# T Level Technical Qualification in Engineering and Manufacturing – Manufacturing, Processing and Control

## 8713-334 Fabrication and Welding Technologies

## Grade standard exemplification material

## Distinction - summer 2024

Version 1-0

| Version and date | Change detail | Section | Question |
|---|---|---|---|
| v1-0<br>Oct 2024 | | | |

# Contents

# Introduction

### Summer 2024 Results

This document is aimed at providers and learners to help understand the standard that was required in the summer 2024 assessment series to achieve a distinction grade for the 8713-334 Fabrication and Welding Technologies Occupational Specialism (OS).

The grade standard exemplification evidence (Grade SEM) provided for the distinction grade displays the holistic standard required across the tasks to achieve the distinction grade boundary in the summer 2024 series.

The aim of these materials is to provide examples of knowledge, skills and understanding that attested to **two marks above** distinction competence in summer 2024. It is important to note that in live assessments a candidate's performance is very likely to exhibit a spikey profile and standard of performance will vary across tasks.

The Occupational Specialism is graded Distinction, Merit, Pass or Unclassified.


The distinction grade boundary is based on a synoptic mark across all tasks. The materials in this Grade SEM are separated into two sections as described below. Materials are presented against a number of tasks from the assignment.

### Tasks

This section details the tasks that the candidate has been asked to carry out. What needs to be submitted for marking and any additional evidence required including any photograph/video evidence. Also referenced in this section are the assessment themes the candidates were marked against when completing the tasks within it. In addition, candidate evidence that has been included or not been included in this Grade SEM has been identified within this section.

In this Grade SEM there is candidate evidence from:

Task 1 Planning
Task 2 Production
Task 3A Quality review and testing
Task 3B Evaluation and recording
Task 3C Handover

**Candidate evidence**

This section includes exemplars of candidate work, photographs of the work in production (or completed) and practical observation records of the assessment completed by centre assessors. This was evidence that was captured as part of the assessment and then internally marked by the centre assessor.

The Occupational Specialism brief and tasks can be downloaded from here.

**Important things to note**:

- We discussed the approach to standard setting/maintaining with Ofqual and the other awarding organisations before awarding this year. We have agreed to take account of the newness of qualifications in how we award this year to recognise that students and teachers are less familiar with the assessments (grading-arrangements-for-vtqsand-technical-qualifications-within-t-levels-in-the-academic-year-2023-to-2024), whilst also recognising the standards required for these qualifications.

- The evidence presented, as a whole, was **two marks** above the distinction grade. However, performance across the tasks may vary (i.e. some tasks completed to a higher/lower standard than distinction grade).

# Grade descriptors

**To achieve a distinction, a candidate will be able to:**

Competently and thoroughly interpret technical information, applying technical skills to plan, assess risk and follow safe working methods to practical tasks and procedures to an exemplary standard in response to the requirements of the brief, producing an excellent quality of work that meets regulations and standards.

Thoroughly prepare working area, mitigating potential risks prior to commencing tasks and consistently apply exemplary housekeeping techniques during tasks.

Demonstrate exemplary technical practical skills in marking out, cutting, forging, fabricating and welding that is in line with industry standards and meet the requirements of the brief.

Demonstrate exemplary knowledge and understanding of the principles and processes required for fabrication and welding technologies.

Work safely and make informed and appropriate use of tools, materials and equipment within the working environments for marking out, cutting, forging, fabricating and welding activities.

Identify causes and diagnose problems or common issues related to fabrication and welding and have a thorough understanding and the skills to be able resolve and rectify them.

Demonstrate exemplary technical skills and understanding in the use of non-destructive testing methods to ensure quality welds are produced to recognised industry standards.

Consistently and accurately use industry and technical terminology across different communication methods with full consideration of technical and non-technical audiences.

# Task 1 Planning

| | |
|---|---|
| **Assessment number (eg 1234-033)** | 8713-334 |
| **Assessment title** | Fabrication and Welding Technologies Occupational Specialism |

| | |
|---|---|
| **Candidate name** | <first name> <surname> |
| **City & Guilds candidate No.** | ABC1234 |

| | |
|---|---|
| **Provider name** | <provider name> |
| **City & Guilds provider No.** | 999999a |

| | |
|---|---|
| **Task(s)** | 1 |
| **Evidence title / description** | Resource list with justifications with measuring equipment calibration check results recorded<br>Completed risk assessment<br>Method statement with justifications<br>Hot works permit (countersigned by assessor)<br>Cutting list<br>Quality check sheet template |
| **Date submitted by candidate** | DD/MM/YY |

# Task 1

**Assessment themes:**

- Health and safety
- Planning and preparation
- Production
- Quality review and evaluation

You must:

- produce a resource list with justifications
- produce a risk assessment
- produce a method statement
- complete a hot works permit
- carry out calibration checks on measurement equipment
- produce a cutting list
- produce a quality check sheet

**Additional evidence of your performance that must be captured for marking:**
N/A

# Candidate evidence

| *Cutting List* | | | | | | |
|---|---|---|---|---|---|---|
| | | | | | | |
| **Item Id** | **Component** | **Quantity** | **Measurements** | **Material** | **Added Manufacturing Notes** | |
| **Bucket** | | | | | | |
| B1 (BP) | Base Plate | 1 | 600mm x 250mm x 5mm | Low carbon steel | The fully built bucket would amount to 600mm long, 400mm on the top and 250mm on the bottom, 500mm tall, all with 5mm thickness. | |
| B2 (EP) | End Plates | 2 | 250mm bottom, 400mm top x 500mm x 5mm | Low carbon steel | | |
| B3 (SP) | Side Plates | 2 | 600mm long, 505mm high x 5mm | Low carbon steel | | |
| **Frame sizes** | | | | | | |
| F1 (FL) | Frame Leg | 4 | 50mm x 50mm x 500mm 3mm box section | Low carbon steel | A fully built frame would amount to 700mm long, 300mm deep, 500mm high, with 3mm thickness all made out of box section. The Frame Leg will have a 45* angle cut from it taking away 50mm from one side. | |
| F2 (FTHB) | Frame Top Horizontal Brace | 2 | 50mm x 50mm x 300mm 3mm box section | Low carbon steel | | |
| F3 (FHB) | Frame Horizontal Brace | 2 | 50mm x 50mm x 200mm 3mm box section | Low carbon steel | | |
| F4 (FCB) | Frame Cross Brace | 2 | 50mm x 50mm x 600mm 3mm box section | Low carbon steel | | |

Resource List

| Resources | Quantity | Justification | Task |
|---|---|---|---|
| Tools and Equipment | | | |
| Writing utencils | N/A | Writing utencils are used in Task 1 - Planning stage for noting and in task 2 when working out dimensions and to create a cut list, work plan and quality check sheet | 1 & 2 |
| Scribe | 1 | A scribe is needed for marking out metal with engineers square and the steel rule. This will be the tool for marking every component on Frame and Bucket | 2 |
| Oxygen gas bottle | 1 | Used during oxy-fuel cutting process | 2 |
| Acetylene gas bottle | 1 | Used during oxy-fuel cutting process | 2 |

| | | | |
|---|---|---|---|
| Tongs | 1 | Needed for holding and transporting hot metals during MMA, Tig, Angle Grinding and Oxy-fuel cutting processes | 2 |
| Wire Brush | 1 | Used to clean and remove heat scores and aid the removal of slag during MMA welding process | 2 |
| Ball pein Hammer | 1 | Used for hammering the punch marks with the centre punch to allow greater cuts during cutting processes like Oxy-fuel | 2 |
| Angle Grinder (Stone disc and Flappy disc) | 1 | Required for the removal of the finish on metal and to clean up all the cut edges and remove sharp edges. | 2 |
| MMA Welding plant with 2.5mm mild steel electrodes | 1 | Needed for welding the bucket together, 2.5mm rod used | 2 |
| TIG Welding plant with 1.6mm tungsten rod | 1 | Needed to weld Frame together using a 0.9mm filler rod with a 1.6mm tungsten rod sharpened | 2 |

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|---|---|---|---|
| Chipping hammer | 1 | Used to clean away welding slag following MMA welding. | 2 |
| Oxy fuel cutting equipment including gas bottle regulators | 1 | Used for process of cutting 5mm+ materials that cant be cut with a powered guillotine. | 2 |
| Horizontal Bandsaw | 1 | Used for whole process of cutting all the components of the Frame | 2 |
| Chop Saw | 1 | Used for cutting 45* angles into the Frame Leg (F1) | 2 |
| Magnet | 2 | Needed to hold metal to present easily weldable joints during MMA and TIG processes | 2 |
| Deburr tool | 1 | To remove metal splinters from freshly cut pieces from guillotine and oxy-fuel cutting | 2 |
| Tungsten grinder | 1 | Used to create a fine tip for the TIG welding process | 2 |
| Powered guillotine | 1 | Used to cut out some of the 5mm Bucket components | 2 |

| | | | |
|---|---|---|---|
| Centre Punch | 1 | Used to create a line for the oxy-fuel cutting process | 2 |
| Engineer's square | 1 | The square is used to check the angles on the workpiece, to 90*. this is also needed for weld testing | 2 & 3 |
| Steel Rule | 1 | Used to give a straight line when marking out the components and dimensions needed for cutting. Used throughout most processes to test if workpiece is to standard and tolerance | 2 & 3 |
| Personal Protective Equipment (PPE) | | | |
| Dark cutting screen | 1 | To protect eyes and body from the bright light and sparks during the Oxy-fuel cutting process | 2 |
| Welding screen | 1 | To protect eyes and skin from the bright welding light during | 2 |

| | | | |
|---|---|---|---|
| | | MMA and TIG welding processes | |
| Welding gauntlets | 1 pair | To protect hands during welding and Oxy-fuel cutting | 2 |
| TIG welding gloves | 1 pair | To protect hands during TIG welding process | 2 |
| Welding helmet | 1 | To protect eyes, head and body from hot sparks and refracted bright light from welding processes | 2 |
| Safety glasses | 1 | To protect eyes from potential hazards such as dust, grinding material and swarf | 2 |
| Face Guard | 1 | Needed to protect face and neck from possible hazards during grinding, cutting processes on the bandsaw and chop saw | 2 |
| Steel toe cap welding boots | 1 pair | To protect and prevent yourself from personal injury caused from items in workshop | All |

| | | | |
|---|---|---|---|
| | | accidently dropping, welding boots have a slat above laces to ensure they dont catch fire | |
| Gloves | 1 pair | Needed to protect hands from any cuts or scrapes and preventing injury when marking out the materials. Welding gloves has to be worn during hot work | 2 & 3 |
| Overalls | 1 | To protect yourself and underlaying clothing from debris from the work carried out. Ensure no loose clothing is worn around machinery because of risk of entanglement and personal injury | All |
| Nitrile examination gloves | 3 pairs | Needed for a using the bandsaw and chop saw, also needed for the process of dye penetrant testing | 2 & 3 |

| | | | |
|---|---|---|---|
| Disposable respirator | 1 | Needed for task 3b during non-destructive testing part | 3 |
| Technical Information/documentation | | | |
| Assignment brief | ALL | Needed for processes in task 2 including fabricating and welding, using the technical drawings and information inside like tolerances and assessment information | |
| Calibration record | 2 and 3 | Needed to check that the equipment used has been calibrated up to date. | |
| Risk assessment | ALL | This is a document that I will prepare to record the risks and hazards that may occur during the creation of the fabrication and welding of the fire pit. I will use controls to mitigate risks to reduce the likelihood of injury. | |
| User manuals | 2 | Needed for the Chop saw, powered guillotine, Oxy-fuel | |

| | | | |
|---|---|---|---|
| | | cutting, Horizontal bandsaw, Tig and MMA welding plant. Also istructions for the Dye penetrant testing. | |
| COSHH data sheet | 2 | Needed for the hazardous substances which need to be used so that correct safety precautions and standard operating procedures could be followed like coolant and liquids used in dye penetrant testing | |
| Method statement | 2 and 3 | This will be used during the tasks to ensure the correct sequence of operations is followed to ensure the quality requirements can be met. | |
| Cutting list | 1 and 2 | The cutting list is created in accordance to the technical drawings, showing how my components will be made, cut from raw materials and assembled into the bucket and | |

| | | | |
|---|---|---|---|
| | | frame. This list will provide information like what, and how to cut each component with which material | |
| Hot works permit | 2 | I will complete my hot works permit before starting any hot works, I will be allowed to start after the supervisor has given permission after my area is correctly displayed for designated hot works | |
| Quality check sheet | 3 | This sheet is needed to measure the finished fire pit to ensure it matches the drawing specifications, additionally i will document the results of the non-destructive testing (NDT). | |
| Copies of official guidance | All | Copies of Welding and NDT Standards for review. BS EN ISO 5817 standard for welding; fusion-welded joints Non- | |

| | | | |
|---|---|---|---|
| | | destructive testing of welds using dye penetrant testing, | |
| Housekeeping & Workshop resources | | | |
| Extraction system | 2 | Workshop extraction system for exctracting fumes and heat during processes of welding, grinding and cutting | |
| Mop and bucket | 2 and 3 | To clean up any spillages during task dye penetrant testing and clean the work area keeping good housekeeping processing after finished work | |
| First aid kit | 2 and 3 | Needed in the case of any minor injury when carrying out the task. | |
| Eye wash station | 2 and 3 | If an emergency occurs access to an eye wash station should be clear to treat any eye incidents | |
| Warning signs and notices | 2 and 3 | Signs letting people know about PPE requirements before | |

| | | | |
|---|---|---|---|
| | | entering workshop should be easily seen and information on fire exits, hazards, fire extinguishers and first aid kits. | |
| Dust pan and brushes and spill kits | 2 and 3 | For cleaning area of use after grinding, welding or cutting, making sure no clutter is left behind keeping good housekeeping | |
| Waste disposal bins | All | For ensuring all waste is brought into proper disposal | |

Risk Assessment

| Hazards | Risk | Control | Severity | Likelihood |
|---|---|---|---|---|
| Manual handling | Risk of personal injury due to using improper lifting techniques of loads | Always be aware of equipment and tools when lifting. Provide training on proper lifting techniques and use mechanical means when handling heavy loads | ***1*** | ***2*** |
| Slips, Trips and Falls | Injuries due to cluttered spaces with wires and hoses trailing everywhere or slippery surfaces. | Maintain clean and organized work areas, organised housekeeping, provide adequate lighting, and address potential tripping hazards promptly. | ***1*** | ***2*** |
| Personal Protective Equipment | Personal injury, vulnerable from risks because not using proper PPE | Ensure the use of proper PPE, read SOPs on machines being used to know what PPE to use where and when. Ensure availability and proper maintenance of equipment | ***2*** | ***1*** |
| Chemical exposures, liquids and substances | Skin irritation, respiratory issues, or poisoning from hazardous chemicals | Use ventilation systems, provide appropriate PPE, label chemicals properly. Check COSHH data sheet for handling, spill kits, disposal | ***1*** | ***2*** |
| Noise | Hearing damage | Use hearing protection, and conduct regular noise assessments. | ***1*** | ***2*** |
| General fire hazards and hot sparks | Personal Injury from fires and sparks set alight to something, sparks cause burns to skin and PPE | Have fire extinguishers readily available and known, be trained on fire safety procedures, maintain clear evacuation routes. make sure full PPE is worn leaving no gaps for sparks | ***2*** | ***3*** |
| Machining hazards | Risk of cuts, burns, and loss of digits from unguarded machinery and unsafe operating practices | Ensure machine guarding is adequate, conduct regular maintenance checks, and have training on safe machine operation | ***1*** | ***2*** |
| Electricity and Electric hazards | Hazard of electric shocks from faulty equipment or unsafe electrical practices, can also cause fire | Ensure equipment is properly maintained, always be sure tools are grounded, and follow standard operating procedures when working on electrical systems. No jewellery permitted when working in workshop | ***2*** | ***2*** |
| Tool safety | Personal injury and injury to others from misuse and improper tool usage, calibration and maintenance | Regularly have tool inspection to find faults or any other mishap, maintain tools that are fit and rid of the broken, or failed inspection | ***2*** | ***2*** |

| | | | | |
|---|---|---|---|---|
| Training and Supervision | Personal injury and accident from lack of oversight and training | Ensure supervisors monitor work activities closely, and emphasize the importance of following safety protocols and standard operating procedures at all times | ***2*** | ***2*** |
| Welding and burning fumes | Burns, personal injury and respiratory issues from inadequate ventilation. Not trained on Standard Operating Procedures (SOPs) for hot works | Be trained and weary on SOPs for hot works and welding, get supervisor to scan and check workspace before starting, always refer back to hot works permit when working with hot components | ***2*** | ***3*** |
| Ultra-violet, infrared radiation | Can cause burns to the skin, skin damage and damage eyes. Personal injury. | Ensure before starting welding operations complete prerequisites for task, like shutting bay screen curtains. Ensure PPE is worn correctly so that no skin is showing | ***1*** | ***2*** |
| Flammable gas | Leak from oxygen or acetylene hoses and joins from inadequate leak testing, personal injury, explosion. | Complete Leak test on all joints and ensure complete and overall check on hoses for damages, always make sure to purge gases after use and before use. Follow standard operating procedures on task after being completing training on task | ***2*** | ***2*** |

| **Likelihood** | | **Severity** | |
|---|---|---|---|
| 1 | Very unlikely to occur | 1 | Minor injury |
| 2 | Unlikely to occur | 2 | Major injury |
| 3 | Possible to occur | 3 | Loss of Limbs |
| 4 | Likely to occur | 4 | Death |
| 5 | Very likely to occur | 5 | Multiple deaths |

Quality Check Sheet

| Check | Criteria | | |
|---|---|---|---|
| Component | Required Dimensions | Finished dimensions | **Tolerance met?** |
| B1 Base Plate | 600mm x 250mm x 5mm | 600mm x 250mm x 5mm | **Yes** |
| B2 End Plates | 250mm bottom, 400mm top x 500mm x 5mm | 250mm x 399mm x 500mm x 5mm | **Yes** |
| B3 Side Plates | 600mm long, 505mm high x 5mm | 600mm x 504.8mm x5mm | **Yes** |
| F1 Frame Leg | 50mm x 50mm x 500mm 3mm box section | 50mm x 50mm x 500mm | **Yes** |
| F2 Top Horizontal Brace | 50mm x 50mm x 300mm 3mm box section | 50mm x 50mm x 300mm | **Yes** |
| F3 Horizontal Brace | 50mm x 50mm x 200mm 3mm box section | 50mm x 50mm x 201mm | **Yes** |
| F4 Cross Brace | 50mm x 50mm x 600mm 3mm box section | 50mm x 50mm x 600mm | **Yes** |
| Overall Bucket Height | 505mm | 505mm | **Yes** |
| Overall Bucket Length | 610mm | 610mm | **Yes** |
| Overall Bucket Width | 260mm bottom, 410mm top | 260mm bottom 409mm top | **Yes** |
| Overall Frame Height | 500mm | 500mm | **Yes** |
| Overall Frame Length | 700mm | 698mm | **Yes** |
| Overall Frame Width | 300mm | 299mm | **Yes** |
| Welding Processes | | | |
| Welding Process 1 | MMA | | |
| Welding Process 2 | TIG | | |
| Welding Positions | | | |
| Welding Position 1 | PF (Vertical), used during TIG process | Correct setup (weld preparation) and techniques used during process to ensure proper fusion between components | |

| | | | |
|---|---|---|---|
| Welding Position 2 | PA (Flat), used during MMA process | Correct setup (weld preparation) and techniques used during process to ensure proper fusion between components | |
| Welding Standard | BS EN ISO 5817 | | |
| Cutting Processes | | Notes | |
| Cutting Equipment | Oxy-Acetlyene | Used to cut components for bucket | |
| Abrasive Equipement | Angle Grinder, Wire brush | Used for grinding rough surfaces, finishes off | |
| Non Destructive Testing - Dye Penetrant Testing (Flaw Detectant) | | | |
| Weld | Information | | Test Passed? |
| Weld 1 - Frame | Horizontal weld, T joint weld | | **Yes** |
| Weld 2 - Frame | Horizontal weld, T joint weld | | **Yes** |
| Weld 3 - Frame | Horizontal weld, T joint weld | | **Yes** |
| Weld 4 - Frame | Horizontal weld, butt weld | | **Yes** |
| Weld 1 - Bucket | Horizontal weld, open corner weld | | **Yes** |
| Weld 1 - Bucket | Vertical weld, open corner weld | | **Yes** |
| Dye Penetrant Testing Standard: ISO 3452-1:2013 | | | |
| Comments on DPT Non Destructive Testing | | | |
| 4 welds were tested on the frame and 2 other, longer welds tested on the bucket, both sets of welds had no visible penetration after DPT. COSHH alongside PPE was considered throughout this process when handling with chemicals. Nitrile examination gloves and a disposable respirator, with an extraction fan above my work station. My results showed that there were no surface defects in the welds that were tested, the welds passed the quality inspection due to this. Overlooking and observating the whole piece, there were no major defects or surface blemishes, only some minor surface scores from grinding down tack welds used for braces, used for keeping components from warping. | | | |

This document **must** be signed by a supervisor **before** work can commence.

The work supervisor, in the signing of this Hot works permit, confirms that all required safety factors have been considered and actioned accordingly.

Please return this permit, upon completion of the job, to the work supervisor. The supervisor will be required to sign the permit as 'complete' date, sign and initial the permit as directed below.

| | |
|---|---|
| **Area of hot works:** | Grinding bay, welding bay, oxy-fuel cutting area |
| **Work to be completed:** | Grinding, welding, oxy-fuel cutting |

| No. | Description/checks: | Yes | No | N/A |
|---|---|---|---|---|
| 1. | Safety induction has taken place- worker completed safety induction and deemed competent | ✓ | | |
| 2. | Condition of machinery/equipment/tools checked they are in good working order | ✓ | | |
| 3. | The work area is clean and tidy and free from potential hazards and combustible materials | ✓ | | |
| 4. | Risk assessment is in place and has been communicated to the worker | ✓ | | |
| 5. | A fire blanket is accessible | ✓ | | |
| 6. | Gas cylinders stored correctly (e.g. kept on trolley, fittings free from grease and oil, correctly labelled, flashback arrestor fitted) | ✓ | | |
| 7. | Correct PPE provided | ✓ | | |
| 8. | An appropriate fire extinguisher is accessible | ✓ | | |
| 9. | Firewatcher in place- including for 1 hour after work is completed. | ✓ | | |
| 10. | Grinder/cutting equipment is to relevant BS Standard | ✓ | | |
| 11. | Correct supervision is in place and the permit is displayed in the location of the work. | ✓ | | |
| 12. | Other necessary precautions (please specify): | | ✓ | |

**Approval:**
*I personally checked the conditions required as specified. I hereby authorise this hot works to begin.*

*Hot works permit is valid for 5 hours only. This hot works permit can be issued for only **one** shift. It becomes void at the end of the specified works to be completed (as specified above).*

[redacted]

*This document is to be completed to simulate industry practice.*

*The health and safety of the candidates during the assessment process remains the responsibility of the assessor/supervisor delivering the assessment.*

*Providers **are** permitted to amend the template and related content to align with their workshop policies and procedures.*

Method statement

First and foremost I will collect and put on all my Personal Protective Equipment (PPE), where I would need to get my steel toe capped welding boots, alongside my overalls that are flame retardant, safety glasses and gloves, and additional ear defenders like plugsI will then check each item for any damage including inside and out, to see if PPE is fit for purpose, should it not be, or to be damaged this will be reported to a supervisor and gain a replacement Once verified all my PPE is for purpose I will enter the workshop and complete my area of work assessment assessing where I will be working and if anything is wrong, such as the area being untidy, this will all be in accordance of both the PPE regulations (Personal Protective Equipment at work Regulations 1992) and the HASWA (Health and Safety at work act 1974). I will then get myself sorted and assure my area is right to work, then will hand my hot work permit to my supervisor allowing me to complete work in my area.Using the technical drawing I will produce a cut list. I will select and check the materials, in a safe manner using the correct lifting techniques and placing them on a table or the slab ready for marking out,I will visually check the materials to ensure they are suitable for use. I will remove any stains, grease or marks on the material that are easy to remove. I will produce the markings for cutting the materials to size allowing for cut thickness when (oxy-fuel) cutting. I will use a hammer and punch to make lines for me to go along with my oxy-fuel cutting, this will allow me to perfectly cut the lines without any mistakes, creating the base plate, end plate and side plate. Then I will cut them using the oxy acetylene gas axing method, whilst following all safe working practices and SOPs. After this I will then check the accuracy with a steel rule and an engineer's rule, checking if it is in tolerance. After this I will check if these 5 components fit together snug.and dimensions are to standards, and in accordance to the cutting list, if anything is out of tolerance or too far in I will remake them. Then I will ensure all the welding bays have adequate equipment and lighting and extraction. After this I will check if my welding screen has the correct filter lens to protect from the bright lights then check if the welding mask is alright for it. After all of this I will continue to weld together my bucket using MMA following the British Standard. After this I will cut out all the box sections needed including the Frame; leg, top horizontal brace, horizontal brace, cross brace. These then will be grinded down to allow better access for the TIG welding process. These will then be propped up with 2 magnets and be assessed with an engineers square. After waiting for welds to cool down, then once all welds are completed I will inspect these welds visually. Removing spatter and slag from the MMA welds and brushing down welds with wire brush, also with a chisel and hammer. After this for task 3 I will get the Dye Penetrant test ready for the 3 step process following the main SOPs and practices along with

the correct COSHH procedures, I will carry out non-destructive testing of the welded sections of the bucket and frame and record quality of welds on the quality check sheet. After completing my task 3 activity I will return to my workstation and clean my area with a mop and brush as well as a brush and dustpan. At the same time checking if any equipment was damaged during my processes, and returning all equipment to the right areas. I will dispose of any scrap in the assigned bins, ready for recycling. Lastly, I will return my paperwork to its folder.

# Task 2 Production

| | |
|---|---|
| **Assessment number (eg 1234-033)** | 8713-334 |
| **Assessment title** | Fabrication and Welding Technologies Occupational Specialism |

| | |
|---|---|
| **Candidate name** | <first name> <surname> |
| **City & Guilds candidate No.** | ABC1234 |

| | |
|---|---|
| **Provider name** | <provider name> |
| **City & Guilds provider No.** | 999999a |

| | |
|---|---|
| **Task(s)** | 2 |
| **Evidence title / description** | Fully fabricated fire pit |
| **Date submitted by candidate** | DD/MM/YY |

# Task 2

**Assessment themes:**

- Health and safety
- Planning and preparation
- Production
- Quality review and evaluation

You must:

- prepare the work area for the production of the fire pit,
- mark out and cut components for the fire pit using cutting equipment, placing pieces in order of cutting,
- prepare the cut components for welding,
- fabricate the components using:
  - two different welding processes,
  - two different welding positions and
  - three different welded joints from the list given in the fabrication criteria,
- assemble the components,
- reinstate the work area.

**Additional evidence of your performance that must be captured for marking:**

- assessor observation to include:
  - the work area, prior to, during and on completion of fabrication activities
  - preparation of tools and equipment
  - welding and tool skills
  - use of cutting list (noting any changes made)
  - production stages of fire pit (marking out, cutting, welding preparation, welding, finishing and final assembly)
  - the application and use of tools and equipment:
    - to create two 150 mm continuous welds using two different welding processes
    - the use of two different welding techniques
    - production of three different welded joints.

## Candidate evidence

**Working area**

**Candidate's Working area was kept very clean and tidy, equipment neat and in place, hand tools good, working and preparing the work area good. He made sure all equipment and tools were safe.**

**Preparation of tools and equipment**

**Candidate's Preparation of tools and equipment tools and equipment was very good; he placed all tools before and after use in the correct places in store and racking, cleaned all tools and reported any damage if he found any.**

**Production stages**

**His production stages were laid out in a manner that she could pick up the correct tool or piece when she needed it. Candidate seemed to not have a bit of confusion with his pieces at each stage of his work but overcame this quickly. Candidate had his pieces and tools numberd for what stage he was at.**

**Application and use of tools and equipment**

**His Application and use of tools and equipment was good and he understood what tools he had to use at what stage, candidate's application was good and applying to a particular purpose and relevance.The practical applications of space was good. Candidate paid attention to the number of equipment he had with confidence and knowledge. Candidate used two different welding processes to create two different 150 mm single-run welds.**

**Welding and tool skills**

**Candidate tool skills and welding were good, his welding will improve given more time in a welding bay or at work, tool skills good but as I have said given time would be even better, at this time he has shown good skills in both Welding and tool skills and health and safety.**

**Use of cutting list**

**Candidate showed good understanding of his cutting list and demonstrated he knew how to set out and in what order, his work was good and mistakes were made but overall excellent work in the time he had.**

# Task 3A Quality review and testing

| | |
|---|---|
| **Assessment number (eg 1234-033)** | 8713-334 |
| **Assessment title** | Fabrication and Welding Technologies Occupational Specialism |

| | |
|---|---|
| **Candidate name** | <first name> <surname> |
| **City & Guilds candidate No.** | ABC1234 |

| | |
|---|---|
| **Provider name** | <provider name> |
| **City & Guilds provider No.** | 999999a |

| | |
|---|---|
| **Task(s)** | 3A |
| **Evidence title / description** | Completed quality check sheet |
| **Date submitted by candidate** | DD/MM/YY |

# Task 3A

**Assessment themes:**

- Planning and preparation
- Quality review and evaluation

You must:

- prepare the work area to carry out magnetic particle testing (a Non-Destructive Testing (NDT)),
- perform quality assurance checks on the fabricated assembly,
- perform a magnetic particle test on **three** different welds,
- record the magnetic particle test results in the quality check sheet.

**Additional evidence of your performance that must be captured for marking:**

- assessor observation to include:
    - use of measuring equipment
    - application of magnetic particle test
    - completion of quality checks
    - review of work area (preparation, during and on completion of the task).

# Candidate evidence

3A

**Quality review and testing**

**Candidate's testing and quality review overall was very good, he showed no if any weakness, just strengths. Health and safety was good overall as candidate consistently measuring equipment, workarea, methods had to be use at every stage, checking everything 3/4 times before doing anything.**

Quality Check Sheet

| Check | Criteria | | |
|---|---|---|---|
| Component | Required Dimensions | Finished dimensions | **Tolerance met?** |
| B1 Base Plate | 600mm x 250mm x 5mm | 600mm x 250mm x 5mm | **Yes** |
| B2 End Plates | 250mm bottom, 400mm top x 500mm x 5mm | 250mm x 399mm x 500mm x 5mm | **Yes** |
| B3 Side Plates | 600mm long, 505mm high x 5mm | 600mm x 504.8mm x5mm | **Yes** |
| F1 Frame Leg | 50mm x 50mm x 500mm 3mm box section | 50mm x 50mm x 500mm | **Yes** |
| F2 Top Horizontal Brace | 50mm x 50mm x 300mm 3mm box section | 50mm x 50mm x 300mm | **Yes** |
| F3 Horizontal Brace | 50mm x 50mm x 200mm 3mm box section | 50mm x 50mm x 201mm | **Yes** |
| F4 Cross Brace | 50mm x 50mm x 600mm 3mm box section | 50mm x 50mm x 600mm | **Yes** |
| Overall Bucket Height | 505mm | 505mm | **Yes** |
| Overall Bucket Length | 610mm | 610mm | **Yes** |
| Overall Bucket Width | 260mm bottom, 410mm top | 260mm bottom 409mm top | **Yes** |
| Overall Frame Height | 500mm | 500mm | **Yes** |
| Overall Frame Length | 700mm | 698mm | **Yes** |
| Overall Frame Width | 300mm | 299mm | **Yes** |
| Welding Processes | | | |
| Welding Process 1 | MMA | | |
| Welding Process 2 | TIG | | |
| Welding Positions | | | |
| Welding Position 1 | PF (Vertical), used during TIG process | Correct setup (weld preparation) and techniques used during process to ensure proper fusion between components | |

| | | | |
|---|---|---|---|
| Welding Position 2 | PA (Flat), used during MMA process | Correct setup (weld preparation) and techniques used during process to ensure proper fusion between components | |
| Welding Standard | BS EN ISO 5817 | | |
| Cutting Processes | | Notes | |
| Cutting Equipment | Oxy-Acetlyene | Used to cut components for bucket | |
| Abrasive Equipement | Angle Grinder, Wire brush | Used for grinding rough surfaces, finishes off | |
| Non Destructive Testing - Dye Penetrant Testing (Flaw Detectant) | | | |
| Weld | Information | | Test Passed? |
| Weld 1 - Frame | Horizontal weld, T joint weld | | **Yes** |
| Weld 2 - Frame | Horizontal weld, T joint weld | | **Yes** |
| Weld 3 - Frame | Horizontal weld, T joint weld | | **Yes** |
| Weld 4 - Frame | Horizontal weld, butt weld | | **Yes** |
| Weld 1 - Bucket | Horizontal weld, open corner weld | | **Yes** |
| Weld 1 - Bucket | Vertical weld, open corner weld | | **Yes** |
| Dye Penetrant Testing Standard: ISO 3452-1:2013 | | | |
| Comments on DPT Non Destructive Testing | | | |
| 4 welds were tested on the frame and 2 other, longer welds tested on the bucket, both sets of welds had no visible penetration after DPT. COSHH alongside PPE was considered throughout this process when handling with chemicals. Nitrile examination gloves and a disposable respirator, with an extraction fan above my work station. My results showed that there were no surface defects in the welds that were tested, the welds passed the quality inspection due to this. Overlooking and observating the whole piece, there were no major defects or surface blemishes, only some minor surface scores from grinding down tack welds used for braces, used for keeping components from warping. | | | |

# Task 3B Evaluation and recording

| | |
|---|---|
| **Assessment number (eg 1234-033)** | 8713-334 |
| **Assessment title** | Fabrication and Welding Technologies Occupational Specialism |

| | |
|---|---|
| **Candidate name** | <first name> <surname> |
| **City & Guilds candidate No.** | ABC1234 |

| | |
|---|---|
| **Provider name** | <provider name> |
| **City & Guilds provider No.** | 999999a |

| | |
|---|---|
| **Task(s)** | 3B |
| **Evidence title / description** | Quality inspection report |
| **Date submitted by candidate** | DD/MM/YY |

# Task 3B

**Assessment themes:**

- Quality review and evaluation

You must:

- produce a quality inspection report evaluating the production of the finished fire pit. The report should typically be 800 words.
  This must include:
  - finished sizes of components and confirmation the fabricated fire pit conforms to the dimensional requirements of the specification and meets industry standards
  - results from the non-destructive testing with reasonings and whether the welds meet industry standards
  - an explanation of the quality checks undertaken and the reasons for their use
  - an evaluation of the fitness for purpose of the finished assembly and method of production used with reasoning and justifications
  - a concessions list for every facet of the assembly that does not conform to the specification, reasons for occurrence and how to prevent reoccurrence
  - any amendments needed to their method statement with reasoning
  - any improvements or adaptions required to the fire pit, including any reasoning and justifications if adaptions or improvements are not required.

**Additional evidence of your performance that must be captured for marking:**

- N/A

# Candidate evidence

Introduction

The assignment brief given tells me to produce a fire pit for a garden furniture company. I was given twenty six hours and fifteen minutes to complete this. After completing Task 2 of the assignment my fire pit would be inspected, for quality assurance, on welds, tolerances and component sizes, the welds are inspected using the Dye Penetrant Testing, non destructive testing (NDT) method to test welds for conformity towards the welding standard of BS EN ISO 5817.

Fabrication Process

To produce the Fire Pit I needed 2 main parts, the bucket and the frame. Using standard fabrication processes, I fabricated the bucket out of five millimetre mild steel. I needed 5 pieces for this, two side and end plates and one base plate. These were then marked out with chalk, then a scribe for a more precise fine line, then punched holes along this line for more accurate cutting during the oxy-acetylene cutting procedure. During this process I used a scribe, a steel rule, a punch, ball pein hammer, french chalk and an engineer's square. Each of the components for the bucket were cut out using the oxy-acetylene torch, then rasped using a stone disc and a flappy disc with the angle grinder in a grinding bay with adequate ventilation. On top of the angle grinder I needed to use the deburr tool to ensure the edges were straight and prepared for welding. Then for the frame I needed four thousand and two hundred millimetres of three millimetres thick box section mild steel. This was to create four frame legs, two horizontal braces, two top horizontal braces and two cross braces. Some of these components needed to have a forty five degree cut into the end of them. First of all in this process I got the raw materials and laid them out for drawing. I used most of the same tools as the process before but I had to use a tape measure as the lengths were too long for a steel rule, and a forty five degree angle tool to get the precise angle. These were then cut with the horizontal band saw and the chop saw using proper PPE and using Standard Operating Procedures throughout the process. The tips and edges/ends of all these pieces were then grinded down with a flappy disc on the angle grinder to remove any unwanted residue left from previous processes and to rid the finish from the metal to show raw steel.

Welding process

For the welding, I did some weld prep, including chamfering each corner so that welding the frame during the TIG process would be easier and look better. All of these pieces were then assembled with braces to ensure metal doesn't warp and shift during welding. I used clamps,

sash clamps, forty five degree angle magnets. I then tacked together my frame using the TIG process. After this I used the same tools but a different welding technique of MMA arc welding to tack together my bucket. I used a brace in both of these processes. After this I welded my bucket fully using the MMA welding process, using around five to six sticks for each long weld. This is then cleaned with a chipping hammer and a wire brush. I welded my frame together using TIG, with filler rod, and my machine set to dc- and eighty amps. I used the two point four millimetre tungsten tip for my torch. This process seemed to be the easier of the two as the gloves used are more accessible and proper for this welding process. Then I grinded off the braces and finished with my product.

Quality inspection

After completing my finished product I carried out a quality inspection. This included a visual check to see for any deformities, a dimensional accuracy check and a non-destructive test (NDT). Firstly I prepared my work bay with proper cardboard so that the sprays used do not damage anything or stain. After this I got my steel rule, engineers square and tape measure, along with a piece of paper where I wrote my dimensions, accuracy and if anything was in tolerance. After this I checked for dents/ surface abrasions on the welds or any excess welding material like slag/ spatter. The overall shape was perfect and no warping in both bucket or frame, one or two scorch marks seen on the inside of the bucket, because of braces used to hold the bucket together. I checked if any of my components were dimensionally inaccurate and they were all in tolerance of three millimetres. A copy of my quality inspection sheet is in the same file this is in.

Non-destructive testing (NDT)

For the NDT testing phase of my exam I used the dye penetrant testing method. To test the surface integrity of the welds and if they were meeting the standard BS EN ISO 5817. The DPT method is very effective as it works to show defects and holes that the naked eye can't spot. Wearing a disposable respirator and nitrile examination gloves before starting work with considering the ventilation is adequate for the task. Firstly DPT works by cleaning the weld and the area of weld with a cloth/tissue and using a solvent to clean the weld, then wipe the surface of the solvent. Then secondly you use the dye penetrant on the area you are testing, for my circumstance I used red dye, this seeped into any cracks or weld defects. This is then wiped off with blue roll, and lastly the white developer is used to show where defects are if there are any, with the contrast of white to red, the defects will be easily seen from the red leaking through the white. I selected three welds all connected through a corner on my frame, that were all T joint welds and one that is a butt joint. All these welds passed the NDT with no defects. For my bucket I tested two welds, open butt welds for both, my horizontal

weld had no defects shown, the same results showed for my vertical weld, I used the industry standard for DPT:  ISO 3452-1:2013 for this whole process. This rest showed that the selected welds had no surface defects and had passed to the BS EN ISO 5817 standard. Finally I cleaned both the frame and bucket from all the developers and different liquids.

Final evaluation

Producing my final product went accordingly, but there were a few issues that occurred throughout all the tasks. During task one, the given time of three hours was inadequate for all the tasks given. I managed to only scrape past by finishing the cutting list, the quality check sheet template, a hot work permit and a completed risk assessment but had to finish the method statement to a low standard since I was running out of time. I know this is not because of my poor planning but I believe this time limit is too strict for the tasks we have to complete. If I were to do this again I would lower the overall standard of work for task one so all components can be finished. Another difficulty I came across was during task two when I had to evaluate the technical drawings of the work that I was meant to replicate. The drawings had a fault where they did not take into account the thickness of the metal during the fabrication of the bucket, this led to the bucket being three millimetres too thick for it to fit into the frame. This was very unconventional but I acknowledged these mistakes but forgot to redesign my bucket to the correct measurements. This is seen in the quality check sheet where the bucket length is 610mm where it is 10mm too thick for the 600mm frame. Any other issues during the fabrication and welding process would be during the MMA arc welding. During this I wore fully proper PPE for this task but I needed a few extra since I was welding. My arms were getting hit with hot sparks through my overalls, this could be controlled by using leather sleeves for my arms. During the cutting out period I came out with the least waste possible cutting the components in the best possible cost effective way. If I were to redo this assessment not much more else would need to be change other than what was listed

Conclusion

My design of the fire pit turned out great and passed the given tests for suitability for the purpose of a fire pit sold by a manufacturer of garden furniture. Additionally the processes I used for all components were fit to standard fabricating and welding procedures. On the other hand, I would suggest a greater revaluation of the technical drawings as they were wrong, Also giving more time during the first task due as I had to rush parts of it not completing it to a good standard. If this was given, this task would run more smoothly because I would be able to complete all the tasks to a great standard and not miss out on

anything crucial with the tasks after the first, such as forgetting something on my risk assessment or resource list. Something else that should be considered with this test should be how much space would be needed as my welding bay was on the smaller side so welding a large bucket and frame in this bay would turn out to be quite difficult and tedious, this could be improved by letting students know you will need to prepare a space for how big the task would be.

# Task 3C Handover

| | |
|---|---|
| **Assessment number (eg 1234-033)** | 8713-334 |
| **Assessment title** | Fabrication and Welding Technologies Occupational Specialism |

| | |
|---|---|
| **Candidate name** | <first name> <surname> |
| **City & Guilds candidate No.** | ABC1234 |

| | |
|---|---|
| **Provider name** | <provider name> |
| **City & Guilds provider No.** | 999999a |

| | |
|---|---|
| **Task(s)** | 3C |
| **Evidence title / description** | Assessor observation of handover meeting |
| **Date submitted by candidate** | DD/MM/YY |

# Task 3C

**Assessment themes:**

- Quality review and evaluation

You must:

- hold a meeting with the supervisor to complete handover procedures, including:
  - confirmation of the work completed
  - a summary of findings from the quality inspection report
  - suggested improvements to the design of the fire pit and/or fabrication process
  - handover of the finished fire pit and the complete quality inspection report.

**Additional evidence of your performance that must be captured for marking:**

- handover materials consisting of:
  - quality inspection report (from task 3b)
  - completed fire pit assembly (from task 2).

# Candidate evidence

3C

**Handover meeting**

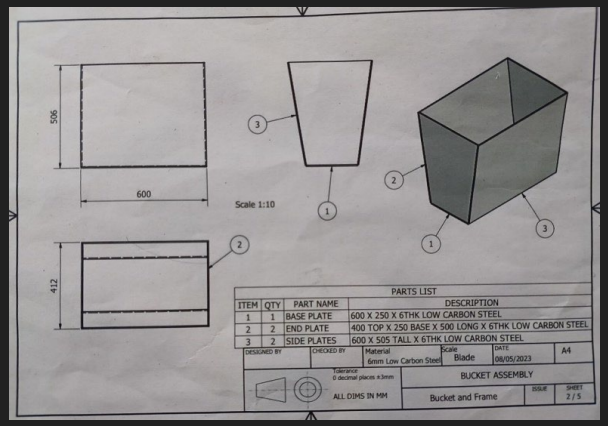
**Candidate produced a good handover meeting, he struggled with keeping still his words were clear and well spoken, Could have put more in the powerpoint and not crossed over so much as this was covering his presentation.Time was not adequate for this task.**

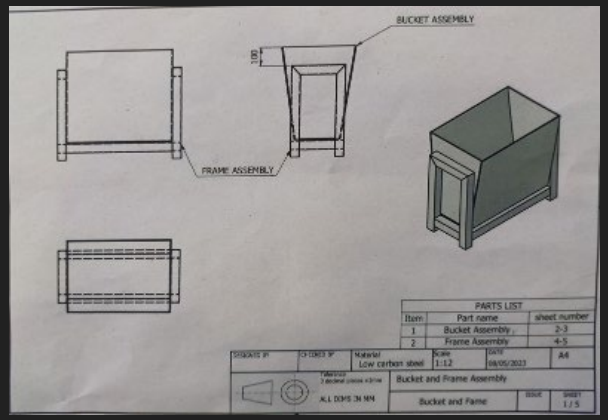
# Brief

Given brief:

To plan out and fabricate a medium - sized welded prototype fire pit for their new product line.

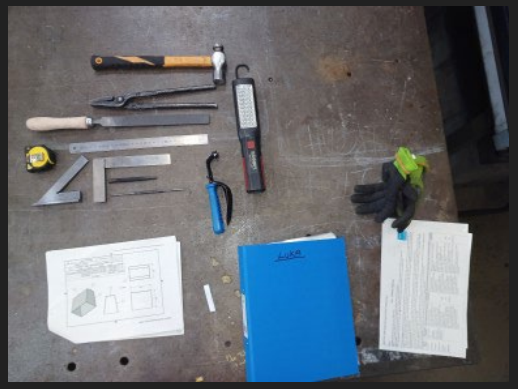
For task 1 I was given all information including technical drawings and what task 1 included, such as risk assessments, hot works permits and resource list etc.

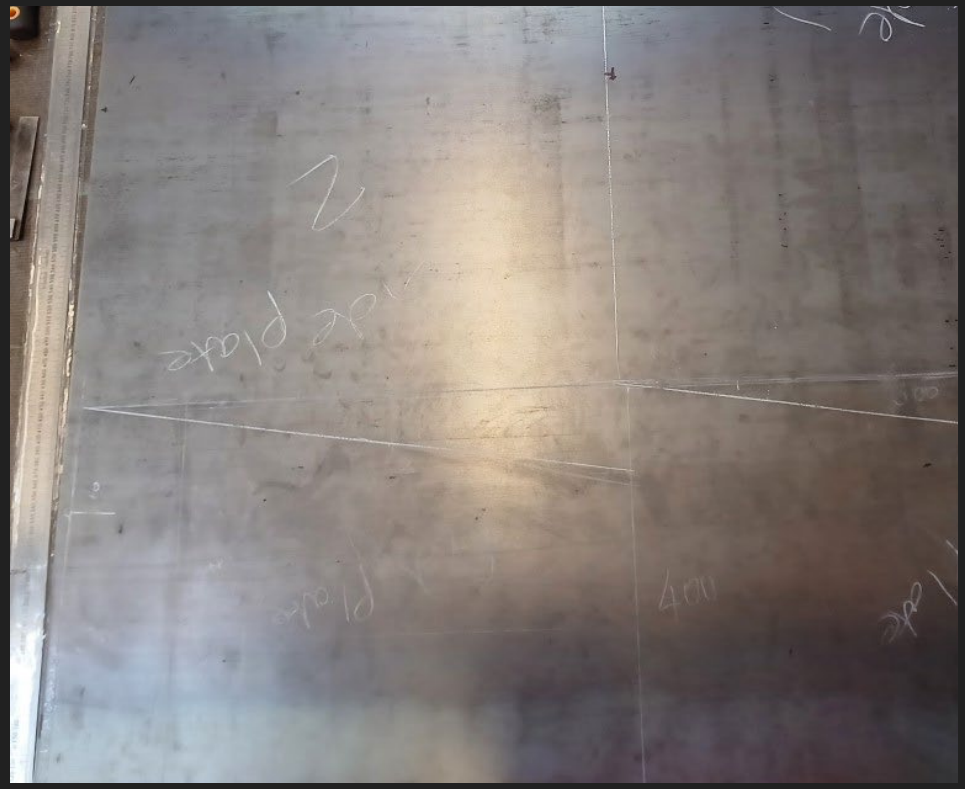


# Marking out

I used the general stencils used for marking out including the engineer's square, steel rule, tape measure, 45* angle, scribe, chalk and vernier caliper





# Fabrication and Welding Processes

I used the oxy-acetylene and powered guillotine for cutting the bucket components.
I used the band saw and the chop saw to cut the straight and angled cuts of box section.
Before welding everything I tacked all the components together.
I used MMA welding for the open corner bucket welds
I used TIG welding for the 3mm box section T joint and butt joint welds.






| Check | Criteria | | |
|---|---|---|---|
| Component | Required Dimensions | Finished dimensions | **Tolerance met?** |
| B1 Base Plate | 600mm x 250mm x 5mm | 600mm x 250mm x 5mm | Yes |
| B2 End Plates | 250mm bottom, 400mm top x 500mm x 5mm | 250mm x 399mm x 500mm x 5mm | Yes |
| B3 Side Plates | 600mm long, 505mm high x 5mm | 600mm x 504.8mm x5mm | Yes |
| F1 Frame Leg | 50mm x 50mm x 500mm 3mm box section | 50mm x 50mm x 500mm | Yes |
| F2 Top Horizontal Brace | 50mm x 50mm x 300mm 3mm box section | 50mm x 50mm x 300mm | Yes |
| F3 Horizontal Brace | 50mm x 50mm x 200mm 3mm box section | 50mm x 50mm x 201mm | Yes |
| F4 Cross Brace | 50mm x 50mm x 600mm 3mm box section | 50mm x 50mm x 600mm | Yes |
| Overall Bucket Height | 505mm | 505mm | Yes |
| Overall Bucket Length | 610mm | 610mm | Yes |
| Overall Bucket Width | 260mm bottom, 410mm top | 260mm bottom 409mm top | Yes |
| Overall Frame Height | 500mm | 500mm | Yes |
| Overall Frame Length | 700mm | 698mm | Yes |
| Overall Frame Width | 300mm | 299mm | Yes |
| Welding Processes | | | |
| Welding Process 1 | MMA | | |
| Welding Process 2 | TIG | | |
| Welding Positions | | | |
| Welding Position 1 | PF (Vertical), used during TIG process | Correct setup (weld preparation) and techniques used during process to ensure proper fusion between components | |
| Welding Position 2 | PA (Flat), used during MMA process | Correct setup (weld preparation) and techniques used during process to ensure proper fusion between components | |
| Welding Standard | BS EN ISO 5817 | | |
| Cutting Processes | | Notes | |
| Cutting Equipment | Oxy-Acetlyene | Used to cut components for bucket | |
| Abrasive Equipement | Angle Grinder, Wire brush | Used for grinding rough surfaces, finishes off | |
| Non Destructive Testing - Dye Penetrant Testing (Flaw Detectant) | | | |
| Weld | Information | | Test Passed? |
| Weld 1 - Frame | Horizontal weld, T joint weld | | Yes |
| Weld 2 - Frame | Horizontal weld, T joint weld | | Yes |
| Weld 3 - Frame | Horizontal weld, T joint weld | | Yes |
| Weld 4 - Frame | Horizontal weld, butt weld | | Yes |
| Weld 1 - Bucket | Horizontal weld, open corner weld | | Yes |
| Weld 1 - Bucket | Vertical weld, open corner weld | | Yes |
| Dye Penetrant Testing Standard: ISO 3452-1:2013 | | | |
| Comments on DPT Non Destructive Testing | | | |
| 4 welds were tested on the frame and 2 other, longer welds tested on the bucket, both sets of welds had no visible penetration after DPT. COSHH alongside PPE was considered throughout this process when handling with chemicals. Nitrile examination gloves and a disposable respirator, with an extraction fan above my work station. My results showed that there were no surface defects in the welds that were tested, the welds passed the quality inspection due to this. Overlooking and observating the whole piece, there were no major defects or surface blemishes, only some minor surface scores from grinding down tack welds used for braces, used for keeping components from warping. | | | |

## Findings and improvements

# Non-destructive Testing Results

I used Dye Penetrant Testing method for my NDT.
I tested a vertical and a horizontal weld on my bucket.
I tested 3 T joint welds and one butt joint on my frame for deformities.
All in Dye Penetrant Testing Standard: ISO 3452-1:2013

Any Questions?

## Get in touch

The City & Guilds Quality team are here to answer any queries you may have regarding your T Level Technical Qualification delivery.

Should you require assistance, please contact us using the details below:

Monday - Friday | 08:30 - 17:00 GMT

T: 0300 303 53 52

E: **technicals.quality@cityandguilds.com**

W: **http://www.cityandguilds.com/tlevels**

Web chat available **here**.