

Cystadleuaeth | **Skills**
Sgiliau | Competition
Cymru | Wales



MANUFACTURE TEAM CHALLENGE

Wales Round COMPETITION BRIEF 2018 - 2019



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Introduction

Cranes are a common everyday item something we take for granted, but they take many forms and styles depending on their usage. Your challenge is to design a suitable crane for this use!

The project brief

This brief specifies the requirements for the design and manufacture of a table top crane that is designed to lift Steel objects varying from 50g to 1 Kg in weight from the floor below the table, to a receptacle placed upon the same table top as the crane. See appendix 2 for positioning of crane, objects and receptacle as well as the list and size of the objects.

Description of Project

The crane is required to:

- o Lift 6 objects from multiple floor positions as shown in appendix 2.
- o Lift 6 objects from the floor at a distance of no less than 600mm and no greater than 1000mm below the base of the crane.
- o The movement of the crane must be controlled from a hand held remote on a minimum of 1 metres of cable.
- o The crane should use any suitable means to lift the objects.
- o The system should be powered electrically using a maximum of 18 Volts for safety purposes. This can be battery or via a purchased mains adapter.
- o The crane must be able to rotate through a full 360 degrees at its base.
- o The crane must be counter balanced to prevent tipping and no attachment or clamping to a table will be allowed.

- o The crane boom arm must be able to move from horizontal, through a minimum of 90 degrees to vertical.
- o The crane will be required to deposit all 6 items into the receptacle.
- o **Safety**
 - The system should be able to be switched off via a key.
 - Any mechanisms and surfaces should be free from being a trap, crushing or cutting hazard.
 - The system should have an emergency stop to cut all power and allow the cart to come to a natural rest.
 - All electrically conductive parts must be guarded.
 - No sharp edges should be evident.

Accuracy

The crane will be required to demonstrate: -

- Accuracy of movement by lowering and depositing the smallest item onto a target.

EQUIPMENT, MACHINERY, INSTALLATIONS AND MATERIALS REQUIRED EQUIPMENTS PROVIDED BY ORGANISERS

All lathes, cut-off saws, pillar drills, fabrication and welding equipment. MIG and TIG and associated tooling, but not Drill bits or Lathe tools.

Testing equipment and testing materials for the Crane.

EQUIPMENT AND MATERIALS NOT PERMITTED

Laptop or portable computers. PDA's e.g. Palm, IPAQ etc. Memory sticks/MP3 Player/Digital Storage. Walkman radio/CD Player. Electronic organiser/diaries. Wireless communication devices. None approved CDs or floppy discs – approval by Experts or delegate is required for all CDs and floppy discs. Any additional software not supplied by organizers unless approved by Experts. Pre-programmed IC's. Purchased items modified in any way prior to the Competition. All subassemblies for the crane. Equipment that is similar or operates in similar manner as supplied equipment. Example – if a metal cut-off saw is provided by organisers, then no team may provide their own metal cut-off saw.

ITEMS TO BE PROVIDED BY TEAMS

It is the responsibility of the team to supply all the components and raw materials to manufacture the Crane. This may include but is not limited to the following items:
Battery/batteries. Electronic circuit board – not mounted (circuit board components must be assembled on the board at the Competition). All Electrical and electronic components. Electric cables, connectors and couplings. Readymade cables with connector are not permitted. All connectors must be fitted during the competition. Jigs, fixtures, formers and clamping devices. All materials with which to construct the crane and all other associated equipment and consumables (sheet metal, screws, nuts, pins, pegs, etc.). Machining consumable tooling required for manufacturing the components. Lathe tools and hand tools for manufacturing components. All hand tools, cutting tools and measuring equipment. All hand tools for assembly. All personal protective equipment. Other specific manufacturing equipment required that is not in the infrastructure list. Bearings (unmodified), Sprockets, pulleys, gears, couplings, chain and belts (as supplied and must not be altered). Catalog or standard must be provided. Hydraulic or pneumatic components and fittings not assembled.

Note: you Must arrange for software to program you LCD to be onsite or bring a Laptop and software with you

DURING THE COMPETITION DURATION, NO TOOLS, EQUIPMENT, STATIONARY, COMPONENTS, MANUALS, DRAWINGS OR DIGITAL STORAGE DEVICES, UNLESS APPROVED BY THE CHIEF EXPERT, MAY BE REMOVED FROM OR BROUGHT INTO THE COMPETITION VENUE.

Marking Scheme

Section	Criteria	Marks
A	Main project performances (Inc. Section B of portfolio)	60 10
B	Main project costs: Manufacturing Time Materials Machining Time	5 2 3
C	Portfolio (Section A only)	20
Total		100

A. Main Project (70 Marks)

The Crane will be able to: -

- o Demonstrate the lifting of 6 objects from multiple floor positions as shown in appendix 2. **(3 Marks)**
Test: the objects will be placed in the pattern shown in appendix 2. The crane will be positioned freestanding on the table top of a height between 600mm and 1000mm above the objects. The crane will pick up and deposit each item in turn in the receptacle. 0.5 marks will be awarded for each successful lift completed without tipping the Crane.
- o Demonstrate the lifting of 6 objects from the floor at a distance of no less than 600mm and no greater than 1000mm below the base of the crane. **(3 Marks)**

Test: the objects will be placed in the pattern specified in appendix A. The crane will be positioned freestanding on the table top of a height between 600mm and 1000mm above the objects. The crane will pick up and deposit each item in turn in the receptacle. 0.5 marks will be awarded for each successful lift completed without tipping the Crane.

- o Demonstrate the full range of movements controlled solely from a hand held remote on a minimum of 1 metres of cable. **(2 Marks)**

Test: The length of the cable from the Crane will be measured between the Crane and handset. A minimum of 1 meter of cable scores 2 mark. Less than 1 Meter scores 0 Marks.

- o Demonstrate a suitable means to lift the objects. **(2 marks)**

Test: The crane shall demonstrate the ability to lift the 1KG object. A suitable lifting device demonstrating it can secure and lift the object from the ground scores 2 marks. If unable to lift the object from the ground the score will be 0 Marks.

- o Be powered electrically using a maximum of 18 Volts for safety purposes. This can be battery or via a purchased mains adapter.

(2 Marks)

Test: The power supply will be specified in the team portfolio. <18 Volts scores 2 Marks, >18Volts scores 0 Marks.

- o Controlled by a handheld controller with the following functions:

(7 Marks)

Left and right rotation with a suitable indicator to show this is happening. 1 mark

1 further mark is awarded for "left" and "right" being indicated by an LCD panel

Up and down of the boom arm with a suitable indicator to show this is happening. 1 mark

1 further mark is awarded for "up" and "down" being indicated by an LCD panel

Cable in and out with a suitable indicator to show this is happening. 1 Mark

1 further mark is awarded for "in" and "out" being indicated by an LCD panel

A suitable indicator to show the method of gripping objects is in use when it is active. 0.5 mark. 0.5 further mark is awarded for "gripping" being indicated by an LCD panel

- o Demonstrate the ability to rotate through a full 360 degrees or >720 degrees at its base. **(4 Marks)**

Test: The Crane shall be rotated through 360 degrees or more. <360 degrees of movement scores 0 Marks, 360 degrees or greater scores 2 marks. The Crane shall be able to rotate through 720 degrees or greater, 2 further marks shall be awarded.

- o Free standing with no attachment or clamping to the table and have

a suitable counter balance to prevent tipping. **(4 Marks)**

Test: Throughout all tests the Crane shall be observed. If it tips over at any point 1 mark is deducted for each time it tips from the maximum of 4. If it does not tip 4 Marks are awarded.

Note: teams will be allowed to right the crane if it tips over to continue other tests.

- o Demonstrate the movement of the boom arm from horizontal, through a minimum of 90 degrees to vertical. **(4 Marks)**

Test: the team will be asked to demonstrate the boom arm in the horizontal or lower position. 2 Marks. The team will then via the handset lift the arm through 90 degrees to vertical. 2 Marks.

- o Demonstrate that it can deposit all 6 items into the receptacle. **(3 Marks)**

Test: During the time trial 0.5 Marks will be awarded for each object safely deposited in the receptacle.

Safety

- The electrical system can be switched off via a key. **(2 Marks)**

Test: The Crane shall be switched off and all controls demonstrated to be inactive. 2 Marks.

- All mechanisms and surfaces are free from being a trap, crushing or cutting hazard. **(2 Marks reduce by 0.5 marks for each problem found)**

Test: Judges shall check the surfaces for cutting hazards and that the moving parts are suitably guarded. 2 Marks awarded for no problems found. 0.5 marks deducted for each problem found.

- The system has an emergency stop. **(2 Marks)**

Test: The system shall be turned on and motion demonstrated. The emergency stop will be activated. Then all controls demonstrated to be inactive. 2 Marks.

- All electrically conductive parts are guarded.

(2 Marks reduce by 0.5 marks for each problem found)

Test: Judges check the Crane for all conductive parts. No unguarded conductive parts 2 Marks. Reduce by 0.5 for each unguarded conductive part found.

- No sharp edges are evident.

(3 Marks reduce by 0.5 marks for each problem found)

Test: Judges check the Crane for sharp edges. No sharp edges found 3 Marks. Reduce by 0.5 for each sharp edge found.

Accuracy

The crane will be required to demonstrate: -

- Accuracy or movement by lowering and depositing the smallest item onto a target in the fastest time.

(5 Marks)

Test: The 50g object will be lifted by the crane. The crane may be set to a position ready to lift. At the start of the clock the object must be lifted, manoeuvred and placed within a 10CM circle. The fastest team will receive 5 Marks. The slowest team will receive 0 Marks. Each other team will be graded in 10% categories in between, losing 0.5 marks for each band after the fastest.

Time Trial

All 6 objects will be lifted from the positions specified in Appendix A and placed into the receptacle. One person shall be required to control the crane and complete the task.

(10 Marks)

Test: The team shall start with the lifting mechanism retracted to the boom. The boom shall be vertical. The crane shall be turned as to face away from the lifting objects by 180 degrees.

On clock start the operator using only the controls in the handset must lift all objects into the receptacle. Once the final object is placed in the receptacle the clock will be stopped. The fastest team wins 10 Marks, second wins 9, third wins 8 and so on, till 1 mark is gained by the 10th placed team.

Portfolio B – to be presented at the start of the competition (10 Marks)

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The teams will bring with them in their portfolio:

- Manufacturing drawings for all components to be made. (Autodesk Inventor, AutoCAD or similar)
- 3D Assembly drawing(s). (Autodesk Inventor or similar)
- Electronic block diagrams/drawings. (AutoCAD Electrical or similar)

B. Manufacturing Costs (10 Marks)

Working hours

For every 10% more expensive than the team with the lowest calculated working hours cost (see note below), 0.5 Marks will be deducted proportionally. **(5 Marks)**



Additional cost for using equipment

For every 10% more expensive than the team with the lowest additional equipment cost (see note below), 0.3 Marks will be deducted proportionally. **(3 Marks)**

Raw materials

For every 10% more expensive than the team with the lowest additional equipment cost (see note below), 0.2 Marks will be deducted proportionally. **(2 Marks)**

Compliance.

The total cost of equipment, materials and labour will be modified by project compliance to specification.

Compliance to specification means that your marks for your built project will be calculated as a percentage and adjust your costings as follows.

$$\text{Final build cost} = \frac{\text{Total cost} \times 100}{\% \text{ compliance to specification}}$$

Examples

If total cost is £2,500 and compliance is 100% then build cost would be £2,500

If total cost is £2,500 and compliance is 80% then build cost would be £3,125

If total cost is £2,500 and compliance is 60% then build cost would be £4,167

If total cost is £2,500 and compliance is 40% then build cost would be £6,250

If total cost is £2,500 and compliance is 20% then build cost would be £12,500

If total cost is £2,500 and compliance is 0% then no marks awarded for cost section.

C. Portfolio A (20 Marks)

A portfolio is to be presented prior to the competition start. This portfolio is to be assessed as a component of this project. The portfolio is to be presented in hard copy in a folder and to

include: -

- Team member details.
- Team work schedule.
- Design calculations and sketches/drawings.
- The size and type of power supply used.
- A Spreadsheet list of materials and components used with catalogue prices.
- Evidence of material and component costs.
- Operation and maintenance manual.
To include: -
 - Troubleshooting guide
 - Operation and installation of lights and controls
 - Replacement of any batteries or power supplies
 - Safe operating procedures
- A poster display 1000mm x 600mm (minimum size) detailing each team member's details and their employers, a description of the project solution including a 3D model of their track and cart, which will be presented prior to the competition and displayed during the competition.

Appendix 1

Additional rules

- Teams may have any notes and sketches they require to build the project, but these must be handwritten/drawn and not printed.
Printed circuit diagrams are acceptable
- Teams are required to provide all the tools and raw materials they require for the project. Teams may borrow tools and equipment from other teams, if they are willing, but will incur a 15-minute time penalty added to their build time for each tool or piece of equipment borrowed.
- Any areas that are not fully understood should be queried prior to the competition. Any misreading of the rules of the competition will be deemed as your own fault and the judge's decisions as to interpretation will be final.
- You are required to wear Safety Goggles/Glasses and Steel Toe Cap Boots/Shoes as a minimum at all times during the competition.
- As a guide you will be able to work from 9:30AM to 3PM on the day of the competition. You are expected to design and schedule your activities to fit within this time. Failure to complete all elements within this time will lead to the forfeiture of marks for uncompleted areas. Extra time can be given to all teams at the Judge's discretion.
- All of the components and parts should be manufactured during the competition by the team. Items it is not possible to manufacture such as wheels, batteries, solar panels etc. will be allowed. Any item that the Judges deem the team could have made will incur a penalty. See penalty table.
- A technical forum is also available via google community, where questions can be asked, and any areas discussed. Search Skills Wales MTC. However, support is also available via Email. Daytun.unitt@cambria.ac.uk

Penalties:

- Penalties may be incurred by activities, seeking help, or noncompliance to the rules, these are as follows:

Penalty	Incurred
Seeking help from an expert	15 minutes of time or any part of £20 cost addition
Health and safety minor infraction Non-use of PPE Unsafe use of tools and equipment etc.	15 minutes added to team working time
Health and safety dangerous infraction Non-use of guards Dangerous horseplay etc.	You may be stopped from working for the remainder of the competition
Interfering with other teams	1 hour added to working time
Borrowing of tools or equipment from other teams	15 minutes team working time added for each piece of equipment or tool borrowed
Not properly cleaning down machinery after use	15 minutes working time added to the team
Use of pre-made items that the team could have manufactured and/or programmed	Judges will estimate the time taken to manufacture the item and add a time penalty to the teams working time equal to three times this figure.
Noncompliance to instructions given by any judge during the competition	15 minutes working time will be added to the team
Discretionary penalty for any other situation that may occur	A working time penalty will be added to suit the infraction, based on the judge's opinion of its severity

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Costings

Item	Cost
Working time: If one team member is working it is costed as all are working.	£90 per hour
Use of Lathe and Welding equipment	£40 per hour
Use of Pillar Drill, cut off Saw, Box and Pan, or Guillotine	£20 per hour
Pre-Manufacture of Printed circuit boards (unmounted)	£0.25/cm ²

The minimum time for booking each machine is fifteen (15) minutes, and 15-minute intervals thereafter.

All of the materials that the team will require to manufacture the track and cart will be put into the spreadsheet at VAT free prices, with a section evidencing this in the team portfolio.

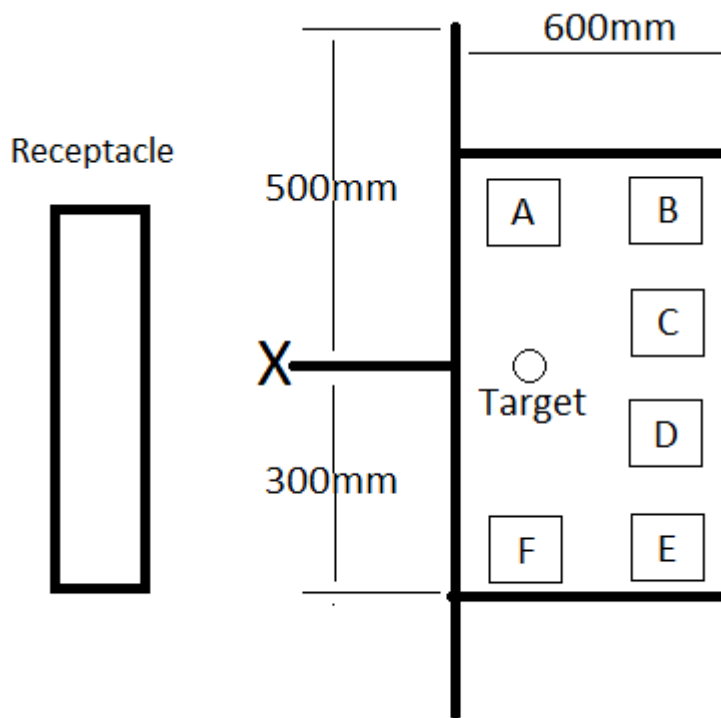
NOTE: After using a machine, the machine must be cleaned, i.e. swarf removed from working area of the machine. Each machine will be inspected by an Expert after each team's use of that machine and a penalty of 15 minutes of cleaning time will be applied if the machine is not cleaned. If a machine is considered not cleaned, Experts will be called to inspect that machine. Their decision is final. Equipment use costs only to be applied to equipment supplied by the organisers. No cost for using portable equipment provided by teams.

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Appendix 2

Figure 1 Overhead view



X marks the central line on which the crane can be placed at any point on the table top.

The receptacle can be placed in any position behind the Crane.

A to F are the positions of items as listed at floor level.

Target is the 10cm Target provided for the accuracy test.

The receptacle on the table top is a box of size, 600mm long, 400mm wide and 300mm tall.

Object list:

- A. 25mm x 25mm x 80mm steel bar approximately 400g
- B. M12 x 35mm steel Bolt approximately 50g (Also the Object used for the Target Test.)
- C. Diameter 25mm x 25mm steel bar approximately 100g
- D. 25mm x 25mm x 200mm steel bar approximately 1 Kg
- E. Diameter 25mm x 200mm steel bar approximately 800g

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F. M16 x 110mm steel Bolt approximately 200g

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Rownd Cymru
BRÏFF Y GYSTADLEUAETH
2018 - 2019

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Ariennir gan
Lywodraeth Cymru
Funded by
Welsh Government

Cyflwynwyd gan: Daytun Unitt

Rhagarweiniad

Mae craeniau'n bethau cyffredin, yn beiriannau a gymerwn yn ganiataol, ond mae yna lawer o wahanol fathau ohonynt yn ddibynnol ar y ffordd y maent yn cael eu defnyddio. Yr her i chi yw cynllunio craen ar gyfer y defnydd canlynol!

Crynodeb o'r prosiect

Mae'r crynodeb yma'n nodi gofynion y cynllun a'r gweithrediad o graen sydd i'w gosod ar fwrdd ac wedi cael ei chynllunio i godi gwrthrychau Dur o'r llawr o dan y bwrdd i fyny ar y bwrdd ac i mewn i ddaliwr sydd ar yr un bwrdd a'r craen. Bydd y gwrthrychau yn amrywio yn eu pwysau o 50g hyd at 1kg

Gweler atodiad 2 am fyw o fanylion am osod y craen, y gwrthrychau a'r daliwr a hefyd, restr o'r gwrthrychau a'u maint.

Disgrifiad o'r prosiect

Mae angen i'r craen:

- o Godi 6 gwrthrych o nifer o wahanol lefydd ar y llawr fel y gweler yn atodiad 2.
- o Codi 6 gwrthrych oddi ar y llawr o bellter heb fod yn llai na 600mm a heb fod yn fwy na 1000mm yn is na gwaelod y craen.
- o Rhaid rheoli symudiad y craen o declyn llaw rheoli-o-bell ar gebl heb fod yn fyrrach nag 1 metr.
- o Dylai'r craen ddefnyddio unrhyw ddull addas i godi'r gwrthrychau.
- o Dylai'r system gael ei bweru'n drydanol gan ddefnyddio dim mwy na 18 Volts am resymau diogelwch. Gall hyn fod ar ffurf batri neu addasydd trydanol wedi ei brynu.

- o Dylai'r craen fedru troi drwy 360 gradd llawn ar ei sail.
- o Rhaid gwrth-gydbwyso'r craen i'w hatal rhag troi drosodd ac ni chaniateir defnyddio atodiad na chlamp i'w dal ar y bwrdd.
- o Rhaid i fraich bwm y craen fedru symud o fod yn llorwedd drwy leiafswm o ongl o 90 gradd i fod yn fertigol.
- o Rhaid i'r craen osod pob un o'r 6 gwrthrych i mewn i'r daliwr.

Diogelwch

- Dylid medru diffodd y system i ffwrdd gydag allwedd.
- Ni ddylai'r mecanwaith na'r arwyneb fod â risg o drapio, gwasgu na thorri bysedd ac yn y blaen.
- Dylid medru stopio'r system ar frys er mwyn torri pob pŵer ynddi a galluogi'r craen i ddiffodd yn naturiol.
- Dylid gorchuddio'r holl gydrannau sy'n dargludo trydan.
- Ni ddylid gweld unrhyw ymylon miniog.

Manyllder

Mae angen i'r craen ddangos: -

- Symudiadau cywir wrth godi a gosod yr eitemau lleiaf ar darged.

OFFER, PEIRIANNAU, CYFARPAR A DEUNYDDIAU ANGENRHEIDIOL A DDARPERIR GAN Y TREFNWYR

Pob turn (lathe), trawslif, driliau piler, offer gwneuthuriad a weldio. MIG, TIG a'r offer i gyd-fynd â nhw ond **nid** y bitiau ar gyfer y Dril nag offer y Turn (lathe).

Offer profi a deunyddiau profi ar gyfer y Craen

OFFER A DEUNYDDIAU NA CHANIATEIR

Gliniadur neu gyfrifiadur. PDA e.e. Palm, IPAQ ac yn y blaen. Cof bach/ Chwaraewr MP3/Storfa ddigidol. Radio Walkman/ chwaraewr CD. Dyddiadur/trefnydd electroneg. Dyfeisiadau cyfathrebu Wi-fi. CD neu ddisgiau heb ganiatâd - rhaid cael caniatâd gan arbenigwyr neu gynrychiolwyr i ddod ag unrhyw CDs. Unrhyw feddalwedd arall sydd heb ei ddarparu gan y trefnwyr os nad yw wedi ei ganiatáu gan Arbenigwr. IC's sydd wedi eu rhaglennu o flaen llaw. Eitemau a brynwyd ac sydd wedi eu haddasu mewn unrhyw ffordd cyn y gystadleuaeth. Pob isgydosodiad (subassemblies) ar gyfer y craen neu'r trac. Offer sy'n debyg neu'n gweithio yn yr un ffordd a'r offer a ddarperir. Er enghraifft - os yw'r trefnwyr yn darparu llif fetel yna ni chaiff yr un tîm ddod a'u llif fetel eu hunain.

EITEMAU SYDD RAID I'R TIMAU EU DARPARU

Cyfrifoldeb y tîm yw dod â holl gydrannau a deunyddiau crai i greu'r Craen. Gallai hyn gynnwys, ond heb fod yn gyfyngedig i'r eitemau canlynol:

Batri /batri. Bwrdd cylched drydanol – heb ei osod (rhaid gosod cydrannau'r bwrdd cylched ar y bwrdd yn ystod y Gystadleuaeth). Pob cydran trydan a thrydanol.

Ceblau trydan, cysylltiadau a chpylyddion. Ni chaniateir ceblau a chysylltydd parod. Rhaid ffitio pob cysylltydd yn ystod y gystadleuaeth. Jigs, gosodion, ffurfydd a dyfeisiadau clampio.

Yr holl ddefnyddiau sydd eu hangen i adeiladu'r Craen a'r holl offer cysylltiedig arall a'r defnyddiau traul (llenfetel, sgriwiau, nytiau, pinnau, pegiau ayb). Offer peiriannu traul sydd eu hangen i adeiladu'r cydrannau. Offer turn (lathe) ac offer llaw ar gyfer creu'r cydrannau.

Yr holl offer llaw, offer torri a mesur. Yr holl offer llaw ar gyfer creu'r craen. Holl offer ar gyfer amddiffyn personol. Offer gweithgynhyrchu penodol angenrheidiol eraill sydd ddim ar y rhestr isadeiledd. 'Bearings' (heb eu haddasu), Sbrocedi, pwllis, geriau, cpylyddion, cadwyni a beltiau (heb eu haddasu). Rhaid dangos y catalog neu'r safon. Cydrannau a ffitiadau hydrolog neu niwmateg heb eu gosod at ei gilydd.

Nodwch: Rhaid i chi drefnu bod meddalwedd i raglennu eich LCD ar y safle neu ddod â gliniadur a meddalwedd hefo chi.

YN YSTOD CYFNOD Y GYSTADLEUAETH, NI CHANIATEIR I NEB DDOD AG, NEU GAEL GWARED AG UNRHYW OFFER, TWLS, OFFER YSGRIFENNU/ MESUR, CYDRANNAU, LLAWLYFRAU, LLUNIAU NEU DDYFEISIADAU STORFA DDIGIDOL O'R SAFLE HEB GANIATÂD Y PRIF

ARBENIGWR

Cynllun Marcio

Adran	Meini Prawf	Marciau
A	Perfformiadau'r prif brosiect	60
	(Cynnwys Adran B o'r portffolio)	10
B	Costau'r prif brosiect:	
	Amser creu	5
	Deunyddiau	2
	Amser peiriannu	3
C	Portffolio (Adran A yn unig)	20
Cyfanswm		100

A. Prif Brosiect (70 Marc)

Bydd y craen yn gallu: -

- o Dangos y gall godi 6 gwrthrych o wahanol safleoedd ar y llawr fel y gwelir yn atodiad 2.

(3 Marc)

Profi: Bydd y gwrthrychau wedi eu gosod yn y patrwm a welir yn atodiad 2. Bydd y craen yn sefyll yn annibynnol ar ben bwrdd o uchder rhwng 600mm a 1000mm uwchben y gwrthrychau. Bydd y craen yn codi'r gwrthrychau a'u gosod yn eu tro yn y daliwr. Rhoddir 0.5 marc am bob codiad llwyddiannus heb i'r craen ddisgyn trosodd.

- o Dangos codi 6 gwrthrych oddi ar y llawr o bellter o ddim llai na 600mm a dim mwy na 1000mm islaw gwaelod y craen.

(3 Marc)

Profi: Bydd y gwrthrychau wedi eu gosod yn y patrwm a welir yn atodiad A. Bydd y craen yn sefyll yn annibynnol ar ben bwrdd o uchder rhwng 600mm a 1000mm uwchben y gwrthrychau. Bydd y craen yn codi'r gwrthrychau a'u gosod yn eu tro yn y daliwr. Rhoddir 0.5 marc am bob codiad llwyddiannus heb i'r craen ddisgyn trosodd.

- o Dangos yr ystod lawn o symudiad wedi ei reoli'n unig o declyn llaw rheoli-o-bell ar gebl sydd



heb fod yn fyrrach nag 1 metr.

(2 Farc)

Prawf: Bydd hyd y cebl yn cael ei fesur rhwng y Craen a'r ddyfais llaw. Bydd cebl sydd heb fod yn llai na 1 metr yn sgorio 2 farc. Mae cebl sy'n fyrrach nag 1 metr yn sgorio 0 marc.

o Dangos dull addas i godi'r gwrthrychau. **(2 farc)**

Prawf: Bydd y craen yn arddangos y gallu i godi'r gwrthrych 1 kg. Bydd dyfais godi addas sy'n dangos ei bod yn gallu diogelu a chodi'r gwrthrych oddi ar y llawr yn sgorio 2 farc. Os na fedr godi'r gwrthrych oddi ar y llawr y sgôr fydd 0 marc.

o Cael ei gyrru gan drydan gan ddefnyddio uchafswm o 18 Volts er mwyn diogelwch. Gall hyn fod ar ffurf batri neu addasydd wedi ei brynu.

(2 Farc)

Prawf: Bydd y cyflenwad trydan yn cael ei nodi ym mhortffolio'r tîm. <18 Volts yn sgorio 2 farc, >18 Volts yn sgorio 0 marc.

o Cael ei reoli gan declyn llaw rheoli-o-bell gyda'r gweithrediadau canlynol:

(7 Marc)

Troad i'r chwith ac i'r dde gyda dangosydd addas fod hyn yn digwydd. 1 marc

Rhoddir 1 marc ychwanegol os oes panel LCD yn dangos chwith a dde.

Y fraich bwm yn symud i fyny ac i lawr gyda dangosydd addas fod hyn yn digwydd. 1 marc

Rhoddir 1 marc ychwanegol os oes panel LCD yn dangos 'i fyny' ac 'i lawr'.

Cebl i mewn ac allan gyda dangosydd addas fod hyn yn digwydd. 1 marc

Rhoddir 1 marc ychwanegol os oes panel LCD yn dangos 'i mewn' ac 'allan'.

Dangosydd addas i ddangos pan mae'r dull o afael yn y gwrthrychau mewn defnydd pan mae'n weithredol. 0.5 marc. Rhoddir 0.5 marc ychwanegol os yw 'gafael' yn cael ei ddangos ar banel LCD.

o Dangos y gallu i droi drwy 360 gradd llawn neu >720 ar ei sail.

(4 Marc)

Prawf: Bydd y craen yn cael ei throï drwy 360 gradd neu fwy. Bydd <360 gradd o symudiad yn sgorio 0 marc, bydd 360 gradd neu fwy yn sgorio 2 farc. Bydd y craen yn gallu troi drwy 720 gradd neu fwy - rhoddir 2 farc ychwanegol

Sefyll ar ei ben ei hun heb yr un atodiad a heb ei glampio i'r bwrdd gyda gwrthbwys i'w atal rhag troi drosodd. **(4 Marc)**

Prawf: Bydd y Craen yn cael ei wylïo drwy bob prawf. Os fydd yn troi drosodd ar unrhyw adeg bydd 1 marc yn cael ei golli bob tro o uchafswm o 4 marc. Os na fydd yn troi drosodd, rhoddir 4 marc.

Nodwch: Mae caniatâd i'r tîm ail-osod y craen os yw'n troi drosodd er mwyn parhau â'r profion eraill.

- o Dangos symudiad braich bwm y craen o fod yn llorweddol drwy leiafswm o ongl o 90 gradd i fod yn fertigol. **(4 Marc)**

Prawf: Bydd angen i'r tîm ddangos braich bwm y craen mewn safle llorwedd neu mor isel ag sy'n bosibl. 2 farc. Yna, gan ddefnyddio'r ddyfais llaw bydd angen codi'r fraich drwy ongl o 90 gradd hyd at safle fertigol. 2 farc

- o Dangos ei bod yn gallu gosod pob un o'r 6 eitem i mewn yn y daliwr. **(3 Marc)**

Prawf: Yn ystod y prawf amseru rhoddir 0.5 marc pan osodir pob eitem yn ddiogel yn y daliwr.

Diogelwch

- Gellir diffodd y system drydanol gydag allwedd.

(2 Farc)

Prawf: Gellir diffodd y Craen gan ddangos fod yr holl reolyddion yn anweithredol.
2 Farc.

- Mae pob mecanwaith ac arwynebau'n ddiogel fel nad oes perygl trapio, gwasgu na thorri unrhyw ran o'r corff.

(2 Farc- colli 0.5 marc am bob problem a welir.)

Prawf: Bydd y beirniaid yn gwirio nad oes perygl o ymylon miniog a bod y rhannau sy'n symud wedi eu hamddiffyn yn briodol. Rhoddir 2 farc os nad oes problem. Collir 0.5 marc am bob problem a welir.

- Mae yna ffordd o stopio'r system ar frys. **(2 Farc)**

Prawf: Bydd y system yn cael ei chychwyn a'r symudiadau'n cael eu dangos. Bydd y dull o'i stopio ar frys yn cael ei ddangos. Yna bydd yr holl reolyddion i'w gweld i fod yn anweithredol. 2 Farc.

- Mae'r holl gydrannau sy'n dargludo trydan wedi eu gwarchod.

(2 Farc – colli 0.5 marc am bob problem a welir)



Prawf: Bydd y beirniaid yn archwilio'r Craen am bob rhan sy'n dargludo trydan. Dim rhannau heb eu gwarchod 2 Farc. Colli 0.5 marc am bob rhan sy'n dargludo sydd heb ei warchod.

- Dim rhannau miniog i'w gweld.

(3 Marc -colli 0.5 marc am bob problem a welir)

Prawf: Bydd y beirniaid yn archwilio'r Craen am ymylon miniog. Dim ymyl miniog i'w gweld 3 Marc. Colli 0.5 marc am bob ymyl miniog a welir.

Cywirdeb

Bydd angen i'r Craen ddangos:-

- Cywirdeb y symudiad drwy godi a gosod yr eitem leiaf ar darged yn yr amser cyflymaf. **(5 Marc)**

Prawf: Bydd yr eitem 50g yn cael ei godi gan y craen. Gellir gosod y craen mewn safle lle mae'n barod i godi. Pan gychwynna'r cloc rhaid codi'r eitem, ei symud a'i osod o fewn cylch 10cm. Bydd y tîm cyflymaf yn ennill 5 marc. Bydd y tîm arafaf yn ennill 0 marc. Bydd pob tîm arall yn cael eu graddio mewn categorïau fesul 10% yn y canol, gan gollu 0.5 marc yn dilyn yr un cyflymaf.

Prawf Amser

Bydd pob un o'r 6 eitem yn cael eu codi o'u safle a welir yn Atodiad A ac yn cael eu gosod yn y daliwr. Bydd angen i un person reoli'r craen a chwblhau'r dasg. **(10 Marc)**

Prawf: Bydd y tîm yn cychwyn gyda'r mecanwaith codi wedi ei dynnu'n ôl at y bwm. Bydd y bwm yn fertigol. Bydd raid troi'r craen fel ei bod yn wynebu i ffwrdd oddi wrth yr eitemau i'w codi drwy ongl o 180 gradd. Pan gychwynna'r cloc rhaid i'r rheolwr, gan ddefnyddio'r ddyfais rheoli o bell yn unig, godi pob un o'r eitemau i mewn i'r daliwr. Pan fydd yr eitem olaf wedi ei gosod yn y daliwr bydd y cloc yn stopio. Bydd y tîm cyflymaf yn ennill 10 marc, yr ail yn cael 9 marc, y trydydd yn cael 8 ac yn y blaen, nes mae 1 marc yn cael ei roi i'r 10fed tîm

Portffolio B – i'w gyflwyno ar gychwyn y gystadleuaeth (10 Marc)

Byd y timau'n cynnwys y canlynol yn eu portffolio:

- Lluniau'r gweithgynhyrchu ar gyfer yr holl gydrannau a wnaed.

(Autodesk Inventor, AutoCAD neu gyfatebol)

- Llun /lluniau cydosod 3D (Autodesk Inventor neu gyfatebol)
- Diagramau/ lluniau
- Bloc trydanol. (AutoCAD Electrical neu debyg)

B. Costau Gweithgynhyrchu (10 Marc)

Oriau Gweithio

Am bob 10% sy'n ddrutach na'r tîm gyda'r oriau gwaith a amcangyfrifwyd isaf (gweler nodyn isod), tynnir 0.5 marc ar gyfartaledd. **(5 Marc)**

Cost ychwanegol ar gyfer y defnydd o offer

Am bob 10% sy'n ddrutach na'r tîm gyda'r gost offer ychwanegol isaf (gweler nodyn isod), tynnir 0.3 marc ar gyfartaledd. **(3 Marc)**

Deunyddiau crai

Am bob 10% sy'n ddrutach na'r tîm gyda'r gost offer ychwanegol isaf (gweler nodyn isod) tynnir 0.2 marc ar gyfartaledd. **(2 Marc)**

Cydymffurfio.

Bydd cyfanswm y gost am offer, deunyddiau a llafur yn cael ei gymhwyso yn ôl cydymffurfiad y prosiect â'r gofynion.

Mae cydymffurfio â'r gofynion yn golygu y bydd y marciau am eich prosiect adeiladu yn cael eu cyfrifo fel canran gan addasu eich costau fel a ganlyn.

$$\text{Cost derfynol y gwneuthuriad} = \frac{\text{Cyfanswm y gost} \times 100}{\% \text{ cydymffurfio â'r gofynion}}$$

Enghreifftiau

Os cyfanswm y gost yw £2,500 a'r cydymffurfio'n 100% -cost y gwneuthuriad -£2,500

Os cyfanswm y gost yw £2,500 a'r cydymffurfio'n 80% - cost y gwneuthuriad - £3,125

Os cyfanswm y gost yw £2,500 a'r cydymffurfio'n 60% -cost y gwneuthuriad - £4,167

Os cyfanswm y gost yw £2,500 a'r cydymffurfio'n 40% -cost y gwneuthuriad - £6,250

Os cyfanswm y gost yw £2,500 a'r cydymffurfio'n 20% -cost y gwneuthuriad - £12,500

Os cyfanswm y gost yw £2,500 a'r cydymffurfio'n 0% yna ni roddir marciau am yr adran cost.

C. Portffolio A (20 Marc)

Rhaid cyflwyno portffolio cyn i'r gystadleuaeth gychwyn. Mae'r portffolio yma i'w hasesu fel rhan o'r prosiect. Rhaid cyflwyno'r portffolio fel copi caled mewn ffolder ac fe ddylai gynnwys:-

- Manylion am aelodau'r tîm.
- Amserlen waith y tîm.
- Cyfrifon a brasluniau /lluniau'r cynllun.
- Y maint a'r math o gyflenwad pŵer a ddefnyddiwyd.
- Rhestr ar daenlen o'r defnyddiau a'r cydrannau a ddefnyddiwyd gyda phrisiau o gatalog.
- Tystiolaeth o gostau defnyddiau a chydrannau.
- Llawlyfr rheoli a chynnal
I'w gynnwys:-
 - Arweiniad ar gywiro diffygion
 - Rheoli a gosod goleuadau a rheolyddion.
 - Ailosod batris neu gyflenwad pŵer.

- Gweithdrefnau rheoli diogel.
- Poster 1000mm x 600mm (lleiafswm) gyda manylion am bob aelod o'r tîm, eu cyflogwr, disgrifiad o'r prosiect yn cynnwys model 3D o'u craen, fydd yn cael ei gyflwyno cyn cychwyn y gystadleuaeth ac yn cael ei arddangos yn ystod y gystadleuaeth.

Atodiad 1

Rheolau ychwanegol

- Mae caniatâd i dimau gael unrhyw nodiadau neu frasluniau y maent eu hangen i adeiladu'r prosiect, ond rhaid i'r rhain fod wedi eu hysgrifennu â llaw /darlunio a heb eu hargraffu. Caniateir diagramau o gylchedau wedi eu hargraffu.
- Rhaid i'r timau ddarparu'r holl offer a deunyddiau crai y maent eu hangen ar gyfer y prosiect. Gall timau fenthyg tŵls ac offer gan dimau eraill, os ydynt yn fodlon, ond ychwanegir cosb amser o 15 munud ar ben eu hamser adeiladu am bob tŵl neu offer unigol a fenthycant.
- Dylid holi cwestiynau am unrhyw beth sy'n aneglur o flaen y gystadleuaeth. Eich bai chi fydd camddeall rheolau'r gystadleuaeth a bydd barn y beirniad am ddehongli'r rheolau yn derfynol.
- Mae disgwyl i chi wisgo o leiaf Gogls Diogelwch/ Sbectol ac Esgidiau Blaen Dur drwy holl gyfnod y gystadleuaeth.
- Fel arweiniad, gallwch weithio o 9.30am hyd at 3pm ar ddiwrnod y gystadleuaeth. Dylech gynllunio ac amseru eich gweithgaredd i ffitio o fewn yr amser yma. Byddwch yn colli marciau am y rhannau na orffennwyd os methwch gwblhau pob elfen o fewn yr amser. Gellir caniatáu amser ychwanegol ar gyfer pob tîm yn ôl disgrisiwn y Beirniad.
- Rhaid gweithgynhyrchu pob cydran a rhan gan y tîm yn ystod y gystadleuaeth. Caniateir eitemau na ellir eu creu megis olwynion, batris, paneli solar ayb. Bydd y beirniad yn rhoi cosb os yw'n gweld unrhyw eitem y gallai'r tîm fod wedi eu creu.

Gweler y tabl cosbi.

- Mae fforwm technegol ar gael hefyd drwy gymuned Google, lle gellir holi cwestiynau a thrafod unrhyw fater. Chwiliwch Skills Wales MTC. Mae cefnogaeth i'w gael hefyd drwy e-bostio Daytun.unitt@cambria.ac.uk <<mailto:Daytun.unitt@cambria.ac.uk>>

Colli marciau:

- Gallwch gael eich cosbi a cholli marciau drwy rai gweithgareddau, gofyn am help, neu fetu a chydymffurfio â'r rheolau, fel a ganlyn:

Cosb	Canlyniad
Gofyn am help gan arbenigwr	15 munud o amser neu unrhyw ran o hynny ychwanegu £20 at y gost.
Peth tystiolaeth o dorri rheolau iechyd a diogelwch Ddim yn defnyddio offer diogelu personol Defnydd peryglus o dŵls ac offer ayb	Ychwanegu 15 munud at amser gweithio'r tîm.
Tystiolaeth beryglus o dorri rheolau iechyd a diogelwch Dim defnydd o warchod cydrannau allai fod yn beryglus Ymddygiad gwirion ac anghyfrifol ayb	Gallech gael eich atal rhag gweithio am weddill y gystadleuaeth
Ymyrryd â thimau eraill	Ychwanegu 1 awr at yr amser gweithio
Benthyg tŵls neu offer gan dimau eraill	Ychwanegu 15 munud at amser gweithio'r tîm am bob darn o offer neu dŵlsyn a fenthycwyd.
Ddim yn glanhau unrhyw beiriant a ddefnyddiwyd yn iawn ar ôl ei ddefnyddio	Ychwanegu 15 munud at amser gweithio'r tîm
Defnyddio eitemau parod – rhai y gallai'r tîm fod wedi eu gwneud a/neu raglennu.	Bydd y beirniaid yn amcangyfrif yr amser a gymerir i wneud yr eitem ac ychwanegu cosb amser at amser gweithio'r tîm yn gyfartal â thair gwaith y ffigwr hwn.
Diffyg cydymffurfio â chyfarwyddiadau a roddir gan unrhyw feirniad ar unrhyw adeg	Ychwanegu 15 munud o amser gweithio i'r tîm.

[Type here]

Cystadleuaeth | **Skills**
Sgiliau | Competition
Cymru | Wales



Cosb disgrisiwn am unrhyw sefyllfa arall
allai godi

Ychwanegir cosb amser gweithio sy'n addas
ar gyfer y rheol a dorrir, yn seiliedig ar farn
y beirniad am ddifrifoldeb y weithred.

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Costau

Eitem	Cost
Amser gwaith: Os yw un aelod o'r tîm yn gweithio, caiff ei brisio fel bod pob aelod yn gweithio	£90 yr awr
Defnydd o Durn ac offer Weldio	£40 yr awr
Defnydd o Ddril Piler, Llif Draws, Bocs a Phan neu Guillotine	£20 yr awr
Byrddau cylched wedi eu hargraffu a'u creu o flaen llaw (heb eu gosod)	£0.25/cm ²

Y lleiafswm o amser a gewch i logi pob peiriant yw 15 munud, ac yna am gyfnodau o 15 munud wedi hynny.

Rhaid nodi'r holl ddefnyddiau y mae'r tîm eu hangen i greu'r craen a'r trac ar daenlen am y pris heb y TAW, gydag adran sy'n dangos hyn ym mhortffolio'r tîm

NODWCH: Ar ôl defnyddio peiriant, rhaid glanhau'r peiriant, h.y. naddion wedi eu symud o ardal waith y peiriant. Bydd pob peiriant yn cael ei archwilio gan Arbenigwr wedi i bob tîm ddefnyddio'r peiriant hwnnw a rhoddir cosb o 15 munud o amser glanhau os na fydd y peiriant wedi ei lanhau. Mae eu barn nhw yn derfynol. Dim ond ar gyfer yr offer a ddarperir gan y trefnwyr y mae'r costau hyn yn berthnasol. Ni fydd cost am ddefnyddio offer cludadwy a ddarperir gan y timau.

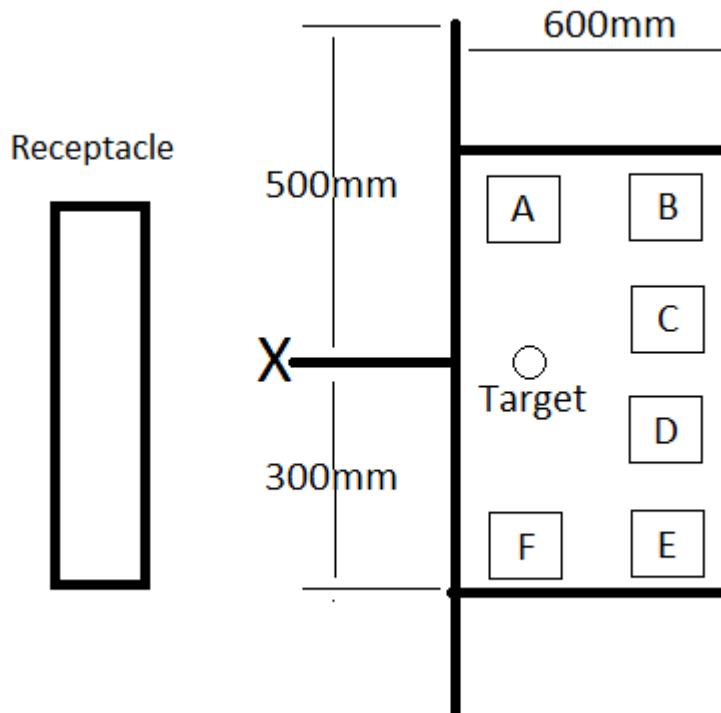
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Atodiad 2

Ffigur 1: O'r awyr



Mae X yn nodi'r llinell ganolog lle gellir gosod y craen ar unrhyw bwynt ar ben y bwrdd.

Gellir gosod y daliwr ar unrhyw safle y tu ôl i'r Craen.

Safleoedd A – F ydi lleoliad yr eitemau ar y llawr.

Y Target ydi'r Targed 10cm a ddarperir ar gyfer y prawf cywirdeb.

Bocs 600mm o hyd, 400mm o led a 300mm o uchder yw'r daliwr ar ben y bwrdd.

Rhestr o wrthrychau:

- A. Bar dur 25mm x 25mm x 80mm yn pwyso tua 400g
- B. Bollt dur M12 x 35mm yn pwyso tua 50g (Defnyddir hefyd fel yr eitem ar gyfer y Prawf Targed)
- C. Bar dur Diamedr 25mm x 25mm yn pwyso tua 100g
- D. Bar dur 25mm x 25mm x 200mm yn pwyso tua 1 Kg
- E. Bar dur gyda diamedr 25mm x 200mm y 800g
- F. Bollt dur M16 x 110mm yn pwyso tua 200g