Arc Welding 2
Intermediate Arc Welding

Review Questions
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Chapter 1 – Distortion

1. Define the term 'distortion'.

2. Describe the term 'coefficient of linear expansion'.

3. State four (4) types of distortion.
   1. ________________________________
   2. ________________________________
   3. ________________________________
   4. ________________________________

4. What is the cause of distortion?

   __________________________________
   __________________________________
   __________________________________
   __________________________________
5. State four (4) ways of minimising distortion.
   1. ____________________________
   2. ____________________________
   3. ____________________________
   4. ____________________________

6. Describe the principle of contra-heating.
   ____________________________
   ____________________________
   ____________________________
   ____________________________

7. Contra-heating temperatures should be kept to a maximum of 600°C. Why?
   ____________________________
   ____________________________
   ____________________________

8. True of false?
   Tick (T) if the statement is true, (F) if the statement is false.

   Stainless steel has a lower coefficient of linear expansion than mild steel.  T  F
   Longitudinal distortion has contraction forces across the line of weld.  T  F
   The effects of contra-heating can be increased by restraining the material prior to heating.  T  F
   Quenching can be used for rapid cooling on any material.  T  F
   Multiple acetylene cylinders should be connected to a manifold system to minimise the draw off rate when contra-heating large areas.  T  F
Chapter 2 – Weld defects

1. Define the following terms.
   - Weld discontinuity
   - Weld defect

2. Define the following discontinuities, and describe their causes.
   - Porosity
   - Inclusions
   - Lack of fusion
   - Undercut
   - Overroll
   - Underfill
3. Name one (1) form of hot cracking.

4. Name one (1) form of cold cracking.

5. Give a definition of underbead cracking.

6. The risk of underbead cracking is considerable when welding low alloy steels. State four (4) general welding recommendations when welding low alloy steels with the MMAW process.
   1. 
   2. 
   3. 
   4. 

7. Describe the procedure for repairing cracks.

8. How can stray arcing be corrected?
9. In Fig 2.1 below, label the types of defects that are shown.
Chapter 3 – Weld testing

1. Give a definition of non-destructive testing and list four (4) non-destructive methods.

   Definition
   __________________________________________________________
   __________________________________________________________
   __________________________________________________________
   __________________________________________________________

   • Method 1: ______________________________________________
   • Method 2: ______________________________________________
   • Method 3: ______________________________________________
   • Method 4: ______________________________________________

2. Give a definition of destructive testing and list four (4) destructive methods.

   Definition
   __________________________________________________________
   __________________________________________________________
   __________________________________________________________
   __________________________________________________________

   • Method 1: ______________________________________________
   • Method 2: ______________________________________________
   • Method 3: ______________________________________________
   • Method 4: ______________________________________________
3. When should visual inspection be carried out?

4. Visual inspection of a welded joint is an essential aspect of quality control. List six (6) aspects which should be visually inspected during welding.
   1. 
   2. 
   3. 
   4. 
   5. 
   6. 

5. Which of the following are advantages of dye penetrant inspection? (Tick the correct answer/s)
   - It can be used on any metal
   - It can locate internal and external defects
   - It provides a permanent record
   - The surface condition of the metal does not matter

6. List six (6) steps to dye penetrant testing.
   1. 
   2. 
   3. 
   4. 
   5. 
   6. 
7. List five (5) steps to magnetic particle inspection.
   1. 
   2. 
   3. 
   4. 
   5. 

8. Why is it suggested that two (2) magnetic particle tests be carried out at 90° to each other?

9. Magnetic particle testing is used to locate what type of defect/s? (Tick the correct answer/s)
   - Misalignment
   - Oversize welds
   - Surface cracks
   - Heavy spatter

10. Which of the following is an advantage of the radiographic testing process? (Tick the correct answer/s)
    - It provides permanent records
    - It’s inexpensive
    - It provides a result from the inspection immediately
    - It can reveal all known defects

11. Besides x-rays, what other rays are suitable for radiographic testing? (Tick the correct answer/s)
    - Beta rays
    - Cosmic rays
    - Gamma rays
    - Ultraviolet rays
12. Describe why a bend test is used.

13. In a root bend test, how is the specimen placed? (Tick the correct answer/s)
   • Root of the weld is in compression
   • Root of the weld is in tension
   • Face of the weld is in tension
   • Root of the weld is not stressed

14. Give a definition of the following terms.
   Ductility

   Toughness

   Hardness

   Malleability

   Elasticity

   Tenacity (tensile strength)

15. Describe why a nick break test is used.
16. Which of the following is a hardness testing machine that uses a diamond cone penetrator with a 150 kg load? (Tick the correct answer/s)
   - Brinell
   - Vickers
   - Rockwell b
   - Rockwell c

17. A metal’s fatigue resistance is determined with the aid of a machine that does which of the following? (Tick the correct answer/s)
   - Stretches the specimen
   - Compresses the specimen
   - Applies an alternating load
   - Breaks the specimen with a single impact

18. Which of the following is the information gained from a tensile test? (Tick the correct answer/s)
   - The percentage of reduction in area
   - The yield point
   - The percentage of elongation
   - All of the above

19. True or false?

   Tick [T] if the statement is true, [F] if the statement is false.
   
<table>
<thead>
<tr>
<th>Statement</th>
<th>T</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Laminations are faults which occur with the parent metal during manufacture.</td>
<td>T</td>
<td>F</td>
</tr>
<tr>
<td>Porosity is caused by trapped slag in the weld.</td>
<td>T</td>
<td>F</td>
</tr>
<tr>
<td>The size, shape and profile of the weld have no significant influence upon the strength of the weld.</td>
<td>T</td>
<td>F</td>
</tr>
<tr>
<td>A pneumatic pressure test is always preferred over a hydrostatic pressure test.</td>
<td>T</td>
<td>F</td>
</tr>
<tr>
<td>Radiographic examinations must be carried out by a suitably trained operator.</td>
<td>T</td>
<td>F</td>
</tr>
<tr>
<td>Ultrasonic testing works on sound waves transmitting through the material.</td>
<td>T</td>
<td>F</td>
</tr>
</tbody>
</table>
Chapter 4 – Identification of metals

1. State the reasons why an operator must accurately identify metals.

   ________________________________________________________________
   ________________________________________________________________
   ________________________________________________________________
   ________________________________________________________________

2. Name four (4) tests that can be used to identify metals in the workplace, and describe what the operator is looking for while carrying out those tests.
   1. _____________________________________________________________
   2. _____________________________________________________________
   3. _____________________________________________________________
   4. _____________________________________________________________

3. True or false?
   Tick (T) if the statement is true, (F) if the statement is false.

<table>
<thead>
<tr>
<th>Statement</th>
<th>T</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grinding mild steel produces a large volume of sparks in long streaks</td>
<td>T</td>
<td>F</td>
</tr>
<tr>
<td>that break off into white forked spurs.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A metal with a Brinell hardness of 400 is easily filed.</td>
<td>T</td>
<td>F</td>
</tr>
<tr>
<td>When chiselling mild steel the chip tends to curl.</td>
<td>T</td>
<td>F</td>
</tr>
<tr>
<td>A better description of the metal is obtained from examining its fracture.</td>
<td>T</td>
<td>F</td>
</tr>
</tbody>
</table>
Chapter 5 – Metals and their properties

1. List five (5) physical properties of a metal and give a brief explanation of each one.
   1. 
   2. 
   3. 
   4. 
   5. 

2. List six (6) mechanical properties of metal and give a brief description of each one.
   1. 
   2. 
   3. 
   4. 
   5. 
   6. 
3. State three (3) factors that determine the properties of metals.
   1. 
   2. 
   3. 

4. How can grain size in steel be controlled?
   

5. Name four (4) ways that the grain structure of metals can be changed.
   1. 
   2. 
   3. 
   4. 

6. Name four (4) effects cold working has upon the physical and mechanical properties of steel.
   1. 
   2. 
   3. 
   4. 
7. Name four (4) effects hot working has upon the physical and mechanical properties of steel.

1. 

2. 

3. 

4. 

8. Explain what is meant by the following terms.

Elastic limit

Plastic deformation
Chapter 6 – Weld procedures

1. State the objective of a weld procedure.

2. List six (6) steps for proving a welding procedure.
   1. 
   2. 
   3. 
   4. 
   5. 
   6. 
3. List six (6) changes that would require a re-qualification of the welding procedure.
   1. 
   2. 
   3. 
   4. 
   5. 
   6. 

4. List ten (10) items that would be included on any welding procedure.
   1. 
   2. 
   3. 
   4. 
   5. 
   6. 
   7. 
   8. 
   9. 
   10. 
5. When writing a weld procedure, what factors need to be considered for selecting a consumable?

6. Using the formula supplied, calculate the carbon equivalent (CE) of a low alloy steel which has the following composition.

\[ C = 0.2\% \quad Mn = 1.2\% \quad Ni = 1.75\% \quad Cr = 0.4\% \]
\[ Mo = 0.33\% \quad V = 0.2\% \quad Cu = 0.01\% \]

**Formula**

\[ CE = C = \frac{Mn}{6} + \frac{Mo + Cr + V}{5} + \frac{Ni + Cu}{15} \]

Show all working out.
7. Calculate the heat input using a hydrogen-controlled electrode (E4916) using the following variables.

- Amperage 140
- Arc voltage 26
- Travel speed 200 mm/min

**Formula**

\[
\text{Heat input} = \frac{\text{Amperage} \times \text{volts} \times 60}{\text{Travel speed in mm/min} \times 1000}
\]

Show all working out.
8. Using the tables and figures in Chapter 6 of your Arc Welding 2 book, calculate the minimum pre-heat required for the following weld joint.

- Material – Grade 350L15
- Welding process – GMAW
- Amperage – 220
- Volts – 27
- Travel speed – 260 mm/min

![Fig 6.1 – A weld joint](image)

<table>
<thead>
<tr>
<th>Weldability group No</th>
<th>Combined thickness</th>
<th>Joint weldability index</th>
<th>Heat input</th>
<th>Minimum pre-heat</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
9. Which of the following statements is correct in relation to weld procedures?
(Tick the correct answer/s)
- They must be recorded
- They’re used to test welders
- They don’t describe edge preparation
- They can be used to monitor welding operators’ health

10. True or false?
Tick T if the statement is true, F if the statement is false.

<table>
<thead>
<tr>
<th>Statement</th>
<th>True</th>
<th>False</th>
</tr>
</thead>
<tbody>
<tr>
<td>Welding procedures are used to document variables so that welds can be produced to an acceptable standard.</td>
<td>T</td>
<td>F</td>
</tr>
<tr>
<td>Changing the type of filler wire does not require a welding procedure re-qualification.</td>
<td>T</td>
<td>F</td>
</tr>
<tr>
<td>For the joint details in a welding procedure, it is necessary to have a sketch of the joint with all its dimensions.</td>
<td>T</td>
<td>F</td>
</tr>
<tr>
<td>Welding procedures can be used in place of codes or standards.</td>
<td>T</td>
<td>F</td>
</tr>
<tr>
<td>A welding procedure does not require the approval of the client.</td>
<td>T</td>
<td>F</td>
</tr>
<tr>
<td>An existing weld procedure can be used on other contracts.</td>
<td>T</td>
<td>F</td>
</tr>
</tbody>
</table>
Review Questions

DESCRIPTION
This book contains review questions based on the content of Arc Welding 2 – Intermediate Arc Welding Information Book, product code ENG094. It can be used as a ‘partner’ to that book, to provide students with the opportunity to review their learning. It may also be used as an assessment tool, enabling students to demonstrate their understanding of intermediate arc welding principles.

The book is divided into chapters, to match the chapters in Arc Welding 2.
• Chapter 1 – Distortion
• Chapter 2 – Weld defects
• Chapter 3 – Weld testing
• Chapter 4 – Identification of metals
• Chapter 5 – Metals and their properties
• Chapter 6 – Weld procedures

For more information about the content covered by Arc Welding 2, please refer to our product catalogue description using its product code; ENG094.

EDITION
2009

CATEGORY
Metals and Engineering

TRAINING PACKAGE
• MEM05

RELATED PRODUCTS
• ENG094: Arc Welding 2 – Intermediate Arc Welding Information Book