**BTEC Assignment Brief**

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| **Qualification** | Pearson BTEC Level 3 National Diploma in EngineeringPearson BTEC Level 3 National Extended Diploma in Engineering  |
| **Unit number and title** | **Unit 13: Welding Technology** |
| **Learning aim(s)** (For NQF only) | **B:** Examine weldable materials and their behaviour during the welding process |
| **Assignment title** | Material Properties |
| **Assessor** |  |
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| **Hand in deadline**  |  |
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| **Vocational Scenario or Context** | You are a final year apprentice within an engineering organisation which specialises in fabrication activities. Your supervisor has been observing your progress and is impressed by your knowledge and understanding of the theory which underpins the welding techniques that you use in the fabrication shop, and your ability to select appropriate welding processes for given applications. He has asked you to produce a written report that investigates how materials react during welding processes. |
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| **Task 1** | You are going to evaluate how the structure and properties of alloyed and unalloyed steels and non-ferrous metals change when welding processes are carried out on them.**To do this:** Your tutor will provide you with examples of suitable alloyed and unalloyed steels and non-ferrous metals to investigate. You need to: * Research the properties of metallic materials including the mechanical properties of metals and the effects of loading conditions on the properties of metallic materials.
* Research how metallic structures behave under loading, including deformation, stress (including from internal forces and moments) and the relationship between stress and strain.

You will also need to:* Research how structural steels behave during fusion welding and applicable welding processes and types of consumable for welding alloyed steels and non-ferrous metals, including nickel and nickel alloys, aluminium and aluminium alloys, and titanium and other metals and alloys.
* Research defects that occur in welded materials, including cracking phenomena in welded joints, fractures and types of corrosion. You should also investigate the reasons for post weld heat treatment and methods of carrying this out.

**You then need to:**Produce a report that evaluates the effects of welding processes on a range of metallic materials with reference to a) the properties and behaviours of metallic materials; b) defects and irregularities caused by welding; and c) the effects of forces and loading on welded joints. Your report should include:* Information on how the properties and behaviours of alloyed and unalloyed steel and non-ferrous materials. You should consider changes in properties, the effects of heat input and cooling rates, the effects of the weld protection, the influence that the type of consumables used has. You should include information about changes to the micro structure of the material, and details of the Heat Effected Zone (HAZ)
* Information about defects and irregularities caused by welding and ways in which these can be detected. You should consider a range of defects such as cracking, fractures and corrosion, including how and why these occur. You should also consider methods of reducing or eliminating cracks and fractures. You should also investigate the use of heat treatment during welding processes, and the use of destructive and non-destructive testing on materials and welds.
* Information about the effects of forces and loading on welded joints.
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| **Checklist of evidence required**  | A written report about the properties and structures of alloyed and unalloyed steel and non-ferrous materials, determining how defects are prevented and which tests are applied to detect defects |
| **Criteria covered by this task:** |
| Unit/Criteria reference | To achieve the criteria you must show that you are able to: |
| 13/B.D2 | Evaluate the structure, mechanical properties and defects of alloyed and unalloyed steel and non-ferrous materials used in a welding process, including the effects of irregularities, forces and loading on the joints |
| 13/B.M2 | Analyse the structure, mechanical properties, and defects of alloyed and unalloyed steel and non-ferrous materials used in welding process, including the effects of irregularities, forces and loading on the joints |
| 13/B.P2 | Explain the structure and mechanical properties, of alloyed and unalloyed steel and non-ferrous materials used in welding process |
| 13/B.P3 | Explain the effect of forces and loading on welded joints |
| 13/B.P4 | Explain the defects and irregularities that occur in alloyed and unalloyed steel and non-ferrous materials used in welding process |
| **Sources of information to support you with this Assignment** | BooksDavies A; Science and Practice of Welding, Volume 1;Cambridge University Press, 1993; ISBN 9780521435659Davies A; Science and Practice of Welding, Volume 2; Cambridge university Press, 1993; ISBN 9780521435659Raj B, Shankar V and Bhaduri; A Welding Technology for Engineers; Alpha Science International Ltd, 2005; ISBN 9781842651940Smith B; Welding Practice; Routledge, 2014; ISBN 9781317761365Timings R; Fabrication and Welding Engineering; Newnes, 2008; ISBN 9780750666916Weman K; Welding Processes Handbook; Woodhead Publishing, 2012; ISBN 9780857095107Websites<http://me-mechanicalengineering.com/guidelines-for-welding-process-selection/>http://www.mechengg.net/2015/03/selection-of-welding-processes-and.html**resources may be found at** [http://qualifications.pearson.com/en/support/published-resources.html#step1](http://qualifications.pearson.com/en/support/published-resources.html) |
| **Other assessment materials attached to this Assignment Brief** | *Examples of metallic materials to be used for the investigation* |