner from the threat of Extremism and Radical influences The Training consists of the following aims: • To understand the ideology of extremist groups and ideologies operating in the UK and abroad (Far Right and ISIS). • Present some counter narratives to such ideologies. • Provide participants with the confidence and resilience to critically think for themselves of recognising and referring cases of concern. Signed *(Trainer)* ..... *(print)* ..... Date ..... **(delete as applicable)*

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SECTION 2

RECORDS OF ACHIEVEMENT

SATISFACTORY KNOWLEDGE AND UNDERSTANDING OF THE FOLLOWING SUBJECTS HAS BEEN DEMONSTRATED VIA OBSERVATION OF PRACTISE AND THE COMPLETION OF PRACTICAL AND WRITTEN ASSIGNMENTS AND TESTS.

For mapping to the relevant apprenticeship standards please see the individual index pages 19-41

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RECORD OF ACHIEVEMENT – PHASE I

This Record of Achievement is to be completed by the Training Officer once the trainee has achieved the required standard, having completed all practical and written units relevant to the subject area, and may therefore be deemed competent only in a training environment as outlined in the subject synopsis.

This is a Record of : ..... whose training started : ..... Employed by : .....

Pg No	Module No	Module Title	Course Mark/ Completed	Date	Maintenance Std Ref	WBL Ref:	Manufacturing Std Ref
44	E1	ELECTRICAL SAFETY – WORKSHOP INDUCTION		28/09/20	S1-3 S4 S7 S8 S9 S11 S12 S13 S14 S15 S17	3 4 5 9 26 27 28 29 34-37 38 39 40 43 44 47 48 50 51 52 53 59	K3 K5 S39 B1 B2 B3 B4 B5 B6
44	E2	INTRODUCTION TO ELECTRICITY			S17	59	K30 K33 S1 S3 S8 S18 B1 B2 B3 B4 B5 B6
45	E3	CABLES, PLUGS AND SOCKETS			S1-3 S4 S7 S8 S9 S11 S12 S13 S14 S15 S17	3 4 5 9 26 27 28 29 34-37 38 39 40 43 44 47 48 50 51 52 53 59	K38 S1 S3 S8 S28 S35 B1 B2 B3 B4 B5 B6
45	E4	INTRODUCTION TO ELECTRICAL PRINCIPLES (V.P.L.)			S16 S17	36 58 59	S1 S3 S8 B1 B2 B3 B4 B5 B6
46	E5	UNIT 1 TEST INSTRUMENTS			S1-3 S4 S7 S8 S9 S10 S11 S12 S13 S14 S15 S17	3 4 5 9 26 27 28 29 34-37 38 39 40 43 44 45 47 48 50 51 52 53 59	S1 S3 S8 B1 B2 B3 B4 B5 B6
46	E6	UNIT 2 RESISTORS & RESISTANCE			S1-3 S4 S7 S8 S9 S11 S12 S13 S14 S15 S17	3 4 5 9 26 27 28 29 34-37 38 39 40 43 44 47 48 50 51 52 53 59	S1 S3 S8 B1 B2 B3 B4 B5 B6
47	E7	UNIT 3 MEASUREMENT AND OHMS LAW			S1-3 S4 S7 S8 S9 S11 S12 S13 S14 S15 S17	3 4 5 9 26 27 28 29 34-37 38 39 40 43 44 47 48 50 51 52 53 59	S1 S3 S8 B1 B2 B3 B4 B5 B6
47	E8	UNIT 4 RESISTORS - SERIES AND PARALLEL CIRCUITS			S1-3 S4 S7 S8 S9 S11 S12 S13 S14 S15 S17	3 4 5 9 26 27 28 29 34-37 38 39 40 43 44 47 48 50 51 52 53 59	S1 S3 S8 B1 B2 B3 B4 B5 B6
47	E8	UNIT 5 CAPACITORS			S1-3 S4 S7 S8 S9 S11 S12 S13 S14 S15 S17	3 4 5 9 26 27 28 29 34-37 38 39 40 43 44 47 48 50 51 52 53 59	S1 S3 S8 B1 B2 B3 B4 B5 B6
48	E9	UNIT 6 AC & DC MEASUREMENT			S1-3 S4 S7 S8 S9 S11 S12 S13 S14 S15 S17	3 4 5 9 26 27 28 29 34-37 38 39 40 43 44 47 48 50 51 52 53 59	S1 S3 S8 B1 B2 B3 B4 B5 B6
48	E10	CABLES AND CABLE GLANDS PRACTICAL			S1-3 S4 S7 S8 S9 S11 S12 S13 S14 S15 S17	3 4 5 9 26 27 28 29 34-37 38 39 40 43 44 47 48 50 51 52 53 59	K38 S1 S3 S8 S18 S28 S29 S35 B1 B2 B3 B4 B5 B6
48	E10	CABLES AND CABLE GLANDS PRACTICAL ASSIGNMENT			S1-3 S4 S7 S8 S9 S11 S12 S13 S14 S15 S17	3 4 5 9 26 27 28 29 34-37 38 39 40 43 44 47 48 50 51 52 53 59	K38 S1 S3 S8 S18 S28 S29 S35 B1 B2 B3 B4 B5 B6
		1st Carousel Average					

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Pg No	Module No	Module Title	Course Mark/ Completed	Date	Maintenance Std Ref	WBL Ref:	Manufacturing Std Ref
49	E11	SWITCHES & ISOLATORS			S1-3 S4 S7 S8 S9 S11 S12 S13 S14 S15 S17	3 4 5 9 26 27 28 29 34-37 38 39 40 43 44 47 48 50 51 52 53 59	S3 B1 B2 B3 B4 B5 B6
49	E12	DISTRIBUTION BOARDS			S1-3 S4 S7 S8 S9 S11 S12 S13 S14 S15 S17	3 4 5 9 26 27 28 29 34-37 38 39 40 43 44 47 48 50 51 52 53 59	S3 B1 B2 B3 B4 B5 B6
50	E13	CIRCUIT PROTECTION - HRC FUSES			S1-3 S4 S7 S8 S9 S11 S12 S13 S14 S15 S17	3 4 5 9 26 27 28 29 34-37 38 39 40 43 44 47 48 50 51 52 53 59	S3 B1 B2 B3 B4 B5 B6
50	E14	ELECTRICITY AT WORK REGULATIONS (1989)			S17	59	S3 B1 B2 B3 B4 B5 B6
50	E15	I.E.T. (18th EDITION) REGULATIONS Installation Survey			S1-3 S4 S7 S8 S9 S11 S12 S13 S14 S15 S17	21 22 23 27 44 45	K38 K39 S1 S2 S3 S8 S18 S28 S29 S33 S34 S35 S26 B1 B2 B3 B4 B5 B6
51	E16	INSTALLATION & TESTING – POWER & LIGHTING CIRCUITS (Practical score)			S1-3 S4 S7 S8 S9 S11 S12 S13 S14 S15 S17	3 4 5 9 26 27 28 29 34-37 38 39 40 43 44 47 48 50 51 52 53 59	K38 K39 S1 S2 S3 S8 S18 S26 S28 S29 S33 S34 S35 S26 B1 B2 B3 B4 B5 B6
51	E16	INSTALLATION & TESTING – POWER & LIGHTING CIRCUITS (Theory score)			S1-3 S4 S7 S8 S9 S11 S12 S13 S14 S15 S17	3 4 5 9 26 27 28 29 34-37 38 39 40 43 44 47 48 50 51 52 53 59	K38 K39 S1 S2 S3 S8 S18 S26 S28 S29 S33 S34 S35 S26K38 B1 B2 B3 B4 B5 B6
		2nd Carousel End-Test					
		2nd Carousel Average					
52	E17	INSTALLATION SKILLS – CONDUIT PRACTICAL			S1-3 S4 S7 S8 S9 S11 S12 S13 S14 S15 S17	3 4 5 9 26 27 28 29 34-37 38 39 40 41 43 44 47 48 50 51 52 53 59	B1 B2 B3 B4 B5 B6
52	E17	INSTALLATION SKILLS – CONDUIT ASSIGNMEMT			S1-3 S4 S7 S8 S9 S11 S12 S13 S14 S15 S17	3 4 5 9 26 27 28 29 34-37 38 39 40 41 43 44 47 48 50 51 52 53 59	B1 B2 B3 B4 B5 B6

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Pg No	Module No	Module Title	Course Mark/ Completed	Date	Maintenance Std Ref	WBL Ref:	Manufacturing Std Ref
53	E18	GAS DISCHARGE LIGHTING – OPERATION & SAFETY			S1-3 S15 S17	5 14 16 54 59	S4 B1 B2 B3 B4 B5 B6
53	E19	LIGHTING DESIGN, SAFETY & MEASUREMENT			S1-3 S4 S7 S8 S9 S10 S11 S12 S13 S14 S15 S17	3 4 5 9 26 27 28 29 34-37 38 39 40 41 43 44 45 47 48 50 51 52 53 59	B1 B2 B3 B4 B5 B6
54	E20	MOTOR CONTROL – DIRECT-ON-LINE STARTER (PRACTICAL)			S1-3 S4 S7 S8 S9 S11 S12 S13 S14 S15 S17	3 4 5 9 26 27 28 29 34-37 38 39 40 43 44 47 48 50 51 52 53 59	S1 B1 B2 B3 B4 B5 B6
54	E20	MOTOR CONTROL – DIRECT-ON-LINE STARTER (ASSIGNMENT)			S1-3 S4 S7 S8 S9 S11 S12 S13 S14 S15 S17	3 4 5 9 26 27 28 29 34-37 38 39 40 43 44 47 48 50 51 52 53 59	B1 B2 B3 B4 B5 B6
54	E21	INTRODUCTION TO ELECTRONICS			S1-3 S4 S7 S8 S9 S11 S12 S13 S14 S15 S17	3 4 5 9 26 27 28 29 34-37 38 39 40 43 44 47 48 50 51 52 53 59	B1 B2 B3 B4 B5 B6
55	E22	SEMICONDUCTORS – DIODES & RECTIFIERS			S1-3 S4 S7 S8 S9 S11 S12 S13 S14 S15 S17	3 4 5 9 26 27 28 29 34-37 38 39 40 43 44 47 48 50 51 52 53 59	B1 B2 B3 B4 B5 B6
55	E23	BINARY, BASIC LOGIC AND COMBINED LOGIC PART 1			S1-3 S4 S7 S8 S9 S11 S12 S13 S14 S15 S17	3 4 5 9 26 27 28 29 34-37 38 39 40 43 44 47 48 50 51 52 53 59	B1 B2 B3 B4 B5 B6
55	E23	BINARY, BASIC LOGIC AND COMBINED LOGIC PART 2			S1-3 S4 S7 S8 S9 S11 S12 S13 S14 S15 S17	3 4 5 9 26 27 28 29 34-37 38 39 40 43 44 47 48 50 51 52 53 59	B1 B2 B3 B4 B5 B6
		3rd Carousel End-Test					
		3rd Carousel Average					
		COURSE AVERAGE					

VALIDATION: The above training has / has not* been completed to the specified success criteria.

Signed……..Print: …….. Signed…… Print…….
(Training Officer) (Trainee)

***Additional Training Officer Comments/Reasons for training incomplete.**

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RECORD OF ACHIEVEMENT – PHASE I

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This is a Record of: .....……..... whose training started: …..... Employed by: .....

Pg No	Module No	Module Title	Course Mark/ Completed	Date	Maintenance Std Ref	WBL Ref:	Manufacturing Std Ref
58	I1a	INTRODUCTION TO INSTRUMENTS (GENERAL)			S1-3 S17	1 2 4 5 12 59	K1 K2 K3 K8 K10 K11 K12 K13 K14 K15 K16 K17 K18 K19 K20 K22 K21 K23 K24 K25 K26 K30 K42 K43 K44 S1 S2 S3 S4 S7 S8S18 S24 S28 S33 S35 S36 S37 S38 S40 S41 S42 S43 B1 B2 B3 B4 B5 B6
59	I1b	LINE DIAGRAMS			S1-3 S17	1 2 4 5 12 59	K1 K2 K3K8 K10 K11 K12 K13 K14 K15 K16 K17 K19 K20 K21 K23 K24 K25 K26 K30 K39 K42 K43 K44 S1 S2 S3 S4 S7 S8 S18 S24 S28 S33 S35 S36 S37 S38 S40 S41 S42 S43 B1 B2 B3 B4 B5 B6
59	I2	PIPES AND FITTINGS			S1-3 S4 S7 S8 S9 S10 S11 S12 S14 S15 S16 S17	4 19 26 27 28 29 34-37 39 43 44 45 47 48 52-57 59	K1 K2 K3 K11 K12 K13 K14 K15 K19 K20 K23 K24 K25 K26 K30 K37 K42 K43 K44 S1 S2 S3 S4 S7 S8 S18 S24 S28 S33 S35 S36 S37 S38 S40 S41 S42 S43 B1 B2 B3 B4 B5 B6
60	I3	PRESSURE MEASUREMENT OF PROESS VARIABLE			S1-3 S4 S7 S8 S9 S10 S11 S12 S15 S16 S17	4 21 26 27 28 29 34-37 39 40 43 44 45 47 48 52-57 59	K1 K2 K3 K9 K10 K11 K12 K13 K14 K15 K19 K20 K22 K23 K24 K25 K26 K29 K30 K38 K42 K43 K44 S1 S2 S3 S4 S7 S8S18 S24 S28 S33 S35 S36 S37 S38 S40 S41 S42 S43 B1 B2 B3 B4 B5 B6
61	I4	TRANSMISSION OF INSTRUMENT SIGNALS/TRANSITTERS			S1-3 S4 S7 S8 S9 S10 S11 S12 S15 S16 S17	4 26 27 28 29 34-37 39 40 43 44 45 47 48 52-57 59	K1 K2 K3 K8 K11 K12 K13 K14 K15 K19 K20 K23 K24 K25 K26 K30 K37 K38 K40 K42 K43 K44 S1 S2 S3 S4 S7 S8S18 S24 S28 S33 S35 S36 S37 S38 S40 S41 S42 S43 B1 B2 B3 B4 B5 B6
62	I5	SIGNAL CONDITIONERS			S1-3 S4 S7 S8 S9 S10 S11 S12 S15 S16 S17	4 26 27 28 29 34-37 39 40 43 44 45 47 48 52-57 59	K1 K2 K3 K11 K12 K13 K14 K15 K19 K20 K23 K24 K25 K26 K30 K38 K42 K43 K44 S1 S2 S3 S4 S7 S8S18 S24 S28 S33 S35 S36 S37 S38 S40 S41 S42 S43 B1 B2 B3 B4 B5 B6
63	I6	LEVEL MEASUREMENT OF PROCESS VARIABLE			S1-3 S4 S7 S8 S9 S10 S11 S12 S15 S16 S17	4 21 26 27 28 29 34-37 39 40 43 44 45 47 48 52-57 59	K1 K2 K3 K11 K12 K13 K14 K15 K18 K19 K20 K23 K24 K25 K26 K27 K28 K29 K30 K32 K33 K37 K38 K42 K43 K44 S1 S2 S3 S4 S7 S8S18 S24 S28 S33 S35 S36 S37 S38 S40 S41 S42 S43 B1 B2 B3 B4 B5 B6
64	I7	FLOW MEASUREMENT OF PROCESS VARIABLE			S1-3 S4 S7 S8 S9 S10 S11 S12 S15 S16 S17	4 21 26 27 28 29 34-37 39 40 43 44 45 47 48 52-57 59	K1 K2 K3 K9 K10 K11 K12 K13 K14 K15 K19 K20 K23 K24 K25 K26 K29 K30 K37 K38 K42 K43 K44 S1 S2 S3 S4 S7 S8S18 S24 S28 S33 S35 S36 S37 S38 S40 S41 S42 S43 B1 B2 B3 B4 B5 B6

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Pg No	Module No	Module Title	Course Mark/ Completed	Date	Maintenance Std Ref	WBL Ref:	Manufacturing Std Ref
65	I8	TEMPERATURE MEASUREMENT OF PROCESS VARIABLE			S1-3 S4 S7 S8 S9 S10 S11 S12 S15 S16 S17	4 5 26 27 28 29 34-37 39 40 43 44 45 47 48 52-57 59	K1 K2 K3 K22 K10 K11 K12 K13 K14 K13 K14 K15 K19 K20 K23 K24 K25 K26 K28 K29 K30 K35 K36 K42 K43 K44 S1 S2 S3 S4 S7 S8S18 S24 S28 S33 S35 S36 S37 S38 S40 S41 S42 S43 B1 B2 B3 B4 B5 B6
66	I9	CONTROL VALVES			S1-3 S4 S7 S8 S9 S10 S11 S12 S13 S15 S16 S17	4 5 26 27 28 29 34-37 3839 40 43 44 45 47 48 51 52-57 59	K1 K2 K3 K11 K12 K13 K14 K15 K19 K20 K22 K23 K24 K25 K26 K30 K39 K42 K43 K44 S1 S2 S3 S4 S7 S8 S18 S24 S28 S33 S35 S36 S37 S38 S40 S41 S42 S43 B1 B2 B3 B4 B5 B6
67	I10	PROCESS CONTROL			S1-3 S4 S7 S8 S9 S10 S11 S12 S15 S16 S17	4 7 18 21 26 27 28 29 34-37 39 40 43 44 45 47 48 52-57 59	K1 K2 K3 K4 K5 K6 K7 K8 K9 K10 K11 K12 K13 K14 K15 K16 K17 K18 K19 K20 K21 K23 K24 K25 K26 K28 K29 K30 K36 K37 K39 K40 K42 K43 K44 S1 S2 S3 S4 S7 S8S18 S24 S28 S33 S35 S36 S37 S38 S40 S41 S42 S43 B1 B2 B3 B4 B5 B6
68	I11	SHUTDOWN SYSTEMS			S1-3 S4 S7 S8 S9 S10 S11 S12 S15 S16 S17	4 5 7 9 10 11 14 15 20 26 27 28 29 34-37 39 40 43 44 45 47 48 52-57 59	K1 K2 K3 K8 K9 K11 K12 K15 K19 K20 K22 K23 K24 K25 K26 K27 K28 K30 K39 K42 K43 K44 S1 S2 S3 S4 S7 S8S18 S24 S28 S33 S35 S36 S37 S38 S40 S41 S42 S43 B1 B2 B3 B4 B5 B6
68	I12	PROCESS ALARMS			S7 S9 S16 S17	36 40 45 57 59	
		END TEST RESULT					

VALIDATION: The above training has / has not* been completed to the specified success criteria.

Signed……..Print: …….. Signed…… Print…….
(Training Officer) (Trainee)

***Additional Training Officer Comments/Reasons for training incomplete.**

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RECORD OF ACHIEVEMENT – PHASE I

This Record of Achievement is to be completed by the Training Officer once the trainee has achieved the required standard, having completed all practical and written units relevant to the subject area, and may therefore be deemed competent only in a training environment as outlined in the subject synopsis.

This is a Record of: .....……..... whose training started: …..... Employed by : .....

Pg No	Module No	Module Title	Course Mark/ Completed	Date	Maintenance Std Ref	WBL Ref:	Manufacturing Std Ref
70	BF1	WORKSHOP INDUCTION & APPLYING SAFE WORKING PRACTICES			S1-3 S7 S17	1 3 4 7 9 1 16 19 34-37 59	K3 S3 S4 B1 B2 B3 B4 B5 B6
71	BF2	MEASUREMENT UNITS – METRIC & IMPERIAL			S10 S17	45 59	K38 S35 B1 B2 B3 B4 B5 B6
72	BF3	PROJECT PLANNING – BENCH FITTING			S1-3 S7 S16 S17	1-5, 9 34-37, 47, 56 59	S1 B1 B2 B3 B4 B5 B6
73	BF4	BOLT IDENTIFICATION			S1-3 S7 S8 S9 S10 S11 S12 S14 S15 S16 S17	4 16 38-39 40-44 45 47 48 52 53 54 55 57 59	B1 B2 B3 B4 B5 B6
74	BF5.1	MANUFACTURE A CENTRE FINDER			S1-3 S7 S8 S9 S10 S11 S12 S14 S15 S16 S17	4 16 38-39 40-44 45 47 48 52 53 54 55 57 59	B1 B2 B3 B4 B5 B6
75	BF5.2	MANUFACTURE A BENCH FITTING PROJECT			S1-3 S7 S8 S9 S10 S11 S12 S14 S15 S16 S17	4 16 38-39 40-44 45 47 48 52 53 54 55 57 59	B1 B2 B3 B4 B5 B6
		END TEST RESULT					

VALIDATION: The above training has / has not* been completed to the specified success criteria.

Signed……..Print: ……
(Training Officer)

Signed…… Print……
(Trainee)

***Additional Training Officer Comments/Reasons for training incomplete.**

For mapping to the relevant apprenticeship standards please see the individual index pages 19-41

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RECORD OF ACHIEVEMENT – PHASE I

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Pg No	Module No	Module Title	Course Mark/ Completed	Date	Maintenance Std Ref	WBL Ref:	Manufacturing Std Ref
78	MS3	THE VERNIER CALIPER			S1-3 S7 S8 S9 S10 S11 S12 S14 S15 S16 S17	4 16 38-39 40-44 45 47 48 52 53 54 55 57 59	B1 B2 B3 B4 B5 B6
79	MS4	MACHINE SHOP SAFETY			S1-3 S7 S17	1 3 4 7 9 1 16 19 34-37 59	B1 B2 B3 B4 B5 B6
80	MS5	CENTRE LATHE – SAFE OPERATION			S1-3 S7 S8 S9 S10 S11 S12 S14 S15 S16 S17	4 16 38-39 40-44 45 47 48 52 53 54 55 57 59	B1 B2 B3 B4 B5 B6
81	MS6	CENTRE LATHE – TASK PLANNING			S1-3 S7 S8 S9 S10 S11 S12 S14 S15 S16 S17	4 16 38-39 40-44 45 47 48 52 53 54 55 57 59	B1 B2 B3 B4 B5 B6
82	MS7	MILLING MACHINE – SAFE OPERATION			S1-3 S7 S8 S9 S10 S11 S12 S14 S15 S16 S17	4 16 38-39 40-44 45 47 48 52 53 54 55 57 59	B1 B2 B3 B4 B5 B6
83	MS9	OPERATION OF DIGITAL CONTROLS			S1-3 S7 S8 S9 S10 S11 S12 S14 S15 S16 S17	4 16 38-39 40-44 45 47 48 52 53 54 55 57 59	B1 B2 B3 B4 B5 B6
		END TEST RESULT					

VALIDATION: The above training has / has not* been completed to the specified success criteria.

Signed……..Print: …….. (Training Officer)

Signed…… Print…….. (Trainee)

***Additional Training Officer Comments/Reasons for training incomplete.**

For mapping to the relevant apprenticeship standards please see the individual index pages 19-41

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Pg No	Module No	Module Title	Course Mark/ Completed	Date	Maintenance Std Ref	WBL Ref:	Manufacturing Std Ref
87	MA1	MACHINE-SHOP SAFETY			S1-3 S7 S17	1 3 4 7 9 1 16 19 34-37 59	B1 B2 B3 B4 B5 B6
88	MA2	MEASUREMENT UNITS – METRIC & IMPERIAL			S1-3 S7 S8 S9 S10 S11 S12 S14 S15 S16 S17	4 16 38-39 40-44 45 47 48 52 53 54 55 57 59	B1 B2 B3 B4 B5 B6
89	MA4	PROJECT PLANNING – MOBILE MODULAR			S1-3 S7 S8 S9 S10 S11 S12 S14 S15 S16 S17	4 16 38-39 40-44 45 47 48 52 53 54 55 57 59	B1 B2 B3 B4 B5 B6
90	MA5	MANUFACTURE & ASSEMBLY - MOBILE MODULAR			S1-3 S7 S8 S9 S10 S11 S12 S14 S15 S16 S17	4 16 38-39 40-44 45 47 48 52 53 54 55 57 59	B1 B2 B3 B4 B5 B6
		END TEST RESULT					

Pg No	Module No	Module Title	Course Mark/ Completed	Date	Maint Std Ref	WBL Ref:	Manu Std Ref
92-93	LR1	LIFTING & RIGGING			S17	59	B1 B2 B3 B4 B5 B6

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Pg No	Module No	Module Title	Course Mark/ Completed	Date	Maintenance Std Ref	WBL Ref:	Manufacturing Std Ref
96	S1A	MECHANICAL & FABRICATION HAND TOOLS			S1-3 S4 S7 S8 S9 S10 S11 S12 S14 S15 S16 S17	4 5 26 27 28 29 34 35 36 37 38 39 43 44 45 47 48 52 53 54 55 59	B1 B2 B3 B4 B5 B6
97-98	FA1	ENGINEERING DRAWING			S1-3 S4 S7 S8 S9 S10 S11 S12 S14 S15 S16 S17	4 5 26 27 28 29 34 35 36 37 38 39 43 44 45 47 48 52 53 54 55 59	B1 B2 B3 B4 B5 B6
99-100	FA2	PIPEWORK DESIGN INSTALLATION & MAINTENANCE			S1-3 S4 S7 S8 S9 S10 S11 S12 S14 S15 S16 S17	4 5 6 7 8 9 10 11 12 13 16 17 18 19 20 21 26 27 28 29 34 35 36 37 38 39 40 42 43 44 45 47 48 52 53 54 55 59	B1 B2 B3 B4 B5 B6
101	FA3	PIPEWORK SUPPORTS			S1-3 S4 S7 S8 S9 S10 S11 S12 S14 S15 S16 S17	4 5 6 7 8 9 10 11 12 13 21 26 27 28 29 34 35 36 37 38 39 43 44 45 47 48 52 53 54 55 59	B1 B2 B3 B4 B5 B6
102	FA4	MAINTENANCE OF MECHANICAL VALVES			S1-3 S4 S7 S8 S9 S10 S11 S12 S14 S15 S16 S17	4 5 6 7 8 9 10 11 12 13 21 26 27 28 29 34 35 36 37 38 39 43 44 45 47 48 52 53 54 55 59	B1 B2 B3 B4 B5 B6
103-105	FA5	WELDING METHODS & OPERATIONS MANUAL METAL ARC WELDING			S1-3 S4 S7 S8 S9 S10 S11 S12 S14 S15 S16 S17	4 5 6 7 8 9 10 11 12 13 21 26 27 28 29 34 35 36 37 38 39 43 44 45 47 48 52 53 54 55 59	B1 B2 B3 B4 B5 B6
106	FA6	THERMAL CUTTING			S1-3 S4 S7 S8 S9 S10 S11 S12 S14 S15 S16 S17	1 3 4 5 21 26 27 28 29 34 35 36 37 38 39 43 44 45 47 48 52 53 54 55 59	B1 B2 B3 B4 B5 B6

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Pg No	Module No	Module Title	Course Mark/ Completed	Date	Maintenance Std Ref	WBL Ref:	Manufacturing Std Ref
107	FA8	MAINTENANCE OF STEAM TRAP			S1-3 S17	6 7 8 9 10 11 16 17 18 19 20 59	B1 B2 B3 B4 B5 B6
108	FA9	THERMAL INSULATON			S1-3 S17	5 59	B1 B2 B3 B4 B5 B6
109	FA10	TEMPORARY REPAIRS			S17	59	B1 B2 B3 B4 B5 B6
		END TEST RESULT					

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Pg No	Module No	Module Title	Course Mark/ Completed	Date	Maintenance Std Ref	WBL Ref:	Manufacturing Std Ref
112	P1	WORKSHOP INDUCTION, BASIC CHEMISTRY AND ELECTROLYSIS			S17	59	K30 K31 K35 K36 S37 B1 B2 B3 B4 B5 B6
113	P2	HEAT EXCHANGE			S1-3 S17	18 59	K19 K25 K27 K28 K29 K36 S6 B1 B2 B3 B4 B5 B6
114	P3	EVAPORATION			S1-3 S17	18 59	K12 K25 K28 K29 K38 B1 B2 B3 B4 B5 B6
114	P4	CRYSTALLISATION			S17	59	K12 K19 K25 K28 K32 K35 S17 B1 B2 B3 B4 B5 B6
115	P5	SOLIDS HANDLING			S17	59	K19 K25 B1 B2 B3 B4 B5 B6
116	P6	FILTRATION			S1-3 S17	18 59	K12 K19 K27 K28 K29 B1 B2 B3 B4 B5 B6
116	P7	PARTICLE SIZE REDUCTION			S1-3 S17	18 59	K19 K25 K28 K29 B1 B2 B3 B4 B5 B6
117	P8	DISTILLATION			S1-3 S17	18 59	K19 K21 K25 K28 K29 K38 S17 B1 B2 B3 B4 B5 B6
118	P9	REFRIGERATION			S17	59	K12 K19 K25 K29 K36 K39 B1 B2 B3 B4 B5 B6
119	P10	MIXING			S1-3 S17	18 59	K19 K25 K28 K29 K32 K35 S9 B1 B2 B3 B4 B5 B6
119	P11	LEACHING			S1-3 S17	59	K12 K19 K25 B1 B2 B3 B4 B5 B6
120	P12	SOLVENT EXTRACTION			S17	13 59	K12 K19 K25 K28 K32 S17 B1 B2 B3 B4 B5 B6
121	P13	GAS ABSORPTION			S1-3 S17	13 59	K19 K25 K28 K29 B1 B2 B3 B4 B5 B6

For mapping to the relevant apprenticeship standards please see the individual index pages 19-41

Pg No	Module No	Module Title	Course Mark/ Completed	Date	Maintenance Std Ref	WBL Ref:	Manufacturing Std Ref
122	P14	ENVIRONMENT			S1-3 S17	14 – 19 47 54 59	K7 K8 K9 K12 K27 K28 S2 S6 B1 B2 B3 B4 B5 B6
123	P15	PROCESS LINE DIAGRAMS			S1-3 S17	55 56 57 59	K20 K39 K44 S1 S35 S38 S44 B1 B2 B3 B4 B5 B6
124	P16	PROCESS ANALYSIS*			S1-3 S17	6 7 8 59	K13 K14 K15 K16 K17 K18 K27 K28 K30 K31 K38 K39 K42 K43 K44 S1 S2 S3 S7 S8 S9 S10 S11 S12 S13 S14 S15 S16 S17 S18 S21 S24 S25 S34 S35 S36 S37 S38 S41 S42 S43 B1 B2 B3 B4 B5 B6
		END TEST RESULT					

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SECTION 3

ELECTRICAL

SATISFACTORY KNOWLEDGE AND UNDERSTANDING OF THE FOLLOWING ITEMS HAS BEEN DEMONSTRATED VIA OBSERVATION OF PRACTISE AND THE COMPLETION OF PRACTICAL AND WRITTEN ASSIGNMENTS AND TESTS.

For mapping to the relevant apprenticeship standards please see the individual index pages 19-41

MODULE TITLE :	**ELECTRICAL SAFETY – WORKSHOP INDUCTION**
MODULE No.'s :	E1
SCOPE :	Develop the Trainees' safety awareness, behaviour, and approach when working in an electrical workshop environment and with its associated equipment in accordance with the current training objectives.

OBJECTIVE No.	SUCCESS CRITERIA
	The Trainee will receive an Induction into the Electrical Workshop following which they should be able to explain :
1	• the need to consider safely at all times
2	• the use of Personal Protective Equipment (PPE)
3	• behaviour and approach
4	• safe use and storage of hand tools
5	• time-keeping, punctuality, and entering and leaving the work area
6	• Fire Alarm procedures
7	• maintaining a clean work area and environment

MODULE TITLE :	**INTRODUCTION TO ELECTRICITY**
MODULE No.'s :	E2
SCOPE :	Develop the Trainees' awareness, knowledge and understanding of electricity, its associated principles and measurement Units, and safety considerations in accordance with the current training objectives.

OBJECTIVE No.	SUCCESS CRITERIA
	The Trainee will be able to demonstrate a basic understanding of :
1	• what electricity is and where it comes from
2	• conductors and insulators
3	• magnets, magnetism and electro-magnetism
4	• Voltage, Current, Resistance and Frequency
5	• Ohms Law and Kirchoffs Laws
6	• the different sources of power, Alternating and Direct Current
7	• electrical generation and distribution
8	• generation fuels and sources of alternative energy
9	• sources and effects of static electricity and lighting
10	• the dangers of electricity and its effects on the human body
11	• the purpose and types of electrical protection and earthing
12	• electrical safety
13	• safe use of electrical equipment and portable appliances

MODULE TITLE :	**BASIC WIRING SKILLS - CABLES, PLUGS AND SOCKETS**
MODULE No. :	E3
SCOPE :	Develop the Trainees' knowledge, understanding and practical skills associated with the preparation, termination and visual inspection of cables to equipment in accordance with the current training objectives.

OBJECTIVE No.	SUCCESS CRITERIA
	The Trainee will be able to demonstrate and explain :
1	• the different types of cable cores
2	• the purpose of the insulation
3	• how to prepare cables for termination
4	• the hazards associated with hand-tools and how to use them safely
5	• how to terminate solid and stranded conductors into plugs and sockets to an acceptable standard
6	• how to visually inspect the cable installation and recognise unsuitable and/or unsafe conditions
7	• the hazards associated with cable installation

MODULE TITLE :	**INTRODUCTION TO ELECTRICAL PRINCIPLES - VIRTUAL PHYSICAL LEARNING (VPL)**
MODULE No. :	E4
SCOPE :	Develop the Trainees' knowledge and understanding of the basic electrical principles using specialist animated software in accordance with the current training objectives.

OBJECTIVE No.	SUCCESS CRITERIA
	The Trainee will be able to demonstrate and explain a basic understanding of :
1	• resistance, voltage, and current
2	• magnetic fields, electro-magnetism and induction (Faradays' and Lenzes' Laws)
3	• Ohms Law and Kirchoffs Laws using series and parallel circuits
4	• generation of electricity and the effect of rotor speed, coil radius and field strength
5	• power distribution and the effects of transformers (step-up and step-down), cable diameter and electricity demand
6	• transformers (step-up and step-down), and the effects of primary and secondary turns ratio

MODULE TITLE :	**MEASUREMENTS AND UNITS 1 (TEST INSTRUMENTS)**
MODULE No. :	E5
SCOPE :	Develop the Trainees' knowledge, understanding, and practical experience of the various types of instruments used to measure electrical units and test electrical equipment and systems in accordance with the current training objectives.

OBJECTIVE No.	SUCCESS CRITERIA
	The Trainee will be able to:
1	• recognise the following types of instrument: a) analogue multi-meter (AVO) b) digital multi-meter (Iso-Tech, Tenma) c) voltage indicator (RS Voltstick, TIS840, TIS950, Martindale) d) bridge megger (Megger Inst.) e) digital megger (Megger Inst.) f) clip-on ammeter (Metrotest, UNI-T)
2	• visually inspect each instrument and the associated leads to ensure it is suitable for use
3	• demonstrate how each type may be used to measure and/or test for voltage, current and/or resistance
4	• describe how readings on analogue instruments can be incorrectly read including the effect of parallax error and incorrect selection of scale
5	• describe how the Wheatstone Bridge method is used to measure resistance
6	• recognise the limitations of each type of instrument and the dangers associated with exceeding these limits

MODULE TITLE :	**MEASUREMENTS AND UNITS 2 (RESISTORS AND RESISTANCE)**
MODULE No. :	E6
SCOPE :	Develop the Trainees' knowledge and understanding of resistance in a circuit or component and be able to measure and/or calculate its value in accordance with the current training objectives.

OBJECTIVE No.	SUCCESS CRITERIA
	The Trainee will be able to demonstrate:
1	• a basic understanding of what constitutes "resistance" in a circuit
2	• how to determine the value of a resistor using the colour band system
3	• how to use a multi-meter and Bridge Megger to measure the value of a resistor
4	• how to calculate values of resistance when connected in series and in parallel

MODULE TITLE :	**MEASUREMENTS AND UNITS 3 (SERIES AND PARALLEL CIRCUITS - OHMS LAW)**
MODULE No. :	E7
SCOPE :	Develop the Trainees' knowledge and understanding of resistance in a circuit or component and be able to measure and/or calculate its value in accordance with the current training objectives.

OBJECTIVE No.	SUCCESS CRITERIA
	The Trainee will be able to demonstrate how to:
1	• connect components in series and parallel circuits using schematic diagrams
2	• inspect and connect test instruments to measure voltage and current and select the correct Units and scale and explain why the measuring instruments are connected in series or parallel
3	• demonstrate how to accurately read and record readings of voltage and current on analogue instruments
4	• calculate the value of a resistor using the values of current and voltage (Ohms Law)
5	• compare measured and calculated values and explain any difference between them
6	• describe the relationship between resistance, voltage and current

MODULE TITLE :	**MEASUREMENTS AND UNITS 4 (RESISTOR NETWORKS AND CAPACITORS)**
MODULE No. :	E8
SCOPE :	Develop the Trainees' knowledge and understanding of the relationship between voltage and current in a resistance circuit, resistor networks, and capacitor circuits in accordance with the current training objectives.

OBJECTIVE No.	SUCCESS CRITERIA
	The Trainee will be able to demonstrate how to:
1	• connect components in a circuit using wiring and schematic diagrams
2	• determine the relationship between voltage and current in a resistive circuit
3	• calculate the value of a resistor using the measured values of current and voltage (Ohms Law)
4	• calculate the values of resistors in a series and parallel network using the measured values of current and voltage (Ohms Law)
5	• determine the voltage and current at any given point in a resistor network (Kirchoffs Laws)
6	• explain the operation of a capacitor
7	• determine the relationship between voltage, current, charge, and time in a capacitor
8	• increase and decrease capacitance in a circuit using series and parallel connections

MODULE TITLE :	**MEASUREMENTS AND UNITS 5 (AC AND DC MEASUREMENT)**
MODULE No. :	E9
SCOPE :	Develop the Trainees' knowledge, understanding and experience of measuring direct and alternating current using an oscilloscope and how to determine the supply frequency in accordance with the current training objectives.

OBJECTIVE No.	SUCCESS CRITERIA
	The Trainee will be able to demonstrate how to:
1	• identify and measure the peak and peak-to-peak voltages
2	• determine the period of the AC waveform
3	• calculate the value of the AC frequency
4	• explain the relationship between the period and the frequency
5	• explain the meaning of RMS value

MODULE TITLE :	**CABLES AND CABLE GLANDS**
MODULE No. :	E10
SCOPE :	Develop the Trainees' knowledge and understanding of cable construction, and extend their experience to preparing a steel-wire-armoured cable for installation, and how to identify, inspect and fit a cable gland in accordance with the current training objectives.

OBJECTIVE No.	SUCCESS CRITERIA
	The Trainee will be able to:
1	• explain the need to include mechanical & electrical protection for cables between the points of supply and use
2	• describe the construction of steel-wire-armoured cable
3	• identify different types of cable glands and their uses
4	• explain the construction of cable glands and identify their parts
5	• demonstrate how to prepare a steel-wire-armoured cable and identify, inspect, and fit an appropriate cable gland to an acceptable standard
6	• explain the consequences of incorrect selection and/or not fitting the gland correctly
7	• describe the hazards associated with cable preparation and gland installation

MODULE TITLE :	**SWITCHES AND ISOLATORS**
MODULE No. :	E11
SCOPE :	Develop the Trainee's awareness, knowledge and understanding of the basic principles of motor control in accordance with the current training objectives.

OBJECTIVE No.	SUCCESS CRITERIA
	The Trainee is able to:
1	• describe the difference between a switch and an isolator
2	• identify all the parts of a single-phase and three-phase isolator
3	• explain the principle and purpose of the spring-assisted switch mechanism
4	• identify and explain all of the safety features on a standard isolator
5	• describe the consequences of using an isolator to break large loads (current)

MODULE TITLE :	**DISTRIBUTION BOARDS**
MODULE No. :	E12
SCOPE :	Develop the Trainee's awareness, knowledge and understanding of a distribution board and its contents in accordance with the current training objectives.

OBJECTIVE No.	SUCCESS CRITERIA
	The Trainee will be able to:
1	• identify the associated isolator and explain the purpose of removing the load before its operation
2	• explain and recognise the difference between "switched-off" and "isolated"
3	• describe the information that is legally required to be displayed on a distribution board
4	• identify the component parts and explain their function
5	• identify the pre and post 2006 phase, neutral and earth colours and explain the need for caution when entering an electrical enclosure
6	• state the available voltage(s) and describe how they may be measured
7	• identify any equi-potential bond and describe why they are necessary
8	• explain the importance of the circuit information card
9	• recognise the potential hazards associated with a distribution board

MODULE TITLE :	**ELECTRICAL PROTECTION – HIGH RUPTURE CAPACITY (HRC) FUSES**
MODULE No. :	E13
SCOPE :	Develop the Trainee's awareness, knowledge and understanding of the different types of fuse protection available and why HRC fuses are used in accordance with the current training objectives.

OBJECTIVE No.	SUCCESS CRITERIA
	The Trainee will be able to demonstrate knowledge and understanding of:
1	• the construction of an HRC fuse
2	• why they are the preferred choice of protection in industry
3	• how the design of the fuse element influences its speed of operation
4	• the meaning of the term "discrimination" with respect to circuit protection

MODULE TITLE :	**INTRODUCTION TO THE ELECTRICITY AT WORK REGULATIONS (1989)**
MODULE No. :	E14
SCOPE :	Develop the Trainee's awareness, knowledge and understanding of the requirements of the Electricity At Work (EAW) Regulations (1989) in accordance with the current training objectives.

OBJECTIVE No.	SUCCESS CRITERIA
	The Trainee will be able to explain:-
1	• the purpose of the EAW Regulations and the implications of not observing them
	• who the Regulations apply to and where they are applicable
2	• the meaning of some of the prominent terms within the Regulations including
3	"Competence", "Isolation", "Absolute" and "Reasonably Practicable"
	• the potential consequences of failing to follow the EAW Regulations
4	
	and be able to demonstrate, via an open-book test :
	• how to find / retrieve information and/or data from the Regulations
5	

MODULE TITLE :	**INTRODUCTION TO THE INSTITUTE OF ENGINEERING AND TECHNOLOGY (I.E.T.) REGULATIONS (18th EDITION)**
MODULE No. :	E15
SCOPE :	Develop the Trainee's awareness, knowledge and understanding of the I.E.T Requirements for Electrical Installations (18th Edition) in accordance with the current training objectives.

OBJECTIVE No.	SUCCESS CRITERIA
	The Trainee will be able to explain:-
1	• the purpose of the Regulations and why they are a British Standard
2	• who the Regulations apply to and where they are applicable
	and be able to demonstrate, via a series of open-book tests :
3	• how to find / retrieve information and/or data from the Regulations

MODULE TITLE :	**INSTALLATION SKILLS - DOMESTIC POWER AND LIGHTING**
MODULE No. :	E16
SCOPE :	Develop the Trainee's knowledge, understanding and experience of the principles and methods for the installation, inspection and testing of power and lighting circuits for domestic and office premises in accordance with the current training objectives.

OBJECTIVE No.	SUCCESS CRITERIA
	The Trainee is able to demonstrate how to:
1	• identify and inspect the required equipment including : a) patress boxes (single and double) b) switched socket outlets (twin) and single pole lighting switches (single, two-way and intermediate) c) ceiling rose and lamp holders d) Consumer Unit and MCB's
2	• select the appropriate cables for power circuits and lighting circuits using the I.E.T. Regulations (18th Edit.)
3	• prepare flat twin-and-earth cable for installation using appropriate hand tools in a safe manner
4	• final-ring and radial circuits
5	• single and two-way switched lighting circuits
6	• installation of all cables and component parts to the industry standard (inc. identification of the cable cores using appropriate sleeving)
7	• installation and termination of cables to domestic equipment to Regulatory standards
8	• select, inspect and use appropriate test instruments to complete Insulation, Continuity and Polarity tests in the appropriate order
9	• record test results and interpret readings

MODULE TITLE :	**ELECTRICAL INSTALLATION – CONDUIT**
MODULE No. :	E17
SCOPE :	Develop the Trainee's knowledge, understanding and experience of the techniques associated with the preparation and installation of electrical conduit in accordance with the current training objectives.

OBJECTIVE No.	SUCCESS CRITERIA
1	Using both galvanised metal and plastic (pvc) conduit, the Trainee will be able to : • recognise the hazards associated with: a) the transportation and use of different types of conduit bender b) the transportation and use of galvanised metal and plastic (pvc) conduit c) cutting and threading galvanised metal conduit d) the movement of resources around the workshop
2	The Trainee will also be able to demonstrate:
3	• how to use the conduit bender in a safe manner • safe use and storage of all associated hand tools
4	• the purpose of the conduit spring
5	• how to safely construct a 90° bend in accordance with the assignment plan
6	• how to calculate the required angles to safely construct a dog-leg bend in accordance with the assignment plan
7 8	• the selection of a suitable stock and die , dis-assemble, clean, and re-assemble
9	• the correct body position (relative to the work) in preparation for cutting a thread
10	• cut a thread on the metal conduit in accordance with the assignment plan and to an acceptable standard
11	• recognise the reasons for sub-standard thread cutting and amend accordingly
12	• dis-assemble the stock and die for inspection, clean and re-assemble for storage
13	• identify and install conduit saddles and mount constructed pieces on a board • demonstrate how to transport and store the conduit bender in a safe manner

MODULE TITLE :	**GAS DISCHARGE LIGHTING**
MODULE No. :	E18
SCOPE :	Develop the Trainee's awareness, knowledge and understanding of the different types of gas discharge lighting in accordance with the current training objectives.

OBJECTIVE No.	SUCCESS CRITERIA
	The Trainee is able to demonstrate knowledge and understanding of:
1	• the principle of operation of the following types of lamp: a) High pressure sodium (SON) b) Low pressure sodium (SOX) c) High pressure mercury (MBF, HID, HIT) d) Low pressure mercury (Flourescent) e) Incandescent (Tungsten Filament)
2	• the safety principles associated with each type including safe handling and disposal
3	• the environmental issues associated with each type
4	• the light output (efficacy) and typical types of use
5	• the princples of an LED
6	• Emergency Lighting

MODULE TITLE :	**LIGHTING DESIGN AND MEASUREMENT**
MODULE No. :	E19
SCOPE :	Develop the Trainee's awareness, knowledge and understanding of the Lighting Regulations and how lighting levels are measured and maintained in accordance with the current training objectives.

OBJECTIVE No.	SUCCESS CRITERIA
	The Trainee will be able to explain:
1	• where the Regulations may be found
2	• how plant structures can influence lighting levels
3	• the function and operation of emergency exit / route lighting
	The Trainee will be able to :
4	• demonstrate how to construct a lighting plan
5	• demonstrate how to measure lighting levels
6	• complete a lighting installation assessment and make recommendations for improvements in order to address any concerns and/or meet Health and Safety standards

MODULE TITLE :	**BASIC MOTOR CONTROL – DIRECT-ON-LINE STARTER**
MODULE No. :	E20
SCOPE :	Develop the Trainee's awareness, knowledge, understanding and experience of the basic principles of motor control in accordance with the current training objectives.

OBJECTIVE No.	SUCCESS CRITERIA
	The trainee is able to:
1	• explain the theory of operation of a direct-on-line connected contactor
2	• identify all the parts of a three-phase contactor and how they may be accessed
3	• explain the purpose and operation of the Overload unit
4	• describe how Start and Stop push-buttons are connected
5	• explain the purpose of, and how to connect, a Remote Control Unit (RCU)
	The trainee will demonstrate:
6	• the installation and operation of a contactor and associated control equipment
7	• how to install a Remote Control Unit (RCU)
8	• the operation of the contactor with local control and with a RCU connected

MODULE TITLE :	**INTRODUCTION TO ELECTRONICS**
MODULE No. :	E21
SCOPE :	Develop the Trainee's knowledge, understanding and experience of the basic principles and operation of simple electronic components in accordance with the current training objectives.

OBJECTIVE No.	SUCCESS CRITERIA
	The Trainee is able to:
1	• identify simple components including resistors, capacitors, diodes, and transistors
2	• recognise the drawing symbol(s) used for the different components
3	• recognise series and parallel connections and explain why they are used
4	• describe the construction and operation of resistors, capacitors diodes and transistors
5	• recognise a variable resistor/potentiometer and describe how it operates

MODULE TITLE :	**SEMICONDUCTORS – DIODES AND RECTIFIERS**
MODULE No. :	E22
SCOPE :	Develop the trainee's awareness, knowledge, understanding and experience of the principles and operation of diodes in the process of half and full wave rectification in accordance with the current training objectives.

OBJECTIVE No.	SUCCESS CRITERIA
	The trainee will be able to:
1	• understand the construction and operation of a diode
2	• construct a half-wave rectifier circuit using the relevant circuit diagram
3	• construct a full-wave rectifier circuit using the relevant circuit diagram
4	• use an oscilloscope to measure wave patterns and levels of voltage and current
5	• use the measured values to calculate the frequency
6	• describe and demonstrate the effect of capacitors on the rectified waveform

MODULE TITLE :	**BINARY, BASIC LOGIC AND COMBINED LOGIC**
MODULE No. :	E23
SCOPE :	Develop the trainee's awareness, knowledge, understanding and experience of the theory and principles of basic logic operations in accordance with the current training objectives.

OBJECTIVE No.	SUCCESS CRITERIA
	The trainee is able to show an understanding of:
1	• the concepts of decimal and binary systems
2	• basic logic gates : AND, OR, NAND, NOR, NOT
3	• Truth Tables
4	• combination logic
5	• their use in motor and process control systems and operations
	The trainee will be able to demonstrate :
6	• how to construct simple logic circuits using a diagram
7	• the operation of AND, OR, NAND, NOR and NOT gates
8	• how to assemble and record data in a Truth Table
9	• how to combine logic gates / operations and determine their outcomes supported by the use of Truth Tables
10	• how to obtain a Truth Table from a circuit diagram

SECTION 4

INSTRUMENTATION

SATISFACTORY KNOWLEDGE AND UNDERSTANDING OF THE FOLLOWING ITEMS HAS BEEN DEMONSTRATED VIA OBSERVATION OF PRACTISE AND THE COMPLETION OF PRACTICAL AND WRITTEN ASSIGNMENTS AND TESTS.

For mapping to the relevant apprenticeship standards please see the individual index pages 19-41

MODULE TITLE :	**INSTRUMENTATION SAFETY – WORKSHOP INDUCTION**
MODULE No.'s :	I1
SCOPE :	Develop the Trainees' safety awareness, behaviour, and approach when working in an instrumentation workshop environment and with its associated equipment in accordance with the current training objectives.

OBJECTIVE No.	SUCCESS CRITERIA
	The Trainee will receive an Induction into the Instrument Workshop following which they should be able to explain:
1	• the need to consider safely at all times
2	• the use of Personal Protective Equipment (PPE)
3	• behaviour and approach
4	• safe use and storage of hand tools
5	• time-keeping, punctuality, and entering and leaving the work area
6	• Fire Alarm procedures
7	• maintaining a clean work area and environment

MODULE TITLE :	**INTRODUCTION TO INSTRUMENTS**
MODULE No. :	I1a
SCOPE :	Develop trainee awareness, knowledge and understanding of the general principles of Instrumentation measurement in accordance with the current training objectives.

OBJECTIVE No.	SUCCESS CRITERIA
	The trainee will receive an Induction into the Instrumentation Workshop which will include the need to work safely at all times, the use of Personal Protective Equipment (PPE), behaviour, safe use of hand tools, time-keeping and punctuality, and Fire Alarm procedures.
1	The trainee will be able to:
2	• state the need for instrumentation
3	• understand the reasons for taking measurements
4	• define process variables and requirements
5	• explain measurement lags and DV lags
	• demonstrate the following instrument errors by use of graphs : a) Zero b) Span/Range c) Linearity d) Hysteresis

MODULE TITLE :	**LINE DIAGRAMS**
MODULE No.	I1b
SCOPE :	Develop trainee awareness, knowledge and understanding of instrument line diagrams and identification systems in accordance with the current training objectives.

OBJECTIVE No.	SUCCESS CRITERIA
1 2 3 4 5 6	The trainee will be able to explain: • The need for loop identification systems • The lettering system • The numbering system • Summary • Identificatoin in symbol/diagram form • Line diagram examples

MODULE TITLE :	**PIPES AND FITTINGS**
MODULE No.	I2a
SCOPE :	Develop trainee awareness, knowledge and understanding of pipes and fittings in accordance with the current training objectives.

OBJECTIVE No.	SUCCESS CRITERIA
1 2 3 4 5 6	The trainee will be able to: • State the purpose of pipework • Correctly identify commonly used pipe fittings • Select correct pipe for applications • Identify sealing methods • Construct a test manifold using a variety of pipe types and fittings • Leak test a manifold

MODULE TITLE :	**PRESSURE MEASUREMENT OF PROCESS VARIABLE**
MODULE No. :	I3
SCOPE :	Develop trainee awareness, knowledge and understanding of pressure measurement in accordance with the current training objectives.

OBJECTIVE No.	SUCCESS CRITERIA
	The trainee will be able to:
1	• state the relationship between pressure, force and unit area
2	• state the factors affecting pressures caused by head of liquid
3	• use conversion tables with respect to pressure measurement
4	• define the meanings of Gauge Pressure, Absolute Pressure, Differential Pressure and Static Pressure
5	• demonstrate the working knowledge of manometers
6	• demonstrate the principle of operation of pressure gauges, including Bourdon Tube and Diaphragm types, and describe the materials of construction and can demonstrate knowledge of practical application
7	• demonstrate the principle of compound and duplex gauges and knowledge of practical application
8	• explain the hazards associated with the use of Oxygen and Acetylene gases
9	• install pressure gauges taking into account where necessary correction for ‘Head Error’
10	• explain method of calibration using a “Dead Weight Tester”
11	• recognise a receiver gauge and demonstrate an awareness of the range covered and its’ applications
12	• explain the principle of operation of pressure regulators
13	• explain the meaning of Instrument Air and General Purpose Air used in process plant operations
14	• calibrate the pressure gauges to specific standards
15	• explain the principle of a pressure switch and its uses, taking into account deadband
16	• identify a range of fittings and couplings used in instrument pipework
17	• connect various pipes and fittings together to produce pressure tight seals
18	• demonstrate the ability to use portable calibration equipment
19	• understand operating principles of a pressure regulator
20	• connect up and test pressure switches, taking into account deadband

MODULE TITLE :	**TRANSMISSION OF INSTRUMENT SIGNALS/TRANSMITTERS**
MODULE No. :	I4
SCOPE:	Develop trainee awareness, knowledge and understanding of transmission of instrument signals in accordance with the current training objectives.

OBJECTIVE No.	SUCCESS CRITERIA
	The trainee will be able to:
1	• demonstrate, using a block diagram, where transmitters fit into a control or measurement loop
2	• demonstrate knowledge of signal ranges covered and can calculate output for given input signals
3	• demonstrate an understanding of the 'Force Balance Principle' and relate this to a pneumatic transmitter
4	• explain the importance of a clean dry air supply
5	• understand the theory of the installation of a pneumatic transmitter to specified drawings in a competent and safe manner
6	• demonstrate knowledge of air supply requirements and how to set the zero correctly
7	• carry out workshop calibration by applying input signal and measuring output signal for : a) pneumatic transmitters b) electronic transmitters
8	• understand how to remove/refit transmitter from/to live plant situations, with due regard for safety of self and equipment (in harmony with common site procedures inc. Permit to Work)
9	• connect up pneumatic and electronic transmitters for calibration in workshop demonstrate an understanding of the principle of operation of electrical transmitters
10	• use test equipment to simulate operations for testing a level measurement and control transmitter

MODULE TITLE :	**SIGNAL CONDITIONERS**
MODULE No.	I5
SCOPE :	Develop trainee awareness, knowledge and understanding of signal conditioners in accordance with the current training objectives

OBJECTIVE No.	**SUCCESS CRITERIA**
	The trainee will be able to:
1	• demonstrate a basic understanding of the following types of signal conditioning instruments and their applications : a) pressure to current converter (P/I) b) current to pressure converter (I/P)
2	• complete simple checks on signal conditioning instruments by applying input signal from test unit and measuring output
3	• connect and test signal conditioners in a control or measurement loop using test equipment to simulate input and output changes

MODULE TITLE :	**LEVEL MEASUREMENT OF PROCESS VARIABLE**
MODULE No. :	I6
SCOPE :	Develop trainee awareness, understanding and knowledge of level measurement in accordance with the current training objectives

OBJECTIVE No.	SUCCESS CRITERIA
	The trainee will be able to:
1	• demonstrate knowledge of the use of dip sticks to measure liquid level and explain the necessary precautions
2	• demonstrate knowledge of sight glasses and is aware of error when reading (Parallax)
3	• explain the principle of operation of purged dip pipe systems used on open and closed tank installation
4	• recognise basic faults with regard to purged dip pipe installations and is able to explain the associated hazards
5	• complete a series of basic checks on level installations in a competent and safe manner
6	• explain the operation of 'Pneumerstat' in connection with purged dip pipe systems
7	• explain the operation of the buoyancy type liquid level instrument, including the construction materials and practical application
8	• demonstrate the basic knowledge of electrical methods of level measurement including the following : a) radiation (R/A) b) capacitance c) vibration d) flange mount transmitter (limpet cells) e) thermal f) ultra sonic
9	• complete basic checks on level indication systems employing dip pipes

MODULE TITLE :	**FLOW MEASUREMENT OF PROCESS VARIABLE**
MODULE No. :	I7
SCOPE :	Develop trainee awareness, knowledge and understanding of flow measurement in accordance with the current training objectives.

OBJECTIVE No.	SUCCESS CRITERIA
	The trainee will be able to:
1	• state the difference between rate of flow and quantity type meters, (positive displacement and inferential), and give practical examples of each type
2	• explain the principles of the variable area flow meter
3	• explain the relationship between flow rate and differential pressure across a constriction
4	• correctly identify specific scales and charts
5	• correctly identify orifice plate and venturi installations
6	• complete calibration checks on a differential pressure flow meter installation and associated instrumentation built in the workshop.
7	• explain the need to circulate liquid in a differential pressure flow installation
8	• identify common instrumentation faults such as leaks and blockages and demonstrate the correct procedure for rectification with due regard to safety and plant operating conditions
9	• identify various flow measurement devices and explain the basic principles of operation and practical uses of the following : a) rotameter/magnetic rotameter b) vortex meter c) rotary piston/nutating disc d) electro magnetic flow meter e) turbine meter f) target meter
10	• explain the difference between streamlined and turbulent flow instruments

MODULE TITLE :	**TEMPERATURE MEASUREMENT OF PROCESS VARIABLES**
MODULE No.	I8
SCOPE :	Develop trainee awareness, knowledge and understanding of temperature measurement in accordance with the current training objectives.

OBJECTIVE No.	SUCCESS CRITERIA
	The trainee will be able to:
1	• explain the differences between heat and temperature
2	• convert, using simple formulae, ^{o}F (Farenheit) into ^{o}C (Celcius) and vice versa
3	• explain the function and range of liquid in glass thermometer and it's limitations
4	• describe the principle of operation of liquid in metal thermometers and how they are related to pneumatic transmitters
5	• explain the basic principle of thermocouples identifying the various types and ranges covered
6	• state problems related to thermopocket use and explain difference between compensating and extension cable
7	• demonstrate the method of checking the output from a thermocouple and converting it to the corresponding temperature by reference to relevant tables
8	• explain the basic principles of the resistance thermometer and the common types used and explain the advantages and limitations of the associated wiring methods • install resistance thermometers and explain both 3 and 4 wire method
9	• explain the basic principle of operation of transmitting head thermometers • recognise and remedy simple faults associated with T/C's and R/T's
10 11	• complete simple checks on temperature systems for the purpose of identifying faults or faulty equipment, using relevant test equipment
12	• explain the principle of the solid expansion thermometer and give practical examples of it's use
13	• Demonstrate a basic understanding of the following types of signal conditioning instruments and their applications and check the calibration using correct test equipment of: a) Thermocouple to current converter(Tc/I) b) Resistance thermometer to current converter (Rt/I)

MODULE TITLE :	**CONTROL VALVES**
MODULE No. :	I9
SCOPE :	Develop trainee awareness, knowledge and understanding of control valves in accordance with the current training objectives.

OBJECTIVE No.	SUCCESS CRITERIA
	The trainee will be able to:
1	• define the major component parts of a control valve, explain their basic function and demonstrate where control valves fit into a control loop
2	• demonstrate the following fail safe modes and explain typical applications for each : a) fail closed b) fail open c) fail stay-put
3	• complete “stroke checks” and explain the problems associated with “valve stiction”
4	• explain the principle of operation and typical applications for solenoid valves
5	• connect and test solenoid valves to switch air supply (as used in shutdown systems)
6	• identify valves used in association with shutdown systems
7	• design & construct simple valve shutdown instrument loop

MODULE TITLE :	**PROCESS CONTROL**
MODULE NO. :	I10
SCOPE :	Develop trainee awareness, knowledge and understanding of process control in accordance with the current training objectives.

OBJECTIVE No.	**SUCCESS CRITERIA**
	The trainee will be able to:
1	• explain the reasons for using process control
2	• explain, using diagrams, the basic elements of simple closed and open loop systems
3	• use BS1523 to define terminology
4	• explain what is meant by, and reasons for using, the following : a) hand by-pass control b) manual control c) automatic control
5	• explain, using a variety of controllers, the need for the correct switching procedures involving bumpless transfer for the following : a) automatic to manual b) manual to automatic
6	• explain the process characteristics exhibited by on/off or two step control
7	• demonstrate, with the aid of diagrams, knowledge of basic control loops and instrumentation line diagrams in association with the following : a) pressure control loop b) flow control loop c) liquid level control loop d) temperature control loop
8	• examine an electronic controller and demonstrate methods to input and read program data

MODULE TITLE :	**SHUTDOWN SYSTEMS**
MODULE No. :	I11
SCOPE :	Develop trainee awareness, knowledge and understanding of shutdown systems in accordance with the current training objectives.

OBJECTIVE No.	SUCCESS CRITERIA
	The trainee will be able to:
1	• identify and explain the reasons for using emergency shutdown systems
2	• explain the voting system using practical examples
3	• demonstrate the use of special keys for the purpose of isolation
4	• explain the following modes: a) standby b) automatic
5	• explain the operation of associated alarms
6	• explain the reason for manual reset action
7	• explain the procedure following an emergency shutdown of process
8	• design and construct a simple relay logic trip system and: a) Explain its operation b) Demonstrate how it functions
9	• using knowledge gained design and construct logic circuit to given criteria

MODULE TITLE :	**PROCESS ALARMS**
MODULE NO. :	I12
SCOPE :	Develop trainee awareness, knowledge and understanding of process alarms in accordance with the current training objectives.

OBJECTIVE NO.	SUCCESS CRITERIA
	The trainee will be able to:
1	• identify and define the meaning of colour coding systems
2	• complete defined checks to ensure specific alarms operates
3	• define what is meant by “First Up Module”
4	• define the procedure for the acceptance of an alarm
5	• replace defective bulbs in alarm modules
6	• identify different types of alarm modules
7	• change a defective alarm module

SECTION 5

MECHANICAL

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MODULE TITLE :	**MECHANICAL SAFETY – WORKSHOP INDUCTION**
MODULE No.'s :	BF1
SCOPE :	Develop the Trainees' safety awareness, behaviour, and approach when working in a mechanical workshop environment and with its associated equipment in accordance with the current training objectives.

OBJECTIVE No.	SUCCESS CRITERIA
	The Trainee will receive an Induction into the Mechanical Workshop following which they should be able to explain:
1	• the need to consider safely at all times
2	• the use of Personal Protective Equipment (PPE)
3	• behaviour and approach
4	• safe use and storage of hand tools
5	• time-keeping, punctuality, and entering and leaving the work area
6	• Fire Alarm procedures
7	• maintaining a clean work area and environment

MODULE TITLE :	**APPLY SAFE WORKING PRACTICES**
MODULE No. :	BF1
SCOPE :	Develop trainee awareness, knowledge, understanding and application of safe working practices in accordance with the current training objectives.

OBJECTIVE NO.	SUCCESS CRITERIA
	The trainee will be able to:
1	• Understand their roles and responsibilities under the Health and Safety at Work Act
2	• Ensure the appropriate Personal Protective Equipment is worn and PPE procedures are followed
3	• Ensure that Safe systems of Work are followed
4	• Recognise the need to observe personal hygiene
5	• The risks associated with the working environment
6	• Recognise the control measures that can be used to eliminate/reduce the hazard
7	• Know the organisational procedures in the event of an accident or emergency
8	• Know the methods of manually handling and moving heavy loads
9	• Identify and locate health and safety information and the sources of expert assistance when help is needed
10	• Ensure the working area is kept clean and tidy
11	• Ensure Health & Safety requirements and good working practices are always observed and act responsibly within the working environment

For mapping to the relevant apprenticeship standards please see the individual index pages 19-41

MODULE TITLE :	**MEASUREMENT UNITS – IMPERIAL AND METRIC**
MODULE No. :	BF2
SCOPE :	Develop trainee awareness, knowledge, understanding and application of imperial and metric systems of measurements in accordance with the current training objectives.

OBJECTIVE NO.	SUCCESS CRITERIA
	The trainee will be able to:
1	• Demonstrate a knowledge and understanding of the metric & imperial systems of measurement
2	• Demonstrate a knowledge and understanding of fractions and decimals within the imperial system
3	• Demonstrate a knowledge and understanding of the imperial angular units Degrees, Minutes & Seconds
4	• Demonstrate a knowledge and understanding of how to make conversions from one system to the other using both mental arithmetic & calculators
5	• Use reference tables and charts to establish: imperial to metric & metric to imperial conversions, find tapping drill sizes, thread data, Tolerances (limits &fits) where applicable
6	• Understand the scale of the metric/imperial micrometers
7	• Understand the metric/imperial Vernier scales
8	• Have an understanding of the calibration system i.e. slip gauges etc
9	• Exercise care in the use of imperial/metric measurement equipment
10	• Demonstrate correct the techniques when measuring the machined components

MODULE TITLE :	**PROJECT PLANNING – BENCH FITTING**
MODULE No. :	BF3
SCOPE :	Develop trainee awareness, knowledge, understanding and practice of how to plan and collate information for a machine-shop based task in accordance with the current training objectives.

OBJECTIVE No.	**SUCCESS CRITERIA**
	The trainee will be able to demonstrate:
1	• How to understand and interpret the engineering drawings
2	• How to establish the size and type of materials required for the project
3	• How to interpret the tolerances from the drawing to establish what precision measuring tools are needed to complete the project
4	• The requirement for the relevant tools needed to complete the project
5	• the requirement to plan the work
6	• how to split the tasks into stages to establish set milestones
7	• the need to examine and conduct interim inspections at each stage in order to ensure quality
8	• how to identify problems and deal with them
9	• the collation of relevant information and use of it
10	• a knowledge of how to plan a simple project
11	• The need to return tools, materials and leaving the work area in a safe tidy manner
12	• how to review and reflect on the end result and modify if required

MODULE TITLE :	**BOLT IDENTIFICATION EXERCISE**
MODULE No. :	BF4
SCOPE :	Develop trainee awareness, knowledge and understanding of the identification of bolts in accordance with the current training objectives.

OBJECTIVE NO.	SUCCESS CRITERIA
	The trainee will be able to:
1	• Identify a range of common fastenings: a) nuts and bolts b) screws c) studs d) hexagon socket screws e) fitted / machine bolt
2	• Identify a range of fastenings by size and material: a) in terms of length b) in terms of diameter c) in terms of screw head d) in terms of type of head e) has a knowledge of bolt tensioning / torque methods f) has a knowledge of current bolting materials
3	• Understand the reasons for using locking devices and washer by demonstrating : a) a knowledge of locking devices which use friction as a means of locking b) knowledge of locking devices which are classed as positive locking devices c) knowledge of appropriate locking devices or washers for a specific application giving reasons for its selection

MODULE TITLE :	**MANUFACTURE A CENTRE FINDER**
MODULE No. :	BF5.1
SCOPE :	Develop trainee awareness, knowledge and understanding of hand tools and measurement in accordance with the current training objectives.

OBJECTIVE NO.	SUCCESS CRITERIA
	By undertaking the practical assignment the trainee will be able to:
1	• Use hand tools safely and accurately
2	• Understand and interpret engineering drawings
3	• Use hand tools to create datum faces in preparation for marking out
4	• Use precision marking out equipment to accurately mark the job
5	• Cut and shape the materials using hand tools only
6	• Meet the tolerances stated on the drawing using hand tools only
7	• Be able to accurately set the blade into position in preparation for jointing
8	• Safely set-up the drilling machine in preparation for drilling operations to include: a) Check the machine for safe operation b) Correctly clamp the workpiece c) Select and set the correct RPM to suit the task
9	• Understand and use riveting techniques for the jointing of materials
10	• Achieve the finish stated on the drawing
11	• Inspect the centre finder and check centre line accuracy

MODULE TITLE :	**MANUFACTURE A BENCH FITTING PROJECT**
MODULE No. :	BF5.2
SCOPE :	Develop trainee awareness, knowledge and understanding of hand tools and measurement in accordance with the current training objectives.

OBJECTIVE NO.	SUCCESS CRITERIA
	By undertaking the practical assignment the trainee will be able to:
1	• Use hand tools safely and accurately
2	• Understand and interpret engineering drawings
3	• Use hand tools to create datum faces in preparation for marking out
4	• Use precision marking out equipment to accurately mark the job
5	• Safely set-up the drilling machine in preparation for drilling operations to include: a) Check the machine for safe operation b) Correctly clamp the work piece c) Select and set the correct RPM to suit the task
6	• Understand and use threading techniques by using taps & dies to produce the required threads
7	• Cut and shape the materials using hand tools only
8	• Meet the tolerances stated on the drawing using hand tools only
9	• Achieve the finish stated on the drawing
10	• Inspection

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MODULE TITLE :	**THE VERNIER CALIPER**
MODULE No. :	MS3
SCOPE :	Develop trainee awareness, knowledge, understanding and practice of how to operate a Vernier calliper in accordance with the current training objectives.

OBJECTIVE No.	**SUCCESS CRITERIA**
	The trainee will be able to demonstrate:
1	• an understanding of the principal of the Vernier scale
2	• how to manually read the Vernier scale
3	• how to operate the digital display and change the battery if required
4	• how to set/calibrate and correctly use the Vernier height gauge
5	• how to set/calibrate and operate the Vernier calliper for both internal and external measurements

MODULE TITLE	**MACHINE SHOP SAFETY**
MODULE No.	MS4
SCOPE :	Develop trainee awareness, knowledge, understanding and practice of machine shop safety in accordance with the current training objectives.

OBJECTIVE No.	**SUCCESS CRITERIA**
	The trainee will receive an Induction into the Mechanical Machining Workshop which will include the need to work safely at all times, the use of Personal Protective Equipment (PPE), behaviour, safe use of hand tools, time-keeping and punctuality, and Fire Alarm procedures. The trainee will be able to demonstrate hazard awareness, appreciation and understanding, by recognising the following in order to demonstrate safe working practice:
1	• hazards associated with cutting tools
2	• hazards associated with rotating machinery
3	• the necessity for safety equipment in a machine shop, e.g. emergency stops
4	• a basic knowledge of the Statutory Regulations
5	• the requirement for personal protection in the machine shop
6	• the requirement for personal safety in the machine shop
7	• the requirement to undertake risk assessments
8	• safe systems of work & procedures
9	• identifying and reporting hazards e.g. machine maintenance issues
10	• the procedures to be followed in the event of an emergency

MODULE TITLE :	**SAFE OPERATION OF A CENTRE LATHE**
MODULE No. :	MS5
SCOPE :	Develop trainee awareness, knowledge, understanding and practice of how to safely operate a centre lathe by undertaking the practical assignment in accordance with the current training objectives.

OBJECTIVE No.	**SUCCESS CRITERIA**
	The trainee will be able to demonstrate an appreciation and understanding, by recognising the following in order to demonstrate safe working practice:
1	• the components of the centre lathe
2	• the specific uses of the centre lathe
3	• the procedure for stop/starting in normal operation and safety mechanisms for emergency shutdown, guards, interlocks, brakes etc.
4	• how to safely mount/dismount work holding devices to include chucks
5	• how to safely set up and secure the work piece
6	• how to safely set up and secure the cutting tools
7	• how to select and set on centre height variety of turning tools
8	• how to select feeds and speeds relative to the type and size of the material being machined and the finish required
9	• identify the need to use coolant for specific materials and operations whilst observing good hygiene
10	• how to machine accurately and safely using the machine dials
11	• to safely isolate the machine and restore the machine and work area to a safe and tidy manner

MODULE TITLE :	**CENTRE LATHE – PLANNING A TASK**
MODULE No. :	MS6
SCOPE :	Develop trainee awareness, knowledge, understanding and practice of how to plan and collate information for a machine-shop based task in accordance with the current training objectives.

OBJECTIVE No.	**SUCCESS CRITERIA**
	The trainee will be able to demonstrate:
1	• How to understand and interpret the engineering drawings
2	• How to establish the size and type of materials required for the project
3	• How to interpret the tolerances from the drawing to establish what precision measuring tools are needed to complete the project
4	• The requirement for the relevant tools needed to complete the project
5	• the requirement to plan the work
6	• how to split the tasks into stages to establish set milestones
7	• the need to examine and conduct interim inspections at each stage in order to ensure quality
8	• how to identify problems and deal with them
9	• the collation of relevant information and use of it
10	• a knowledge of how to plan a simple project
11	• The need to return tools, materials and leaving the work area in a safe tidy manner
12	• how to review and reflect on the end result and modify if required

MODULE TITLE :	**SAFE OPERATION OF A TURRET MILLING MACHINE**
MODULE No. :	MS7
SCOPE :	Develop trainee awareness, knowledge, understanding and practice of how to safely operate a milling machine by undertaking the practical assignment in accordance with the current training objectives.

OBJECTIVE No.	**SUCCESS CRITERIA**
	The trainee will be able to recognise the need to apply safe working practices at all times and demonstrate:
1	• the components of the milling machine
2	• the specific uses of the milling machine
3	• the procedures for stop/starting in normal operation and safety mechanisms for emergency shutdown, guards, interlocks, brakes etc.
4	• how to set/check the head for accurate positioning relating to the axis of the machine using DTI
5	• how to safely mount/dismount work holding devices for accurate positioning relating to the axis of the machine using DTI
6	• how to safely set up and secure the work piece
7	• how to safely set up and secure the cutting tools
8	• how to safely set up and secure the work piece
9	• how to safely set up and secure the cutting tools
10	• how to select and set up a variety of cutting tools
11	• how to select feeds and speeds relative to the type and size of the material being machined and the finish required
12	• identify the need to use coolant for specific materials and operations whilst observing good hygiene
13	• how to machine accurately and safely using the machine dials
14	• to safely isolate the machine and restore the machine and work area to a safe and tidy manner

MODULE TITLE :	**OPERATION OF DIGITAL CONTROLS**
MODULE No. :	MS9
SCOPE :	Develop trainee awareness, knowledge, understanding and practice of how to safely operate a digital indication and control system by undertaking the practical assignment in accordance with the current training objectives.

OBJECTIVE No.	**SUCCESS CRITERIA**
1 2 3 4 5	The trainee will be able to demonstrate knowledge and demonstrate: • how to set the digital readout to read metric or imperial units • how to set the co-ordinates in relationship to the work-piece to a tolerance of + or – 0.002” or 0.05mm using a known cutter diameter • how to directly input dimensions into the control • how to use absolute and incremental modes for specific operations • how to use the x and y axis readouts to + or - 0.002” or 0.05mm on a work-piece

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MODULE TITLE	**MACHINE SHOP SAFETY**
MODULE No.	MA1
SCOPE :	Develop trainee awareness, knowledge, understanding and practice of machine shop safety in accordance with the current training objectives.

OBJECTIVE No.	**SUCCESS CRITERIA**
	The trainee will receive an Induction into the Machining Workshop which will include the need to work safely at all times, the use of Personal Protective Equipment (PPE), behaviour, safe use of hand tools, time-keeping and punctuality, and Fire Alarm procedures. The trainee will be able to demonstrate hazard awareness, appreciation and understanding, by recognising the following in order to demonstrate safe working practice:
1	• hazards associated with cutting tools
2	• hazards associated with rotating machinery
3	• the necessity for safety equipment in a machine shop, e.g. emergency stops
4	• a basic knowledge of the Statutory Regulations
5	• the requirement for personal protection in the machine shop
6	• the requirement for personal safety in the machine shop
7	• the requirement to undertake risk assessments
8	• safe systems of work & procedures
9	• identifying and reporting hazards e.g. machine maintenance issues
10	• the procedures to be followed in the event of an emergency

MODULE TITLE :	**MEASUREMENT UNITS – IMPERIAL AND METRIC**
MODULE No. :	MA2
SCOPE :	Develop trainee awareness, knowledge, understanding and application of imperial and metric systems of measurements in accordance with the current training objectives.

OBJECTIVE NO.	SUCCESS CRITERIA
	The trainee will be able to:
1	• Demonstrate a knowledge and understanding of the metric & imperial systems of measurement
2	• Demonstrate a knowledge and understanding of fractions and decimals within the imperial system
3	• Demonstrate a knowledge and understanding of the imperial angular units Degrees, Minutes & Seconds
4	• Demonstrate a knowledge and understanding of how to make conversions from one system to the other using both mental arithmetic & calculators
5	• Use reference tables and charts to establish: imperial to metric & metric to imperial conversions, find tapping drill sizes, thread data, Tolerances (limits & fits) where applicable
6	• Understand the scale of the metric/imperial micrometers
7	• Understand the metric/imperial Vernier scales
8	• Have an understanding of the calibration system i.e. slip gauges etc
9	• Exercise care in the use of imperial/metric measurement equipment
10	• Demonstrate correct the techniques when measuring the machined components

MODULE TITLE :	**PROJECT PLANNING – MOBILE MODULAR**
MODULE No. :	MA4
SCOPE :	Develop trainee awareness, knowledge, understanding and practice of how to plan and collate information for a machine-shop based task in accordance with the current training objectives.

OBJECTIVE No.	**SUCCESS CRITERIA**
	The trainee will be able to demonstrate:
1	• How to understand and interpret the engineering drawings
2	• How to establish the size and type of materials required for the project
3	• How to interpret the tolerances from the drawing to establish what precision measuring tools are needed to complete the project
4	• The requirement for the relevant tools needed to complete the project
5	• the requirement to plan the work
6	• how to split the tasks into stages to establish set milestones
7	• the need to examine and conduct interim inspections at each stage in order to ensure quality
8	• how to identify problems and deal with them
9	• the collation of relevant information and use of it
10	• a knowledge of how to plan a simple project
11	• The need to return tools, materials and leaving the work area in a safe tidy manner
12	• how to review and reflect on the end result and modify if required

MODULE TITLE :	**MANUFACTURE & ASSEMBLY – MOBILE MODULAR**
MODULE No. :	MA5
SCOPE :	Develop trainee skills of machining and bench fitting knowledge by producing a working model Beam Engine

OBJECTIVE NO.	SUCCESS CRITERIA
	The trainee will be able to:
1	• Follow given written instructions
2	• Use previously learnt skills to plan job and produce job plan
3	• Interpret given Engineering Drawings
4	• Work together as a team to batch produce components
5	• Produce components using acquired Bench Fitting skills
6	• Produce components using acquired Turning skills
7	• Produce components using acquired Milling skills
8	• Ensure all parts meet the specified tolerances
9	• Ensure all parts meet specified surface finish
10	• Manufacture a gasket to specification
11	• Carry out regular quality checks and Inspection
12	• Assembly all parts as per instruction
13	• Test functionality

SECTION 5

MECHANICAL

BENCH-FITTING
MACHINE –SHOP
MANUFACTURE & ASSEMBLY
LIFTING & RIGGING
FABRICATION

SATISFACTORY KNOWLEDGE AND UNDERSTANDING OF THE FOLLOWING ITEMS HAS BEEN DEMONSTRATED VIA OBSERVATION OF PRACTICE AND THE COMPLETION OF PRACTICAL AND WRITTEN ASSIGNMENTS AND TESTS.

For mapping to the relevant apprenticeship standards please see the individual index pages 19-41

MODULE TITLE :	**MECHANICAL LIFTING**
MODULE No. :	LR1
SCOPE :	Develop trainee awareness, knowledge, understanding and experience of mechanical lifting in accordance with the current training objectives.

OBJECTIVE No.	SUCCESS CRITERIA
	The trainee is able to demonstrate knowledge and understanding of each of the following:
1	• rigging by: a) describing one method of calculating the weight of a load b) describing one method of calculating the weight of a load c) explaining the centre of gravity and its importance in rigging a load d) describing four common sling arrangements e) explaining the hook use and cite three reasons for removing a hook from service
2	• wire rope and wire rope slings by: a) identifying the component parts of wire rope and describe its construction and classification b) explaining the factors that affect wire rope strength c) describing the basic single leg and multi-leg slings, and the calculation of their allowable loads d) explaining the signs of damage that would cause a wire rope to be removed from service
3	• slings by: a) identifying two different grades of chain and naming two applications for each b) explaining the terms “working load limit”, “proof test” and “minimum breaking force” c) describe four factors that affect the strength of chain slings d) describe three types damage that a chain sling might incur e) list the visible signs of damage that would cause a sling to be removed from service • rope by: a) identify two grades of manila rope that can be used for lifting b) identify three synthetic fibre ropes and describe their advantages over manila rope c) identify the factors that affect the strength of fibre rope d) identify the signs of wear and damage that would cause a fibre rope to be removed from service e) describe, with the aid of drawings if required, an encased polyester fibre sling

MODULE TITLE :	**MECHANICAL LIFTING** *(cont'd)*
MODULE No.:	LR1
SCOPE :	Develop trainee awareness, knowledge, understanding and experience of mechanical lifting in accordance with the current training objectives.

OBJECTIVE No.	**SUCCESS CRITERIA**
4.	• hoists and cranes by: a) describing the characteristics of two types of overhead hoist b) explaining the terms "single acting" and "double reeving" c) explaining the function of an upper limit switch and an overload limit device d) identifying two basic types of jib crane e) describing what a Rigger's daily visual inspection should include
5	• hoists and cranes by: a) describing the characteristics of two types of overhead hoist b) explaining the terms "single acting" and "double reeving" c) explaining the function of an upper limit switch and an overload limit device d) identifying two basic types of jib crane e) describing what a Rigger's daily visual inspection should include
6	• operating practices by: a) stating ten operating practices that apply to slings b) stating seven operating practices that should be observed when using a hoist or crane c) describing three methods of turning a load

SECTION 5

MECHANICAL

BENCH-FITTING
MACHINE -SHOP
MANUFACTURE & ASSEMBLY
LIFTING & RIGGING
FABRICATION

SATISFACTORY KNOWLEDGE AND UNDERSTANDING OF THE FOLLOWING ITEMS HAS BEEN DEMONSTRATED VIA OBSERVATION OF PRACTISE AND THE COMPLETION OF PRACTICAL AND WRITTEN ASSIGNMENTS AND TESTS.

For mapping to the relevant apprenticeship standards please see the individual index pages 19-41

MODULE TITLE :	**MECHANICAL AND FABRICATION HAND TOOLS**
MODULE No. :	S1A
SCOPE :	Develop trainee awareness, knowledge, understanding and practise of mechanical hand tools in accordance with the current training objectives.

OBJECTIVE No.	SUCCESS CRITERIA
	The trainee will receive an Induction into the Fabrication Workshop which will include the need to work safely at all times, the use of Personal Protective Equipment (PPE), behaviour, safe use of hand tools, time-keeping and punctuality, and Fire Alarm procedures. The trainee will be able to demonstrate:
1	• the selection and safe use of a range of mechanical hand tools including : a) Hammers b) Chisels c) Files d) Marking Equipment e) Measuring Equipment f) Cutting equipment g) Spanners h) Wrenches
2	• the safe methods used to manually cut pipe threads including: a) identification and selection of API and BSP stocks & dies, tapered and straight with reference to the size of the pipe and the assembly requirements b) the preparation of the pipe to a suitable standard prior to threading c) the selection and safe use of an appropriate cutting fluid d) ensuring the threads are correctly formed and finished to a suitable specification and are free from damage
3	• the selection and fitting of a standard hacksaw blade to a hacksaw
4	• how to cut mild steel (up to 12mm thick) to a given tolerance
5	• how to use a pedestal mounted drilling machine in a safe manner and drill holes up to 10mm diameter in mild steel
6	• using the appropriate safety precautions, weld mild steel up to 6mm thick using the manual metal arc process to a specified standard
7	• in safe manner, cut mild steel up to 12mm thickness using mechanical and oxy-fuel cutting equipment
8	• the safe use and efficient operation of a range of portable electrically powered tools including: a) Surface grinders b) Drills c) Saws d) Cutters

MODULE TITLE	**ENGINEERING DRAWING / LINE DIAGRAMS**
MODULE No.	FA1
SCOPE :	Develop trainee awareness, knowledge, understanding and practise of engineering drawing in accordance with the current training objectives.

OBJECTIVE No.	SUCCESS CRITERIA
1 2 3	The trainee will be able to: • read and interpret engineering drawing to BS EN 8888. This includes : a) interpretation of engineering drawings as a means of: information quality standards b) identification of first and third angle projection c) interpretation of symbols and abbreviations commonly used on drawings d) interpretation of dimensions, surface finish and tolerating procedures e) interpretation of size and form of components from orthographic diagrams, sketches and sectioned diagrams f) compare BS EN 8888 to company standards and identify the differences • make sketches of Process plant equipment in isometric and orthographic projection. This includes: a) ensuring sketches are neat, to scale and convey the appropriate information b) ensuring sketches are in proportion and reflect the true shape c) using BS EN standards convention with regard to dimensions, tolerances and symbols d) using Company standards convention with regard to dimensions, tolerances and symbols • construct, read and interpret line diagrams of basic process and plant. This includes: a) stating the purpose of line diagrams b) identification of the symbols used on company line diagrams c) identifying items or equipment on a Process plant to an appropriate line diagram d) diagnosing plant faults with the aid of line diagrams e) constructing line diagrams for the use of the modification or extension of existing Process plant

MODULE TITLE	**ENGINEERING DRAWING / LINE DIAGRAMS** (cont'd)
MODULE No.	FA1
SCOPE :	Develop trainee awareness, knowledge, understanding and practise of engineering drawing in accordance with the current training objectives.

OBJECTIVE No.	**SUCCESS CRITERIA**
	The trainee will be able to:
4	• print letters, numbers and dimensions, using standard drawing pencils, to comply with BS EN 8888
5	• produce a clear, correctly proportional, three dimensional free hand sketch using standard drawing pencils and paper
6	• produce, using standard drawing instruments, to BS EN 8888 the following: a) orthographic drawings b) isometric drawings
7	• produce simple process line diagrams which include symbols associated with Instrument, Electrical and Mechanical pieces of equipment. Reference to be made to BS1553 and BS5070
8	• demonstrate an understanding of a Computer Aide Design system.

MODULE TITLE :	**PIPELINE DESIGN, INSTALLATION AND MAINTENANCE**
MODULE No. :	FA2 & FA3
SCOPE :	Develop trainee awareness, knowledge, understanding and practise of pipeline design, installation and maintenance in accordance with the current training objectives.

OBJECTIVE No.	SUCCESS CRITERIA
	The trainee will be able to:
1	• interpret pipeline specification sheets. This includes : a) explain the reasons for using pipeline specification sheets b) select the appropriate pipeline specification to suit the duty c) extract piping materials information for specification sheets, stating the reasons for using these materials d) extract flange type information from specification sheets, stating the reasons for using the specified flanges e) refer to appropriate standards (ANSI, DIM, BSI) and extracting relevant information from these which relate to pipeline specification sheets f) extract information regarding any specific methods of fabrication, cleaning, insulation, tracing and testing required for these specifications where appropriate
2	• apply safe working practices including: a) the wearing of appropriate protective clothing b) following personal protective procedures c) keeping the work area clean and tidy d) consistently observing all Health and Safety requirements and good working practices e) following appropriate safety precautions and procedures to minimise the risk of personal injury, damage to equipment and danger to others when working on Process Plant f) obtaining a Permit to Work from a responsible person g) observing Plant Isolation Procedure by the isolation and locking-off of the process plant before work commences

MODULE TITLE :	**PIPELINE DESIGN, INSTALLATION AND MAINTENANCE** (cont'd)
MODULE No. :	FA2 & FA3
SCOPE :	Develop trainee awareness, knowledge, understanding and practise of pipeline design, installation and maintenance in accordance with the current training objectives.

OBJECTIVE No.	SUCCESS CRITERIA
3	The trainee will be able to: • identify, select and fabricate a range of pipe joints. This includes : a) identification of a range of pipe joints and jointing materials b) describe the mediums which can be sealed using a range of pipe joints and jointing materials c) identification of a range of pipe fittings d) stating the pipe materials and fittings which are suitable for different types of medium e) preparation of pipes for making a range of joints f) inspection of materials for damage to jointing surfaces g) selection of suitable pipe joints for specific applications h) making a tightly sealed joint using a range of approved methods i) completing appropriate tests / checks to ensure joints are tightly sealed
1	The trainee will be able to: • install pipe-work. This includes: a) identification of a range of pipe supports and fasteners b) stating the methods used for fixing pipes and supports c) selecting an appropriate support for a specific application d) identification of suitable positions for the fixing and alignment of pipe supports e) fixing and aligning supports in suitable position f) install and align appropriate plant item e.g. valves, spades filters etc g) fixing pipe-work in supports and making the joints, taking into account the alignment and accurate positioning of pipe-work, using safe working practices h) completion of appropriate checks and tests to ensure pipe system is correctly and safely installed, leak tight meeting speficiation

MODULE TITLE :	**PIPELINE DESIGN, INSTALLATION AND MAINTENANCE** (cont'd)
MODULE No. :	FA2 & FA3
SCOPE :	Develop trainee awareness, knowledge, understanding and practise of pipeline design, installation and maintenance in accordance with the current training objectives.

OBJECTIVE No.	**SUCCESS CRITERIA**
2	The trainee will be able to: • break open a pipe joint. This consists of: a) obtaining a Permit to Work from a responsible person prior to commencing work b) completing pipe isolation and draining procedures c) checking the pipe is supported safely around the 'break point' d) following the appropriate 'pipe-break' procedures (e.g. never remove all bolts, break flange away from individual) e) using safe working practices to remove pipe length if required f) using safe working practices to install the pipe length and to re-make pipe joint if required g) using safe working practices dismantle and store pipe work ensuring work area is clean and tidy. h) on completion of task permit to work is correctly signed and hand over complete

MODULE TITLE :	**MAINTENANCE OF MECHANICAL VALVES**
MODULE No. :	FA4
SCOPE :	Develop trainee awareness, knowledge, understanding and practise of mechanical valve maintenance in accordance with the current training objectives.

OBJECTIVE No.	SUCCESS CRITERIA
	The trainee will be able to:
1	• identify the following process valves: Gate, Globe, Plug, Check, Needle, Ball, Slide, Star, Diaphragm, Butterfly
2	• identify the main components of mechanical valves
3	• state the working principles of the valves listed above which allow the functional requirements to be met
4	• select a suitable valve for a plant application with reference to its operating temperature, operating pressure, media, size and weight, Engineering Codes of Practice and project specifications
5	• in a workshop environment, apply safe working practices including: a) obtaining a Permit to Work from a responsible person b) isolation and locking-off of the process plant before work commences c) the wearing of appropriate protective clothing d) following personal protective procedures e) consistently observing the Health and Safety requirements and good working practices
6	• apply Health and Safety and maintenance procedures to remove and test a valve from a “live” process plant including: a) safely isolate and lock-off the system, post appropriate safety signs at prominent places prior to starting work b) identify and remove a Diaphragm valve from a system c) identify and remove a Ball or Gate valve from a system d) dis-assemble a Diaphragm, Ball and/or Gate valve and identify the main components which require maintenance e) identify faults and explain rectification methods f) complete a hydraulic test on a Ball, Diaphragm and Gate valve using appropriate safe working procedures g) can identify and rectify any faults to a suitable standard h) can refit the removed valve into the process system and re-commission the system to operational standard

MODULE TITLE :	**WORKSHOP SUPPORT SERVICES – MANUAL METAL ARC WELDING**
MODULE No. :	FA5 & FA7
SCOPE :	Develop trainee awareness, knowledge, understanding and practise of workshop support services in accordance with the current training objectives.

OBJECTIVE No.	SUCCESS CRITERIA
	The trainee will be able to:
1	• gain an understanding of a range of welding processes including: Manual Metal Arc, MIG/MAG, TIG, Friction welding.
2	• deposit a weld bead using the Manual Metal Arc process, break the arc, clean the weld and restore the weld run. This includes: a) building a pad of continuous weld deposits in approval, and in accordance, with BS4872 b) deposit a single run fillet weld, in approval, in accordance, with BS4872 Part 1 c) deposit a multi-run fillet weld, in approval, and in accordance, with BS4872 d) identification and explanation of potential faults in weld deposits
3	• apply safe working practices including: a) selection of a safe position for manual metal arc welding prior to operating b) wearing appropriate protective/safety clothing c) keeping the work area clean and tidy and ensuring there are no fire risks d) consistently observing all Health and Safety requirements and good working practices, e.g. fume extraction and shielding to prevent stray arc flash e) an appreciation of the hazards involved when carrying out the normal metal arc welding process f) safe preparation, by mechanical means, of 6mm thick mild steel plate g) selection of the correct electrode and adjusting the current to suit the particular procedure as in 1a, 1b, and 1c
4	• explain the welding (electrical) circuit and can safely inspect, assemble and dismantle the manual metal arc equipment. This includes: a) a visual inspection of a range of hand tools associated with the manual metal arc process and using them in a safe manner

MODULE TITLE :	a. **WORKSHOP SUPPORT SERVICES – FABRICATION DEVELOPMENT** (cont'd)
MODULE No. :	FA5 & FA7
SCOPE :	Develop trainee awareness, knowledge, understanding and practise of workshop support services in accordance with the current training objectives.

OBJECTIVE No.	**SUCCESS CRITERIA**
	The trainee will be able to:
1	• produce a series of development templates using the following techniques: a) Parallel line b) Radial line c) Triangulation
2	• Identify a range of ferrous, non ferrous and non metal materials. This includes: a) Carbon Steels (Hot Rolled & Cold Rolled) b) Stainless Steel c) Cast Iron d) Aluminium e) Copper f) Brass g) Coated Materials h) Polymers i) Types of form obtainable – sheet, plate, rolled section
3	• produce a variety of formed shapes using hand tools on mild steel sheets up to 1/16" or 1.6mm thickness. This includes: a) following an identified sequence of operations b) safe handling of materials c) selecting, and correctly preparing, suitable datum faces and edges d) correctly marking out, using appropriate techniques and in accordance with the drawing specification e) the removal of surplus material using appropriate hand tools and workshop equipment leaving a suitable finishing allowance f) completion of the profile using appropriate hand tools with surface finish to drawing specification g) completion of the profiles with tolerances to conform to drawing specification h) removal of sharp edges as required using appropriate hand tools

MODULE TITLE:	**WORKSHOP SUPPORT SERVICES – FABRICATION DEVELOPMENT** (cont'd)
MODULE No. :	FA5 & FA7
SCOPE :	Develop trainee awareness, knowledge, understanding and practise of workshop support services in accordance with the current training objectives.

OBJECTIVE No.	SUCCESS CRITERIA
4	The trainee will be able to demonstrate how to: • Safely use and operate a range of fabrication equipment including: a. Power Quillotine b. Bench Sheers c. Folding Machine d. Bending Machine e. Rolling Machine f. Hydraulic Press g. Shot Blaster h. Bandsaw

MODULE TITLE:	**WORKSHOP SUPPORT SERVICES - THERMAL CUTTING**
MODULE No. :	FA6
SCOPE :	Develop trainee awareness, knowledge, understanding and practise of workshop support services in accordance with the current training objectives

OBJECTIVE No.	SUCCESS CRITERIA
	The trainee will be able to demonstrate how to:
1.	• prepare oxy-fuel cutting equipment for use. This includes: a) checking equipment for damage before assembly b) checking flashback arrestors are fitted correctly c) cracking open gas supply prior to connecting regulators, and checks the result d) correct assembly of equipment and checks for gas leaks e) selection of appropriate nozzle f) setting of correct gas working pressure according to nozzle size and material thickness g) obtaining the correct flame setting prior to cutting
2	• apply safe working practices including: a) selection of a safe position for portable burning equipment prior to commencing cutting b) the wearing of appropriate protective/safety equipment c) keeping the work area clean and tidy ensuring there are no fire risks d) consistently observing Health and Safety requirements and good working practices
3	• hand cut carbon steel nuts, bolts, angle iron and steel plate. This includes: a) cut material without excessive waste (material thickness up to 12.5 mm or ½ “) b) cut square and bevelled edges to appropriate quality. c) consideration and selection of the safest/easiest method for cutting nuts and bolts in situ on Process plant equipment e.g., flanges. d) working to dimensional accuracy within ± 2mm or ± 0.08". e) cutting rolled steel sections to appropriate finish
4	• store gas cutting equipment safely. This includes: a) turning the gas supply (torch valves) off in the correct sequence b) closing all cylinders and gas supply valves, ensuring hoses are purged, and allowing sufficient time for burnin /cutting torch to cool c) storing hoses, torch and portable burning equipment in a safe location and leave equipment in a safe position taking account of company policy

MODULE TITLE	**MAINTENANCE OF STEAM TRAPS**
MODULE No.	FA8
SCOPE	Develop trainee awareness, knowledge and understanding of the operation and maintenance of steam traps in accordance with the current training objectives.

OBJECTIVE No.	SUCCESS CRITERIA
	The trainee will be able to:
1.	• identification of the following steam types of traps a) Thermostatic b) Mechanical c) Thermodynamic
2	• Identify the main component parts for each type
3	• explain the working principles which enable the functional requirements of steam traps to be met
4	• select an appropriate steam trap for a specific application, taking account of size, material, temperature and pressure
5	• apply safe working practices including: a) appropriate protective clothing is worn b) personal protective procedures are followed c) working area is kept clean and tidy d) consistent observation of Health and Safety requirements and good working practices e) following appropriate safety precautions and procedures to minimise risk of personal injury, damage to equipment and danger to others f) obtaining a Permit to Work from an appointed person g) isolation and locking-off of associated process plant before work commences
6	• diagnose common faults including: a) explaining the effects of steam traps on a steam system when they are functioning correctly or are in operation b) identification of the operating conditions which are present when steam traps are functioning correctly c) identification of operating conditions present when steam traps do not function correctly

MODULE TITLE	**THERMAL INSULATION**
MODULE No.	FA9
SCOPE :	Develop trainee awareness, knowledge and understanding of thermal insulation in accordance with the current training objectives.

OBJECTIVE No.	SUCCESS CRITERIA
	The trainee will be able to:
1	• demonstrate an understanding of the functions of thermal insulation
2	• identify different types of insulation materials, both mass and reflective
3	• identify asbestos insulation and demonstrate increased awareness of the hazards and safety procedures involved with this material
4	• demonstrate the correct installation and removal techniques of insulation materials
5	• demonstrate an understanding of safe working practices when handling insulation materials
6	• explain the reasons for using trace heating
7	• identify two methods of trace heating
8	• identify the uses of insulation blankets and removable fabricated insulation boxes
9	• demonstrate an understanding of the hazards when working in a hot environment e.g., heat, stress

MODULE TITLE	**TEMPORARY REPAIR**
MODULE No.	FA10
SCOPE :	This module is designed to develop trainee awareness and competence in the subject of temporary repair in accordance with the current training objectives.

OBJECTIVE No.	SUCCESS CRITERIA
	The trainee will be able to:
1	• examine the various materials available for effecting different types of repair
2	• explain the need for, and be able to complete, stringent surface preparation
3	• explain application techniques to ensure correct material performance
4	• recognise material capabilities
5	• recognise conditions unsuitable for repairs using molecular metal compounds
6	• demonstrate an awareness of technical service and support available, understanding local limitations
7	• demonstrate an appreciation of the following materials : a) GRP including plastic welding and glass fibre build up b) molecular metal compounds c) wrap and seal using sheet metal d) protective covering using Denso tape e) pop rivets f) self tapping screws g) jubilee clips h) hose clamps i) adhesives (engineering Locktite products), epoxy resin, super glue (Cyano-acrylate) solvents, plastic adhesives and impact adhesives j) application of mastics and jointing compounds using an industrial mastic gun
8	• repair a thread using a helicoil thread replacement kit and thread restoring tools
9	• demonstrate an understanding of cold repairs to castings using the ‘Metaloc’ process
10	• demonstrate an understanding and appreciate of specialised services, such as on-site leak repairs, on site services i.e., machining and bolt tensioning and on-site valve testing (Fermanite Ltd)

SECTION 6

PROCESS

SATISFACTORY KNOWLEDGE AND UNDERSTANDING OF THE FOLLOWING ITEMS HAS BEEN DEMONSTRATED VIA OBSERVATION OF PRACTISE AND THE COMPLETION OF PRACTICAL AND WRITTEN ASSIGNMENTS AND TESTS.

For mapping to the relevant apprenticeship standards please see the individual index pages 19-41

MODULE TITLE :	**PROCESS SAFETY – WORKSHOP INDUCTION**
MODULE No.'s :	P1
SCOPE :	Develop the Trainees' safety awareness, behaviour, and approach when working in a process workshop environment and with its associated equipment in accordance with the current training objectives.

OBJECTIVE No.	SUCCESS CRITERIA
	The Trainee will receive an Induction into the Process Workshop following which they should be able to explain:
1	• the need to consider safely at all times
2	• the use of Personal Protective Equipment (PPE)
3	• behaviour and approach
4	• safe use and storage of hand tools
5	• time-keeping, punctuality, and entering and leaving the work area
6	• Fire Alarm procedures
7	• maintaining a clean work area and environment

MODULE TITLE :	**INTRODUCTION TO PROCESS - BASIC CHEMISTRY AND ELECTROLYSIS**
MODULE No. :	P1
SCOPE :	Develop trainee awareness, knowledge and understanding of Basic Chemistry in accordance with the current training objectives.

OBJECTIVE No.	SUCCESS CRITERIA
	The trainee will receive an Induction into the Process Workshop which will include the need to work safely at all times, the use of Personal Protective Equipment (PPE), behaviour, safe use of hand tools, time-keeping and punctuality, and Fire Alarm procedures.
	The trainee will be able to:
1	• list the three basic atomic particles and how they are arranged within the atom
2	• identify from chemical formulae the elements and the number of atoms that combine to make chemical compounds
3	• balance chemical equations
4	• use information from the periodic table of elements to calculate the relative molecular masses of compounds
5	• perform calculations involving molar quantities
6	• perform volumetric analysis calculations
7	• electrolysis definition, how it fits into industry and a practical demonstration (operation of a membrane cell)

MODULE TITLE :	**HEAT EXCHANGE**
MODULE No. :	P2
SCOPE :	This module is designed to develop trainee awareness and competence in the subject of Heat Exchange in accordance with the current training objectives.

OBJECTIVE No.	SUCCESS CRITERIA
	The trainee will be able to:
1	• describe the two types of fluid flow
2	• identify different types of heat exchange equipment including : a) jacketed vessel b) jacketed pipes c) shell and tube d) kettle type re-boiler e) thermosyphon re-boiler f) double pipe g) box cooler h) plate i) spiral j) air cooled
3	• describe the two basic flow arrangements in heat exchangers – co-current and counter-current
4	• explain the effects of contaminants on the performance of heat exchangers
5	• list the different methods of cleaning heat exchangers
6	• list several types of heat transfer fluids
7	• describe the need for insulation and thermal tracing

MODULE TITLES :	**EVAPORATION & CRYSTALLISATION**
MODULE No. :	P3 & P4
SCOPE :	Develop trainee awareness, knowledge and understanding of evaporation and crystallisation in accordance with the current training objectives.

OBJECTIVE No.	SUCCESS CRITERIA
	The trainee will be able to:
1	• describe the effect of pressure on boiling point
2	• identify different types of evaporation equipment : a) short tube b) long tube c) forced circulation d) climbing film e) falling film f) agitated film
3	• demonstrate an understanding of the principles of multiple effect evaporation and be able to compare the various feed arrangements
	The trainee will be able to:
1	• describe the purpose of crystallisation
2	• plot and interpret solubility diagrams
3	• perform calculations on crystal yield from solubility data
4	• identify a range of filtration equipment including : a) tank b) trough c) scraped surface d) vacuum e) Oslo
5	• describe how the nature of crystals produced is affected by the type of equipment used

MODULE TITLE :	**SOLIDS HANDLING**
MODULE No. :	P5
SCOPE :	This module is designed to develop trainee awareness and competence in the subject of solid handling in accordance with the current training objectives.

OBJECTIVE No.	SUCCESS CRITERIA
	The trainee will be able to:
1	• identify various types of solid handling equipment and the type of material to which they are most suitable including: a) screw conveyer b) belt conveyer c) bucket elevator d) vibratory conveyer e) pneumatic conveyor
2	• describe the hazards associated with the movement of solids and steps used to eliminate them
3	• identify equipment used for the storage of solid materials including: a) bins b) hoppers c) silos

MODULE TITLES :	**FILTRATION & PARTICLE SIZE REDUCTION**
MODULE No. :	P6 & P7
SCOPE :	Develop trainee awareness, knowledge and understanding of filtration and particle size reduction in accordance with the current training objectives.

OBJECTIVE No.	SUCCESS CRITERIA
	The trainee will be able to:
1	• describe the purpose of filtration
2	• explain the forces that affect the different types of filtration including: a) gravity b) pressure c) vacuum
3	• identify the different types of filtration equipment including: a) cartridge b) leaf c) plate and frame d) rotary vacuum
4	• describe the use of filter aids
5	• identify the factors affecting the choice of filter
6	• identify and explain the factors that affect the rate of filtration including: a) resistance of filter medium b) resistance of filter cake c) area d) viscosity of filtrate
	The trainee will be able to:
1	• describe the reasons for the need for particle size reduction
2	• distinguish between crushing and grinding
3	• identify various types of size reduction equipment including: a) jaw crushers b) roll crushers c) hammer mills d) ball mills
4	• explain the explosion and pyrophonic hazards associated with size reduction and the steps used to overcome them.

MODULE TITLE :	**DISTILLATION PROCESSES**
MODULE No. :	P8
SCOPE :	Develop trainee awareness, knowledge and understanding of the process of distillation in accordance with the current training objectives.

OBJECTIVE No.	SUCCESS CRITERIA
	The trainee will be able to:
1	• define the terms evaporation and boiling
2	• extract data from a vapour pressure curve and relate this to the boiling point of pure liquids and liquid mixtures
3	• distinguish between simple and fractional distillation
4	• explain the operation of the following types of distillation columns: a) plate columns (i) sieve (ii) bubble cap (iii) valve (iv) turbogrid b) packed columns and packings (i) rashig ring (ii) lessing ring (iii) pall ring (iv) berl saddle (v) intalox saddle
5	• define and calculate the reflux ratio and describe its effect on the column temperature gradient and how it is used in column control
6	• perform mass balance calculations for multi-component distillation operations
7	• describe a range of specialised distillation techniques including : a) vacuum distillation with steam ejection b) distillation under pressure c) steam distillation d) azeotropic distillation
8	• list various types of reboilers including : a) thermosyphon b) forced circulation c) internal d) kettle

MODULE TITLE :	**REFRIGERATION**
MODULE No :	P9
SCOPE :	Develop trainee awareness, knowledge and understanding of refrigeration in accordance with the current training objectives.

OBJECTIVE No.	SUCCESS CRITERIA
	The trainee will be able to:
1	• describe of the principles of evaporation
2	• describe the effect of pressure on boiling point
3	• list the two types of heat, latent and sensible and appreciate their differences
	• draw a basic vapour recompression refrigeration cycle
4	• list and explain the function of the following essential items in the above cycle:
5	a) compressor b) condenser c) expansion valve d) evaporator.
6	• draw a process refrigeration system and explain the function of the following items of auxiliary equipment: a) liquid accumulator b) knock-out drum c) liquid vaporiser.
7	• list some operational problems that may occur in a refrigeration system, their effect and how one might overcome them including: a) loss of refrigerant b) air in the system c) loss of cooling water, dirt on the tubes
	• list some common refrigerants together with their advantages and disadvantages

MODULE TITLES :	**MIXING & LEACHING**
MODULE No. :	P10 & P11
SCOPE :	Develop trainee awareness, knowledge and understanding of mixing and leaching in accordance with the current training objectives.

OBJECTIVE No.	SUCCESS CRITERIA
	The trainee will be able to:
1	• identify a number of reasons for mixing
2	• list the factors that will affect the mixing process including: a) temperature b) viscosity c) relative quantities d) interfacial tension
3	• list the various types of mixing equipment and identify the uses for which they are most suitable including: a) paddles b) propellers c) turbines d) jets e) statics
4	• describe the problems associated with vortex formation and list the methods for overcoming them including: a) draught tubes b) baffles c) offset stirrers
	The trainee will be able to:
1	• identify the fundamental principles of leaching as a liquid/solid extraction
2	• list common examples of leaching operations including the: a) manufacture of sugar b) manufacture of instant coffee c) purification of titanium dioxide
3	• identify three types of leaching operation and the equipment used including: a) batch b) semi batch c) continuous

MODULE TITLE :	**SOLVENT EXTRACTION**
MODULE No. :	**P12**
SCOPE :	Develop trainee awareness, knowledge and understanding of solvent extraction in accordance with the current training objectives.

OBJECTIVE No.	SUCCESS CRITERIA
	The trainee will be able to:
1	• describe the need for solvent extraction
2	• define the basic terms used in solvent extraction: a) solvent b) solute c) extract d) raffinate
3	• perform mass balance calculations for both single and multistage extraction
4	• draw and label a simple line diagram for the removal of aromatic impurities from kerosene
5	• list and describe a range of equipment used for solvent extraction including: a) mixer – settler b) spray column c) packed column d) sieve plate column e) baffle plate column f) stirred column g) pulsed column

MODULE TITLE :	**GAS ABSORPTION**
MODULE No. :	P13
SCOPE :	Develop trainee awareness, knowledge and understanding of gas absorption in accordance with the current training objectives.

OBJECTIVE No.	SUCCESS CRITERIA
	The trainee will be able to:
1	• distinguish between absorption and adsorption
2	• distinguish between physical and chemical absorption
3	• list, draw and explain the working of a range of equipment used for gas absorption including: a) packed tower b) plate tower c) spray tower d) centrifugal spray tower
4	• describe the following effects of operating variables on absorption rates: a) temperature b) pressure c) flow rates of liquid and gas

MODULE TITLE :	**ENVIRONMENT**
MODULE No. :	P14
SCOPE :	Develop trainee awareness, knowledge and understanding of the potential impact of pollution on the environment in accordance with the current training objectives.

OBJECTIVE No.	SUCCESS CRITERIA
	The trainee will be able to:
1	• explain the need to control pollution
2	• list some of the important Acts and Legislative powers including: a) Environmental Protection Act (1990) b) Environmental Act of (1995) c) Water Act (1989) d) IPPC & IED
3	• define the term “consent level”
4	• list some common gaseous effluents, their effects on the environment and methods of reducing or eliminating these effects
5	• list some common types of liquid effluents, their effects and means of reducing these
6	• list means of dealing with solid waste, its treatment and/or disposal

MODULE TITLE :	**LINE DIAGRAMS**
MODULE No. :	P15
SCOPE :	Develop trainee awareness, knowledge, understanding and practise of line diagrams in accordance with the current training objectives.

OBJECTIVE No.	**SUCCESS CRITERIA**
	The trainee will be able to:
1	• identify and explain at least three purposes of line diagrams: a) training b) trouble shooting c) location of items of plant equipment.
2	• identify symbols used on line diagrams
3	• produce a selection of line diagrams from written descriptions of plant: a) propane/butane distillation b) production of nickel pellets. c) desulphurisation of diesel oil
4	• complete a written description of a plant from a line diagram

MODULE TITLE :	**PROCESS ANALYSIS**
MODULE No. :	P16
SCOPE :	Develop trainee awareness, knowledge and understanding of process analysis in accordance with the current training objectives.

OBJECTIVE No.	SUCCESS CRITERIA
	The trainee will have:
1	• listed reasons for a quality control system and its importance in the process industry
2	• completed 2 practical on process analysis: a) measured density and specific gravity using density bottle and hydrometers b) used a range of pH indicators and a pH meter to determine the pH of a number of solutions c) used a meter to determine the conductivity of samples of water of various purities from freshly distilled to saline and acid solutions
3	• Follow SOP's
4	• Complete risk assessment and PTW
5	• Understand COSH data sheets
6	• Use scales to Tare weights
7	• Rest Repeatability
8	• Interpret yield and efficiency calculations
9	• Produce statistical data from results and produce graphs
10	• Handle chemical to safe manner
11	• Waste disposal management
12	• How to deal with glass breakages and spillages
	Other practical activities in the process programme Throughout the Process Carousels 5 other laboratory practical assignments are carried out. Their objectives are to impart sufficient knowledge and skill for the trainee to understand the principles of the following experiments, (note - specific objectives are listed in the respective booklets): 1. The effect of temperature and concentration on the rate of reaction 2. Preparation of a soluble salt from soluble starting materials 3. Preparation of a soluble salt from insoluble starting materials 4. Preparation of a standard solution 5. An acid based titration 6. Solvent extraction

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