

CAMBRIDGE

# Professional English in Use



## Engineering

Mark Ibbotson

Technical  
English for  
Professionals

# Contents

## INTRODUCTION

### DESIGN

- |          |                                 |           |
|----------|---------------------------------|-----------|
| <b>1</b> | <b>Drawings</b>                 | <b>8</b>  |
| A        | Drawing types and scales        |           |
| B        | Types of views used on drawings |           |
| <b>2</b> | <b>Design development</b>       | <b>10</b> |
| A        | Initial design phase            |           |
| B        | Collaborative development       |           |
| <b>3</b> | <b>Design solutions</b>         | <b>12</b> |
| A        | Design objectives               |           |
| B        | Design calculations             |           |

### MEASUREMENT

- |           |  |           |
|-----------|--|-----------|
| <b>4</b>  | <b>Horizontal and vertical measurements</b>        | <b>14</b> |
| A         | Linear dimensions                                  |           |
| B         | Level and plumb                                    |           |
| <b>5</b>  | <b>Locating and setting out</b>                    | <b>16</b> |
| A         | Centrelines and offsets                            |           |
| B         | Grids  |           |
| <b>6</b>  | <b>Dimensions of circles</b>                       | <b>18</b> |
| A         | Key dimensions of circles                          |           |
| B         | Pipe dimensions                                    |           |
| <b>7</b>  | <b>Dimensional accuracy</b>                        | <b>20</b> |
| A         | Precision and tolerance                            |           |
| B         | Fit  |           |
| <b>8</b>  | <b>Numbers and calculations</b>                    | <b>22</b> |
| A         | Decimals and fractions                             |           |
| B         | Addition, subtraction, multiplication and division |           |
| <b>9</b>  | <b>Area, size and mass</b>                         | <b>24</b> |
| A         | Area   |           |
| B         | Weight, mass, volume and density                   |           |
| <b>10</b> | <b>Measurable parameters</b>                       | <b>26</b> |
| A         | Supply, demand and capacity                        |           |
| B         | Input, output and efficiency                       |           |

## MATERIALS TECHNOLOGY

- |           |   |           |
|-----------|---|-----------|
| <b>11</b> | <b>Material types</b>                     | <b>28</b> |
| A         | Metals and non-metals                     |           |
| B         | Elements, compounds and mixtures          |           |
| C         | Composite materials                       |           |
| <b>12</b> | <b>Steel</b>                              | <b>30</b> |
| A         | Carbon steels                             |           |
| B         | Alloy steels                              |           |
| C         | Corrosion                                 |           |
| <b>13</b> | <b>Non-ferrous metals</b>                 | <b>32</b> |
| A         | Common non-ferrous engineering metals     |           |
| B         | Plating with non-ferrous metals           |           |
| <b>14</b> | <b>Polymers</b>                           | <b>34</b> |
| A         | Natural and synthetic polymers            |           |
| B         | Thermoplastics and thermosetting plastics |           |
| <b>15</b> | <b>Minerals and ceramics</b>              | <b>36</b> |
| A         | Mineral and ceramic engineering materials |           |
| B         | Glass                                     |           |
| <b>16</b> | <b>Concrete</b>                           | <b>38</b> |
| A         | Concrete mix design                       |           |
| B         | Reinforced concrete                       |           |
| <b>17</b> | <b>Wood</b>                               | <b>40</b> |
| A         | Categories of wood                        |           |
| B         | Solid structural timber                   |           |
| C         | Engineered wood                           |           |
| <b>18</b> | <b>Material properties 1</b>              | <b>42</b> |
| A         | Tensile strength and deformation          |           |
| B         | Elasticity and plasticity                 |           |
| C         | Stages in elastic and plastic deformation |           |
| <b>19</b> | <b>Material properties 2</b>              | <b>44</b> |
| A         | Hardness                                  |           |
| B         | Fatigue, fracture toughness and creep     |           |
| C         | Basic thermal properties                  |           |

<b>20</b>	<b>Forming, working and heat-treating metal</b>	<b>46</b>
A	Casting, sintering and extruding metal	
B	Working metal	
C	Heat-treating metal	

<b>21</b>	<b>Material formats</b>	<b>48</b>
A	Raw materials for processing	
B	Formats of processed materials	

## MANUFACTURING AND ASSEMBLY

<b>22</b>	<b>3D component features</b>	<b>50</b>
A	3D forms of edges and joints	
B	3D forms of holes and fasteners	

<b>23</b>	<b>Machining 1</b>	<b>52</b>
A	Machining and CNC	
B	Machining with cutting tools	

<b>24</b>	<b>Machining 2</b>	<b>54</b>
A	Guillotining and punching	
B	High-temperature metal cutting techniques	
C	Laser cutting and UHP waterjets	

<b>25</b>	<b>Interconnection</b>	<b>56</b>
A	Attaching and supporting	
B	Fitting together	

<b>26</b>	<b>Mechanical fasteners 1</b>	<b>58</b>
A	Bolts	
B	Preload in bolted joints	
C	Washers	

<b>27</b>	<b>Mechanical fasteners 2</b>	<b>60</b>
A	Screws	
B	Screw anchors	
C	Rivets	

<b>28</b>	<b>Non-mechanical joints 1</b>	<b>62</b>
A	Welding	
B	Common gas and arc welding techniques	

<b>29</b>	<b>Non-mechanical joints 2</b>	<b>64</b>
A	Specialized welding techniques	
B	Brazing and soldering	
C	Adhesives	

## STATIC AND DYNAMIC PRINCIPLES

<b>30</b>	<b>Load, stress and strain</b>	<b>66</b>
A	Load	
B	Stress and strain	

<b>31</b>	<b>Force, deformation and failure</b>	<b>68</b>
A	Types of force and deformation	
B	Types of failure	

<b>32</b>	<b>Structural mechanics</b>	<b>70</b>
A	Statically determinate structures	
B	Resultant forces and centre of gravity	
C	Frames and trusses	

<b>33</b>	<b>Motion and simple machines</b>	<b>72</b>
A	Acceleration and motion	
B	Inertia	
C	Simple machines	

<b>34</b>	<b>Moving parts</b>	<b>74</b>
A	Angular motion	
B	Rotary and reciprocating motion	
C	Engine revs	
D	Friction	

## ENERGY AND TEMPERATURE

<b>35</b>	<b>Energy</b>	<b>76</b>
A	Forms of energy	
B	Energy efficiency	
C	Work and power	

<b>36</b>	<b>Heat and temperature</b>	<b>78</b>
A	Changes of temperature and state	
B	Heat transfer	

## FLUIDS

<b>37</b>	<b>Fluid containment</b>	<b>80</b>
A	Pipes, ducts and hoses	
B	Tanks	
C	Pumps, fans and turbines	

<b>38</b>	<b>Fluid pressure</b>	<b>82</b>
A	Gauge pressure and absolute pressure	
B	Hydrostatic pressure and siphonic action	

<b>39</b>	<b>Fluid dynamics</b>	<b>84</b>
A	Fluid dynamics and aerodynamics	
B	Drag	
C	Laminar flow and turbulent flow	
D	Aerofoils	
<b>MECHANISMS</b>		
<b>40</b>	<b>Engines and motors</b>	<b>86</b>
A	Types and functions of engines and motors	
B	Internal combustion engines	
<b>41</b>	<b>Transmission 1</b>	<b>88</b>
A	Gears	
B	Gear ratios	
C	Types of gear wheel	
<b>42</b>	<b>Transmission 2</b>	<b>90</b>
A	Chains, sprockets and pulleys	
B	Conversion between reciprocating and rotary motion	
<b>ELECTRICITY</b>		
<b>43</b>	<b>Current, voltage and resistance</b>	<b>92</b>
A	Electric current	
B	Voltage and resistance	
C	Electrical power	
<b>44</b>	<b>Electrical supply</b>	<b>94</b>
A	Direct current and alternating current	
B	AC generation and supply	
C	DC generation and use	
<b>45</b>	<b>Circuits and components</b>	<b>96</b>
A	Simple circuits	
B	Mains AC circuits and switchboards	
C	Printed and integrated circuits	
D	Electrical and electronic components	

<b>Appendix I</b>	<b>98</b>
Three-dimensional drawings	
<b>Appendix II</b>	<b>99</b>
Shapes	
<b>Appendix III</b>	<b>100</b>
Units of measurement	
<b>Appendix IV</b>	<b>104</b>
Chemical elements	
<b>Appendix V</b>	<b>106</b>
Structural elements and types of load	
<b>Appendix VI</b>	<b>108</b>
Moments	
<b>Appendix VII</b>	<b>109</b>
Vapour, cooling and thermal inertia	
<b>Appendix VIII</b>	<b>110</b>
The electromagnetic spectrum	
<b>Appendix IX</b>	<b>111</b>
Pipe and hose fittings and valves	
<b>Appendix X</b>	<b>112</b>
Siphonic action	
<b>Appendix XI</b>	<b>113</b>
Managing rotary motion	
<b>Appendix XII</b>	<b>114</b>
Electrical and electronic components	
<b>Appendix XIII</b>	<b>118</b>
Sensing, measuring and regulating devices	
<b>Answer key</b>	<b>119</b>
<b>Index</b>	<b>130</b>
<b>Acknowledgements</b>	<b>143</b>