Cystadleuaeth Sgiliau Cymru
Skills Competition Wales

MANUFACTURE TEAM CHALLENGE

ISEIW Wales Regional Final

COMPETITION BRIEF

2024

Rail Pong

UNDEB EWROPEAIDD
EUROPEAN UNION

Llywodraeth Cymru
Welsh Government

Cronfa Gymdeithasol Ewrop
European Social Fund

Submitted By: **Daytun Unitt**

Introduction

One of the oldest mechanised means of travel that exists is the Locomotive.
Together with various carriages, trains can perform a lot of tasks, from passenger movement, to the haulage of goods, simple and specialised.
This year's task is to create a locomotive, or Locomotive with Carraige(s) capable of transporting ping pong balls. However we need to load and unload these balls too, so the further challenge is to design a mechanism for this.
Each team will be given the latitude to do this by any means, automatic, controlled or just hopeful, but the ping pong balls may not be touched or lifted by a person, or mechanism a person is holding once the time trial starts.

The Project Brief

Each team will be required to design their own locomotive to fit a G scale model railway track, capable of transporting 100 ping pong balls from one end of a track to the other. In addition, the team will build a loading and unloading mechanism to collect the balls from one end and deposit them at the other.
This brief will detail the rules of what this must look like. Anything not expressly stated it must do, or must not do, or any method or material not outlawed can be used.

Description of Project

The system must be designed to the following requirements:

- To fit a G gauge model railway track.
- It must be able to transport Ping pong balls without them being dropped.
- The ping pong balls must be loaded by a mechanism that is not held by a human but may be controlled by remote means.
- The ping pong balls must be unloaded by a mechanism that is not held by a human but may be controlled by remote means

- **Safety**

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  - Any mechanisms and surfaces should be free from being a trap, crushing or cutting hazard.
  - The system should be able to be stopped by the control handset.
  - All electrically conductive parts must be guarded.
  - No sharp edges should be evident.

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 project.

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 delegates is required for all CDs and floppy discs. Any additional software not supplied by organisers unless approved by Experts. Pre-programmed IC's. Purchased items modified in any way prior to the Competition. All subassemblies for the track or cart. 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 any materials that have not been sent to them that they wish to use. 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). 25% of the components by number may be pre-mounted. Radio control handset, receiver and speed controller where applicable. All Electrical and electronic components. Electric cables, connectors and couplings. Ready-made cables with connectors are not permitted. All connectors must be fitted during the competition. Jigs, fixtures, formers and clamping devices. All materials with which to construct the solenoid engine and Vehicle 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). Catalogue or standard must be provided. Hydraulic or pneumatic components and fittings not assembled.
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.

Note: For the ISEiW regional round only, both portfolio A and B are brought completed to the competition. All other levels have portfolio A only brought with them.

Marking Scheme

Section	Criteria	Marks
A	Main project performances (Inc. Section B of portfolio)	50 20
B	Main project costs: Materials	10
C	Portfolio (Section A only)	20
Total		**100**

A. Main Project (50 Marks)

The Locomotive and any carriages, along with the loading and unloading systems will be assessed against the following criteria:

- **Toolbox weight. (2 Marks)**
  Test: before competition starts each team shall weigh all the tools they intend to use. The team that has the lightest toolbox shall gain 2 marks. The heaviest toolbox shall be awarded 0 marks. All other teams shall gain marks proportional between.

- **Material weight. (2 Marks)**
  Test: Each team shall weigh the raw materials they will use to construct the PS. The team that has the lightest materials shall gain 2 marks. The heaviest materials shall be awarded 0 marks. All other teams shall gain marks proportional between.
  Note: All lengths of material must be 50mm oversize in 1 direction, sheet materials in 2 directions.

- **Weight of the Locomotive (and carriages if applicable) (2 Marks)** Test: Each team shall weigh the Locomotive and any carriages. The team that has the lightest locomotive with any carriages shall gain 2 marks. The heaviest PS shall be awarded 0 marks. All other teams shall gain marks proportional between.

- **Battery power system. (2 Marks)**
  Test: The team shall demonstrate the presence of a battery supply for the Locomotive which provides a supply of 12V or less. If the battery is 12V or less 2 marks are awarded. If the battery is greater than 12V or has batteries that combine to a supply over 12V, IE in series, 0 marks are awarded.

- **The Locomotive is powered and controlled via the rails (2 Marks)**

Test: The team may use any method for controlling the Locomotive, however, 2 marks are awarded if the control and power to the locomotive is delivered via the rails.

- **The Locomotive is capable of moving forwards and backwards when controlled to do so. (2 Marks)**

  Test: The team shall demonstrate on a length of track the locomotive moving in both directions. If it fails to move in both directions 0 marks are awarded.

- **Safe operations. (2 Marks)**

  Test 1: The team shall demonstrate that the locomotive comes to a dead stop when turned off by the controls. (1 Mark)
  Test 2: The team shall demonstrate that the Locomotive comes to a dead stop when an Emergency stop is pressed. (1 Mark)

- **Safety. (4 Marks)**
  - All mechanisms and surfaces are free from being a trap, crushing or cutting hazard.
    (2 Marks reduce by 0.2 marks for each problem seen)

    Test: Judges shall use the detailed video above to judge that the surfaces are free of cutting hazards and that the moving parts are suitably guarded. 1 Marks awarded for no problems found. 0.2 marks deducted for each problem found.
  - All electrically conductive parts are guarded.
    (2 Marks reduce by 0.2 marks for each problem found)

    Test: Judges shall use the detailed video above to judge all conductive parts. No unguarded conductive parts 1 Marks. Reduce by 0.2 for each unguarded conductive part found.

- **The Locomotive and any carriages has a compact size, it can be folded for storage for this test (2 Marks)**

  Test: Each locomotive and Carriages shall be measured by a judge. The largest size will receive 0 marks. The smallest size shall receive 2 marks. All other teams will be marked proportionally between.

- **The Locomotive and or carriages has a collection method that does not allow the Ping Pong balls to fall out. (1 Marks)**

  Test: During the time trial, any balls that are dropped during collection or deposit will reduce this mark by 0.1 marks.

- **Counting system. (9 Marks)**
  - **The collection point shall be fitted with a counter to count the number of Ping Pong balls deposited..**

    Test: A judge shall inspect the system to confirm an LCD panel is present. An LCD screen present shall receive 2 marks.

- **The LCD shows "System Active" when the counter is turned on.**

  Test: The team shall turn on the system and demonstrate to a judge that the LCD shows "System Active". The correct words shown shall be awarded 2 marks.

- **The LCD is able to count the number of Ping Pong balls to within 10%.**

  Test: During the course time trial the system shall Count the number of deposited Ping Pong Balls. If the number shown is 90-110 then 5 marks are awarded. A figure of less than 90 or more than 110 shall receive 0 marks.

  Note: a genuine count will be observed by judges on the LCD for the mark to be valid.

- **Locomotive and Carriage Storage Volume (10 Marks)**

  The design may hold as few or as many Ping Pong balls as the team deem sufficient, However:

  1. A design that holds 20 or more Ping Pong balls will be awarded 5 Marks.
  2. A Design that can load and unload over the full length of track, 20 ping pong balls in 1 minute or less will be awarded 5 marks.

  Test: The team shall be supplied 20 ping pong balls. The team shall start the Locomotive in the collection area and complete as many runs as they can in 1 minute. If 20 balls are able to be collected in one journey, 5 marks for (1) will be awarded. If 20 balls are loaded and unloaded in any number of runs within 1 minute, 5 marks (2) will be awarded.

- **Speed time trial (10 Marks)**

  Test: Each team will be supplied with 100 Ping Pong balls.

  They may set up a dispenser or vessel of their design to aid in the collection of balls at one end of the track. E.g. a Box

  They may set up the ball counter and collection system at the other end of the track. E.g. a tote bin.

  The team will be given a 3,2,1 countdown followed by "go"

  A five minute timer will commence. The team will drive the Locomotive and any Carriages from the deposit end to the collection end. By mechanical means they will load the Train and return to deposit the balls at the deposit area.

  If all 100 balls are moved, a team member may put the balls back into the collection end and continue this as many times as possible in the 5 minutes.

Any team completing 100 balls in 5 minutes or less shall receive 2 marks.

Any team completing 400 balls in five minutes or less shall receive 3 marks in addition to those above.

The number of balls shall be counted by judges, the highest number of balls moved by all teams shall receive 5 marks, the lowest shall receive 0 marks. All others shall be awarded marks proportionally between.

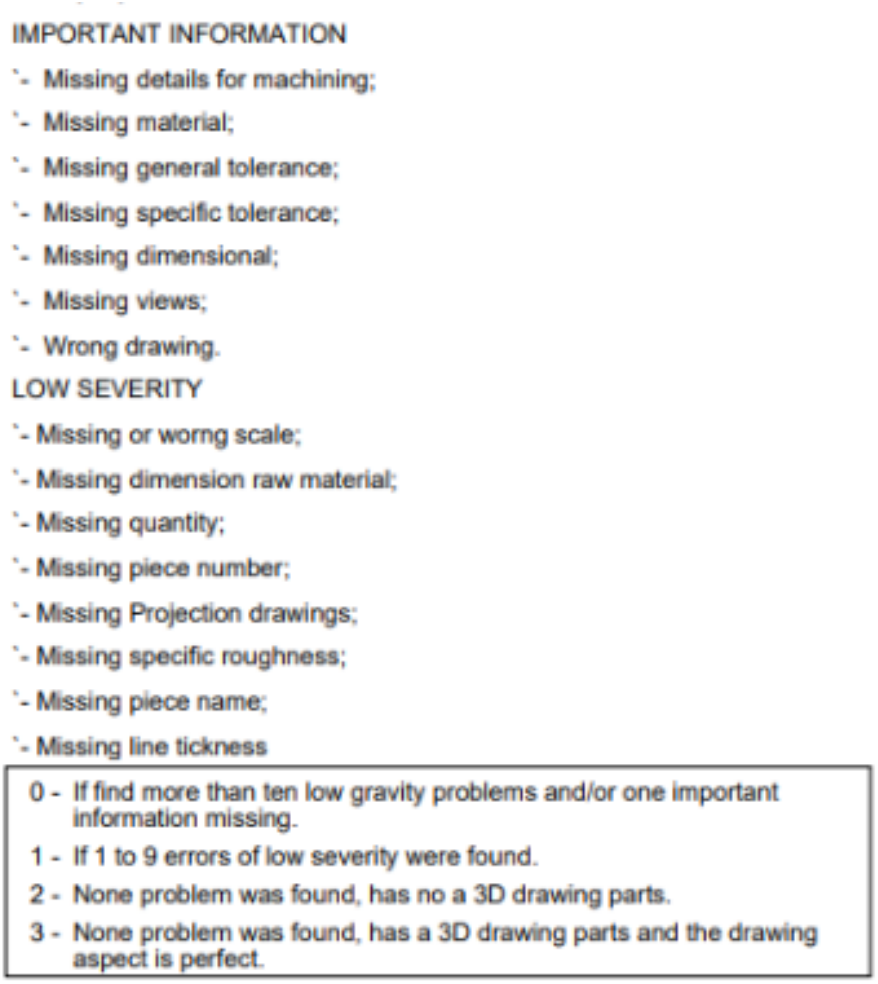
Portfolio B Section A (20 Marks)

The teams will submit a set of drawings:

- 2D Manufacturing drawings for all components to be made. (Autodesk Inventor, AutoCAD or similar.) To be completed to ISO standards.

Three drawings will be chosen at random and be marked to the following standards.

1. 90% of all required drawings are submitted. (2 Marks)
2. Three drawings selected at random. Important information and Low severity items will be assessed. The drawing will be marked according to the following: (9 Marks, 3 per drawing)



IMPORTANT INFORMATION

- Missing details for machining;
- Missing material;
- Missing general tolerance;
- Missing specific tolerance;
- Missing dimensional;
- Missing views;
- Wrong drawing.

LOW SEVERITY

- Missing or worng scale;
- Missing dimension raw material;
- Missing quantity;
- Missing piece number;
- Missing Projection drawings;
- Missing specific roughness;
- Missing piece name;
- Missing line tickness

0 - If find more than ten low gravity problems and/or one important information missing.
1 - If 1 to 9 errors of low severity were found.
2 - None problem was found, has no a 3D drawing parts.
3 - None problem was found, has a 3D drawing parts and the drawing aspect is perfect.

- 3D Assembly drawing(s). (Autodesk Inventor or similar) To be completed to ISO standards.
  1. Assembly drawing(s) contain all manufactured parts referenced with appropriate balloons and a BOM. (2 Marks)
  2. Assembly drawing(s) show all parts required, using standard or exploded views. (2 Marks)
- Electronic block diagrams/drawings. (AutoCAD Electrical or similar). (5 Marks)

B. Manufacturing Costs (10 Marks)

Raw Material costs. **(5 Marks)**
Raw materials shall be costed as per piece purchased for anything not listed below, which shall be costed by weight or KWH.

Steel: £7 per kilo
Aluminium: £9 per kilo
All other metals: £12 per kilo

Plastic: £4 per kilo
Cardboard: £1 per kilo
Batteries: £0.5 per KWH

For any other item used you will need to provide the cost and a link to a place of purchase to prove the cost, using a suitable spreadsheet.

Each team shall provide 1 spreadsheet only, with all costs for the team detailed.
The lowest cost team after compliance has been applied to the cost shall receive 3 marks.
From this cost to 200% of this cost each team shall be given a proportional grade.
Any team over 200% of the cost shall receive 0 marks.

Example: The lowest cost is £50. Team 1
Team 2 has a cost of £70, this team shall receive 6 marks.
Team 3 has a cost of £90, this team shall receive 2 marks.
Team 4 has a cost of £110, this team shall receive 0 marks.

Team Working time: (5 Marks)

The team shall book, using the provided forms, the time used to complete the project.
The cost is £90 per hour per team. If one team member is working, all team members shall be costed.
Judges will calculate the cost and apply compliance.

The lowest cost team after compliance has been applied to the cost shall receive 4 marks.
From this cost to 200% of this cost each team shall be given a proportional grade.
Any team over 200% of the cost shall receive 0 marks.

Compliance.

The total cost of 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 costs 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 £6,2500

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

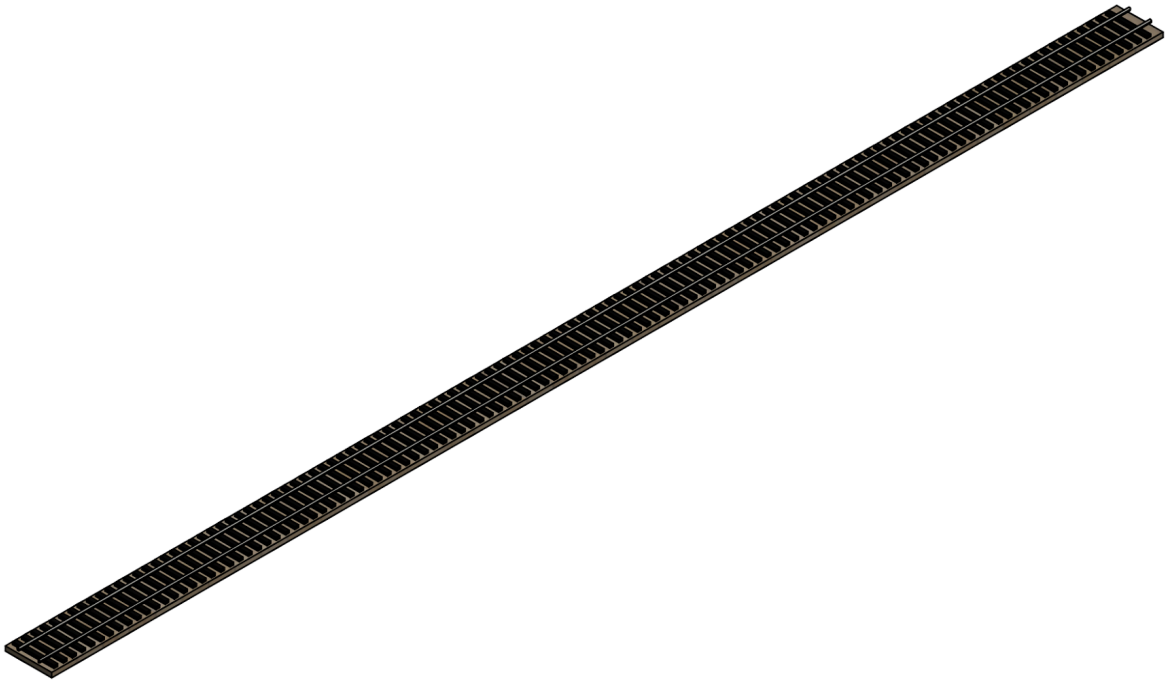
If total cost is £2,500 and compliance is 0% then no marks awarded for cost section.

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: -

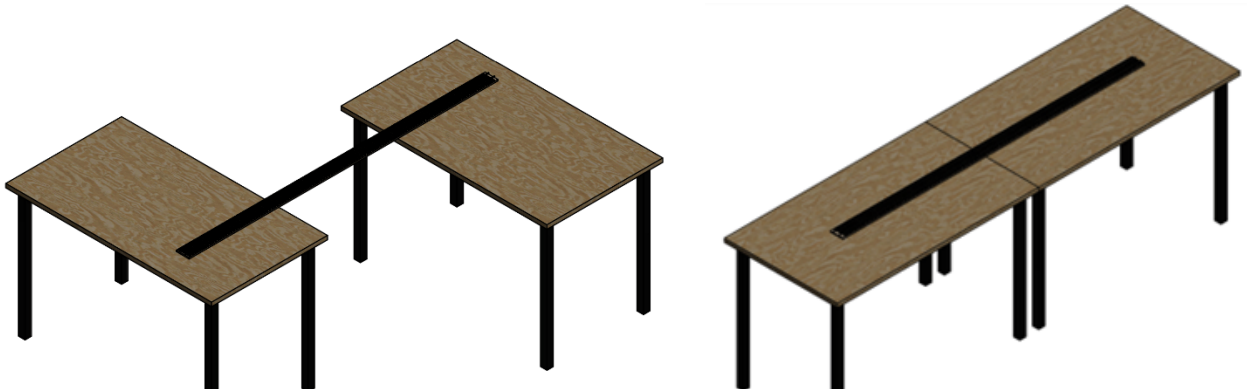
- Team member details.
- Teamwork time taken for the build.
- Design calculations and sketches/drawings.
- The size and type of power supply used.
- A spreadsheet list of materials and components used with catalogue prices.
- Evidence of material and component costs that are not supplied.
- A description of the project solution including a 3D model of the design used.

Appendix 1



The time trial shall be conducted on standard G gauge Railway track.
The track shall be made of three pieces of 918mm long G gauge railway track.
The track shall be mounted on a single length of wood 100-110 mm wide.

Appendix 2.



Each team shall be provided two desks to support the track. The Desks shall be movable and each team may arrange them to suit their individual design of collecting and depositing the Ping Pong balls.

Note: the team must use a minimum of 2.554 metres of track, the front and back of the train coming to rest for collecting and depositing within 100mm of their respective ends.

Cystadleuaeth Sgiliau Cymru
Skills Competition Wales

HER TÎM GWEITHGYNHYRCHU

Rownd Derfynol Ranbarthol Ysbrydoli Rhagoriaeth Sgiliau yng Nghymru (ISEIW)

BRIFF Y GYSTADLEUAETH

2024

Trên Ping Pong

UNDEB EWROPEAIDD
EUROPEAN UNION
Llywodraeth Cymru
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Cronfa Gymdeithasol Ewrop
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Cyflwynwyd gan: Daytun Unitt

Cyflwyniad
Un o'r dulliau mecanyddol hynaf o deithio yw'r Locomotif. Mae trenau yn gallu cyflawni sawl tasg gydag amrywiaeth o gerbydau, o symud teithwyr, i gludo nwyddau syml ac arbenigol.

Y dasg eleni yw creu locomotif, neu Locomotif gyda Cherbyd(au) sy'n gallu cludo peli ping pong. Ond, mae angen i ni lwytho a dadlwytho'r peli hyn hefyd, felly mae her bellach i ddylunio mecanwaith er mwyn cyflawni hyn.

Bydd pob tîm yn cael rhydd hynt i wneud hyn mewn unrhyw ffordd, awtomatig, wedi'i reoli neu drwy obeithio am y gorau. Ni ddylai'r peli ping pong gael eu cyfwrdd neu eu codi gan berson neu fecanwaith neu eu codi gan berson, neu fecanwaith y mae person yn ei ddal unwaith y bydd y treial amser yn dechrau.

Briff y Prosiect

Bydd gofyn i bob tîm ddylunio eu locomotif eu hunain i ffitio ar drac rheilffordd model gyda thrac lled G, a fyddai'n gallu cludo 100 o beli ping pong o un pen trac i'r llall. Yn ogystal, bydd y tîm yn adeiladu mecanwaith llwytho a dadlwytho i gasglu'r peli o un pen a'u dadlwytho yn y llall.

Bydd y briff hwn yn manylu ar reolau'r gystadleuaeth. Gellir defnyddio unrhyw beth nad yw'n cael ei nodi'n benodol i'w wneud neu beidio â'i wneud neu unrhyw ddull neu ddeunydd nad yw'n waharddedig.

Disgrifiad o'r Prosiect

Rhaid dylunio'r system i'r gofynion canlynol:

- I ffitio trac rheilffordd model gyda thrac lled G.
- Rhaid iddo allu cludo peli ping pong heb iddyn nhw gael eu gollwng.
- Rhaid i'r peli ping pong gael eu llwytho gan fecanwaith nad yw'n cael ei ddal gan berson ond gellir rheoli'r mecanwaith trwy ddulliau rheoli o bell.
- Rhaid i'r peli ping pong gael eu dadlwytho gan fecanwaith nad yw'n cael ei ddal gan berson ond gellir rheoli'r mecanwaith trwy ddulliau rheoli o bell.

- **Diogelwch**

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  - Ni ddylai unrhyw fecanweithiau ac arwynebau achosi peryglon maglu, gwasgu neu berygl wrth iddo gael ei dorri
  - Dylai'r system allu cael ei stopio gan y set llaw rheoli.
  - Rhaid bod gard diogelwch ar bob rhan drydanol.
  - Ni ddylai unrhyw ymylon miniog fod yn amlwg.

OFFER, PEIRIANNAU, GOSODIADAU A DEUNYDDIAU SY'N OFYNNOL A DDARPERIR GAN Y TREFNWYR

Pob turn, llif dorri, dril piler, offer gwneuthuriad a weldio. Offer MIG a TIG ac offer cysylltiedig, ond nid darnau Dril neu offer Turn.
Offer profi a deunyddiau profi ar gyfer y prosiect.

OFFER A DEUNYDDIAU NAD YDYN NHW'N CAEL EU CANIATÁU

Cyfrifiadur neu gyfrifiaduron y gellir eu cario. Offer Cynorthwyydd Digidol Personol, e.e., Palm, IPAQ ac ati. Cofau bach/Chwaraewyr MP3/Storio Digidol. Radio Walkman / Chwaraewr cryno ddisg. Trefnydd/dyddiadur electronig. Dyfeisiau cyfathrebu diwifr. Dim cryno ddisgiau na disgiau hyblyg nad ydyn nhw wedi'u cymeradwyo - mae angen cymeradwyaeth gan Arbenigwyr neu ddirprwyon ar gyfer pob cryno ddisg a disg hyblyg. Unrhyw feddalwedd ychwanegol nad yw'n cael ei darparu gan y trefnwyr oni bai ei fod wedi'i gymeradwyo gan Arbenigwyr. Cylched Integredig wedi'i raglennu ymlaen llaw. Eitemau a brynwyd sydd wedi'u haddasu mewn unrhyw ffordd cyn y gystadleuaeth. Pob iswasanaeth ar gyfer y trac neu'r cart. Offer sy'n debyg neu'n gweithredu yn yr un modd ag offer sy'n cael ei ddarparu. Enghraifft - os yw trefnydd yn darparu llif dorri, yna ni all unrhyw dîm ddarparu eu llif dorri metel eu hunain.

EITEMAU I'W DARPARU GAN Y TIMAU

Cyfrifoldeb y tîm yw cyflenwi unrhyw ddeunyddiau y byddan nhw'n dymuno eu defnyddio nad ydyn nhw wedi'u hanfon atyn nhw. Gall hyn gynnwys, ond nid yw'n gyfyngedig, i'r eitemau canlynol:
Batri/batris. Bwrdd cylched electronig - heb ei osod (rhaid gosod cydrannau bwrdd cylched ar y bwrdd yn y Gystadleuaeth). Gellir gosod 25% o'r cydrannau yn ôl nifer ymlaen llaw. Set llaw rheoli radio, derbynnydd a rheolydd cyflymder lle bo'n berthnasol. Pob cydran drydanol ac electronig. Ceblau trydan, cysylltwyr a chyplyddion. Ni chaniateir ceblau parod gyda chysylltydd. Rhaid ffitio pob cysylltydd yn ystod y gystadleuaeth. jigs, gosodiadau, ffurfwyr a dyfeisiau clampio. Pob deunydd ar gyfer adeiladu'r injan a'r cerbyd solenoid a'r holl offer a nwyddau traul cysylltiedig eraill (llenfetel, sgriws, nyts, pinnau, pegiau, ac ati). Peiriannu offer traul sy'n ofynnol ar gyfer gweithgynhyrchu'r cydrannau. Offer turn ac offer llaw ar gyfer cydrannau gweithgynhyrchu. Pob offer llaw, offer torri ac offer mesur. Pob offer llaw ar gyfer cydosod. Pob offer diogelu personol. Offer gweithgynhyrchu penodol arall nad yw ar y rhestr seilwaith. Berynnau (*Bearings*) (heb ei addasu), sbrocedi, pwlïs, pob gêr, cyplyddion, cadwyni a beltiau (fel y'u cyflenwir ac ni ddylid eu newid). Rhaid darparu'r offer sy'n cyd-fynd a'r safonau cydnabyddedig. Cydrannau hydrolig neu niwmatig a ffitiadau heb eu cydosod.
YN YSTOD CYFNOD Y GYSTADLEUAETH, DYDI HI DDIM YN BOSIB DOD AG UNRHYW OFFER, PAPUR YSGRIFENNU, CYDRANNAU, LLAWLYFRAU, LLUNIADAU NA DYFEISIAU STORIO DIGIDOL I LEOLIAD Y GYSTADLEUAETH, NA SYMUD UNRHYW BETH O'R LLEOLIAD, ONI BAI BOD HYNNY WEDI EI GYMERADWYO GAN Y PRIF ARBENIGWR.

Sylwer: Gellir dod â phortffolio A a B wedi'u cwblhau i'r gystadleuaeth ar gyfer rownd rhanbarthol ISEiW yn unig. Gellir dod â phortffolio A wedi'i gwblhau yn unig ar gyfer pob lefel arall.

Cynllun Marcio

Adran	Meini prawf	Marciau
A:	Prif berfformiadau'r prosiect (Gan gynnwys Adran B o'r portffolio)	50 20
B	Prif gostau'r prosiect: Deunyddiau	10
C	Portffolio (Adran A yn unig)	20
Cyfanswm		**100**

A. Prif Brosiect (50 Marc)

Bydd y Locomotif ac unrhyw gerbydau, ynghyd â'r systemau llwytho a dadlwytho yn cael eu hasesu yn erbyn y meini prawf canlynol:

- **Pwysau'r bocs tŵls. (2 Farc)**
  Prawf: cyn i'r gystadleuaeth ddechrau bydd pob tîm yn pwyso'r holl offer y maen nhw'n bwriadu eu defnyddio. Rhoddir 2 farc i'r tîm sydd â'r bocs tŵls ysgafnaf. Rhoddir 0 marc i'r offer trymaf. Rhoddir marciau cymesurol rhwng pob tîm arall.

- **Pwysau'r deunydd. (2 Farc)**
  Prawf: Bydd pob tîm yn pwyso'r deunyddiau crai y byddan nhw'n eu defnyddio i adeiladu'r PS. Rhoddir 2 farc i'r tîm sydd â'r deunyddiau mwyaf ysgafn. Rhoddir 0 marc i'r deunyddiau mwyaf trwm. Rhoddir marciau cymesurol rhwng pob tîm arall.

  Sylwer: Rhaid i bob darn o ddeunydd fod yn 50mm gôr faint (oversize) i gyfeiriad 1, deunyddiau'r ddalen (sheet) i 2 gyfeiriad.

- **Pwysau'r Locomotif (a'r cerbydau os yw'n berthnasol) (2 farc)**
  Prawf: Bydd pob tîm yn pwyso'r Locomotif ac unrhyw gerbyd arall. Rhoddir 2 farc i'r tîm sydd â'r locomotif mwyaf ysgafn gan gynnwys unrhyw gerbydau. Rhoddir 0 Marc i'r PS mwyaf trwm. Rhoddir marciau cymesurol rhwng pob tîm arall.

- **System pŵer y batri. (2 Farc)**
  Prawf: Bydd y tîm yn dangos presenoldeb cyflenwi o'r batri ar gyfer y Locomotif sy'n darparu cyflenwad o 12V neu lai. Rhoddir 2 farc os yw'r batri yn 12V neu'n llai.

Rhoddir 0 marc os yw'r batri'n fwy na 12V neu os oes ganddo fatris sy'n cyfuno â chyflenwad dros 12V, IE mewn cyfres. 0 marc yn cael ei roi.

- **Mae'r Locomotif yn cael ei bweru a'i reoli trwy draciau'r rheilffordd (2 Farc)**

  Prawf: Gall y tîm ddefnyddio unrhyw ddull ar gyfer rheoli'r Locomotif, ond, rhoddir 2 farc os yw'r rheolaeth a'r pŵer i'r locomotif yn cael eu hanfon trwy'r traciau.

- **Mae'r locomotif yn gallu symud ymlaen ac yn ôl pan gaiff ei reoli i wneud hynny. (2 Farc)**

  Prawf: Bydd y tîm yn dangos y locomotif yn symud i'r ddau gyfeiriad ar hyd y trac. Rhoddir 0 marc os yw'r tîm yn methu â symud i'r ddau gyfeiriad.

- **Gweithrediadau diogel: (2 Farc)**

  Prawf 1: Bydd y tîm yn dangos bod y locomotif yn dod i stop pan fydd y rheolyddion yn cael eu diffodd. (1 Marc)
  Prawf 2: Bydd y tîm yn dangos bod y Locomotif yn dod i stop pan fydd botwm Argyfwng yn cael ei wasgu. (1 Marc)

- **Diogelwch. (4 Marc)**

  - Ni ddylai unrhyw fecanweithiau ac arwynebau achosi peryglon maglu, gwasgu neu berygl wrth dorri.
    (2 Farc yn cael eu lleihau fesul 0.2 marc ar gyfer pob problem a welir)

  Prawf: Bydd y beirniaid yn defnyddio'r fideo manwl uchod i farnu bod yr arwynebau yn rhydd o beryglon torri a bod y rhannau symudol yn cael eu gwarchod yn briodol. Rhoddir 1 marc am ddim problem sydd wedi'i ganfod. 0.2 yn cael ei dynnu ar gyfer pob problem sydd wedi'i ganfod.

  - Pob rhan drydanol ddargludol yn cael eu gwarchod.
    (2 Farc yn cael ei leihau fesul 0.2 marc ar gyfer pob problem sydd wedi'u canfod)

  Prawf: Bydd y beirniaid yn defnyddio'r fideo manwl uchod i feirniadu'r holl rannau dargludol. Dim rhannau dargludol heb eu gwarchod 1 Marc. Lleihau fesul 0.2 ar gyfer pob rhan ddargludol sydd heb ei warchod.

- **Mae'r Locomotif ac unrhyw gerbydau'n faint cryno, gellir ei blygu i'w storio ar gyfer y prawf hwn. (2 Farc)**

  Prawf: Bydd pob locomotif a cherbyd yn cael eu mesur gan feirniad. Rhoddir 0 marc i'r maint mwyaf. Rhoddir 2 farc i'r maint lleiaf. Rhoddir marciau cymesur ôl rhwng pob tîm arall.

- **Mae gan y Locomotif a neu'r cerbydau ddull casglu nad yw'n caniatáu i'r peli ping pong ddisgyn. (1 Marc)**

  Prawf: Yn ystod y treial amser, bydd unrhyw beli sy'n cael eu gollwng yn ystod y broses gasglu neu ddadlwytho yn lleihau'r marc hwn o 0.1 marc.

- **System gyfrif. (9 Marc)**
  - **Bydd y pwynt casglu yn cael ei osod gyda chownter i gyfrif nifer y peli ping pong a gafodd eu dadlwytho.**

  Prawf: Bydd beirniad yn archwilio'r system i gadarnhau bod panel LCD yn bresennol. Rhoddir 2 farc i ddyluniadau â LCD.

  - **Mae'r LCD yn dangos "System Active" pan fydd y sgrin yn cael ei throi ymlaen.**

  Prawf: Bydd y tîm yn troi'r system ymlaen ac yn dangos wrth y beirniad bod y LCD yn dangos "System Active". Rhoddir 2 farc os yw'r geiriau cywir yn cael eu dangos

  - **Mae'r LCD yn gallu cyfrif nifer y peli ping pong o fewn 10%.**

  Prawf: Yn ystod y cwrs treial amser, bydd y system yn Cyfrif nifer y peli ping pong a gafodd eu dadlwytho. Rhoddir 5 marc os yw'r rhif rhwng 90 - 110. Rhoddir 0 marc os yw'r rhif yn llai na 90 neu'n fwy na 110.
  Sylwer: Er mwyn i'r marc fod yn ddilys, bydd y beirniaid yn arsylwi ar gyfrif dilys ar y LCD.

- **Cyfaint storio'r Locomotif a'r Cerbydau (10 Marc)**

  Gall y dyluniad ddal cyn lleied neu gynifer o beli Ping Pong ag y mae'r tîm yn eu hystyried yn ddigonol, ond:

  1. Rhoddir 5 Marc i'r dyluniad sy'n dal 20 neu fwy o beli ping pong.
  2. Rhoddir 5 marc i'r dyluniad sy'n gallu llwytho a dadlwytho 20 ping pong peli mewn 1 munud neu lai dros hyd lawn y trac.

Prawf: Bydd y tîm yn cael 20 o beli ping pong. Bydd y tîm yn dechrau'r Locomotif yn yr ardal gasglu ac yn cwblhau cymaint o rediadau ag y gallan nhw mewn 1 munud. Rhoddir 5 marc (1) os gellir casglu 20 o beli mewn un daith. Rhoddir 5 marc (2) os yw 20 o beli'n cael eu llwytho a'u dadlwytho mewn unrhyw nifer o rediadau o fewn un funud.

- **Treial amser o ran cyflymder (10 Marc)**

  Prawf: Bydd pob tîm yn cael 100 o beli ping pong.
  Maen nhw'n gallu gosod dosbarthwr neu gynhwysydd o'u dyluniad i gynorthwyo wrth gasglu peli ar un pen y trac. E.e. Bocs
  Maen nhw'n gallu gosod y system gyfrif a chasglu peli ar ben arall y trac, e.e. bocs cario. Byddwn yn dweud 3,2,1 ac yna'n dweud 'ewch'.
  Bydd amserydd pum munud yn dechrau. Bydd y tîm yn gyrru'r Locomotif ac unrhyw gerbydau o'r pen dadlwytho i'r pen casglu. Drwy ddulliau mecanyddol byddan nhw'n llwytho'r Trên ac yn dychwelyd i ddadlwytho'r peli yn yr ardal ddadlwytho.

Os yw pob un o'r 100 o beli yn cael eu symud, gall aelod o'r tîm roi'r peli yn ôl i'r pen casglu a pharhau â hyn gymaint o weithiau â phosibl yn y 5 munud.

Rhoddir 2 farc i unrhyw dîm sy'n cwblhau 100 o beli mewn 5 munud neu lai.
Rhoddir 3 marc i unrhyw dîm sy'n cwblhau 400 o beli mewn pum munud yn ychwanegol at y rhai uchod.
Bydd nifer y peli yn cael eu cyfrif gan y beirniaid, rhoddir 5 marc am y nifer uchaf o beli sy'n cael eu symud, rhoddir 0 marc am y nifer lleiaf o beli sy'n cael eu symud. Rhoddir marciau cymesurol rhwng pob tîm arall.

Portffolio B Adran A (20 Marc)

Bydd y timau'n cyflwyno set o luniadau:

- Dylid gwneud lluniadau gweithgynhyrchu 2D ar gyfer yr holl gydrannau. (Autodesk Inventor, AutoCAD neu debyg). I'w gwblhau i safonau ISO.
  Bydd tri lluniad yn cael eu dewis ar hap ac yn cael eu marcio mewn perthynas â'r safonau canlynol.

1. Mae 90% o'r holl luniada y gofynnir amdanyn nhw yn cael eu cyflwyno. (2 Farc)
2. Tri lluniad a ddewiswyd ar hap. Bydd gwybodaeth bwysig ac eitemau difrifoldeb Isel yn cael eu hasesu. Bydd y lluniad yn cael ei farcio yn unol â'r canlynol: (9 Marc, 3 fesul lluniad)

IMPORTANT INFORMATION

- Missing details for machining;
- Missing material;
- Missing general tolerance;
- Missing specific tolerance;
- Missing dimensional;
- Missing views;
- Wrong drawing.

LOW SEVERITY

- Missing or worng scale;
- Missing dimension raw material;
- Missing quantity;
- Missing piece number;
- Missing Projection drawings;
- Missing specific roughness;
- Missing piece name;
- Missing line tickness

0 - If find more than ten low gravity problems and/or one important information missing.
1 - If 1 to 9 errors of low severity were found.
2 - None problem was found, has no a 3D drawing parts.
3 - None problem was found, has a 3D drawing parts and the drawing aspect is perfect.

- Lluniad(au) cydosod 3D (Autodesk Inventor neu debyg). I'w gwblhau i safonau ISO.

    1. Mae'r lluniad(au) cydosod yn cynnwys yr holl rannau sydd wedi'u gweithgynhyrchu y cyfeirir atyn nhw gyda balwnau priodol a bil sy'n rhestru'r deunyddiau (BOM).
       (2 Farc)
    2. Mae'r lluniad(au) cydosod yn dangos yr holl rannau sydd eu hangen, gan ddefnyddio golwg safonol neu olwg taenedig (*exploded view*) neu wedi'u ffrwydro.
       (2 Farc)
- Diagramau/lluniadau bloc electronig. (AutoCAD Trydanol neu debyg). (5 Marc)

B. Costau Gweithgynhyrchu (10 Marc)

Costau Deunyddiau Crai. (5 Marc)

Bydd deunyddiau crai yn cael eu costio yn unol â phob darn a brynwyd ar gyfer unrhyw beth nad yw wedi'i restru isod, a gaiff ei gostio yn ôl pwysau neu KWh.

Dur: £7 y kilo
Alwminiwm: £9 y kilo
Pob metel arall £12 y kilo
Plastig: £4 y kilo
Cardfwrdd: £1 y kilo
Batris: £0.5 y KWh

Bydd angen i chi ddarparu'r gost ynghyd â dolen i'r safle lle prynwyd i brofi'r gost, gan ddefnyddio taenlen addas ar gyfer unrhyw eitem arall a ddefnyddiwyd.

Bydd pob tîm yn darparu 1 daenlen yn unig gyda'r holl gostau ar gyfer y tîm wedi'u cynnwys arni.

Rhoddir 3 marc i'r tîm sydd â'r costau isaf ar ôl cydymffurfio â'r gost.
Rhoddir gradd gymesurol i bob tîm o'r gost hon i 200% o'r gost hon.
Rhoddir 0 marc i unrhyw dîm dros 200% o'r gost.

Enghraifft: Y gost isaf yw £50. Tîm 1
Mae gan Dîm 2 gost o £70, bydd y tîm hwn yn derbyn 6 marc.
Mae gan Dîm 3 gost o £90, bydd y tîm hwn yn derbyn 2 farc.
Mae gan Dîm 4 gost o £110, bydd y tîm hwn yn derbyn 0 marc.

Amser Gweithio Tîm: (5 Marc)

Bydd y tîm yn llogi'r amser a ddefnyddiwyd i gwblhau'r prosiect gan ddefnyddio'r ffurflenni a ddarperir. Cost y tîm ydy £90 yr awr. Os ydy un aelod o'r tîm yn gweithio, bydd holl aelodau'r tîm yn cael eu prisio.
Bydd y beirniaid yn cyfrifo'r gost ac yn cymhwyso cydymffurfiaeth.

Rhoddir 4 marc i'r tîm â'r gost isaf ar ôl cymhwyso'r gost.
O'r gost hon i 200% o'r gost hon bydd pob tîm yn cael gradd gymesurol.
Rhoddir 0 marc i unrhyw dîm dros 200% o'r gost.

Cydymffurfiaeth

Bydd cyfanswm cost deunyddiau a llafur yn cael ei addasu trwy gydymffurfiaeth y prosiect â'r fanyleb.

Mae cydymffurfio â manyleb yn golygu y bydd eich marciau ar gyfer eich prosiect adeiledig yn cael eu cyfrifo fel canran ac yn addasu'ch costau fel a ganlyn.

$$\text{Cost adeiladu derfynol} = \frac{\text{Cyfanswm cost} \times 100}{\%\ \text{cydymffurfio â'r fanyleb}}$$

Enghreifftiau

Os yw cyfanswm y gost yn £2,500 a chydymffurfiaeth yn 100%, yna byddai'r gost adeiladu yn £2,500

Os yw cyfanswm y gost yn £2,500 a chydymffurfiaeth yn 80%, yna byddai'r gost adeiladu yn £3,125

Os yw cyfanswm y gost yn £2,500 a chydymffurfiad yn 60%, yna byddai'r gost adeiladu yn £4,167

Os yw cyfanswm y gost yn £2,500 a chydymffurfiaeth yn 40%, yna byddai'r gost adeiladu yn £6,250

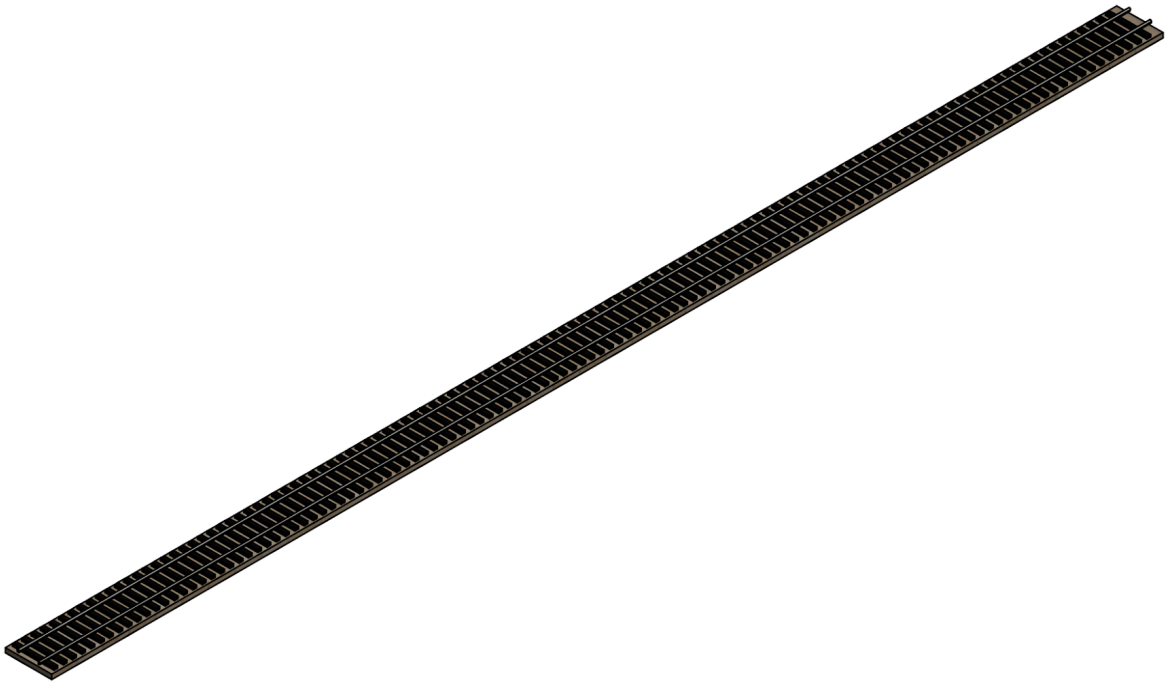
Os yw cyfanswm y gost yn £2,500 a chydymffurfiad yn 20%, yna byddai'r gost adeiladu yn £12,500

Os yw cyfanswm y gost yn £2,500 a chydymffurfiad yn 0%, yna ni roddir unrhyw farciau am yr adran gost.

C. Portffolio A (20 Marc)

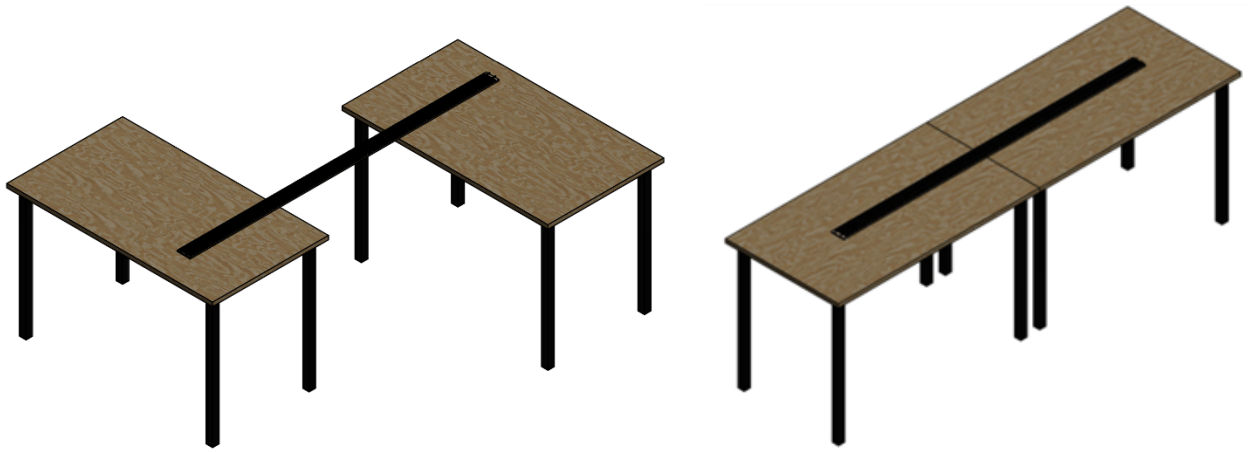
Mae angen cyflwyno portffolio cyn i'r gystadleuaeth ddechrau. Mae'r portffolio hwn i'w asesu fel rhan o'r prosiect hwn. Mae'r portffolio i'w gyflwyno ar ffurf copi caled mewn ffolder ac i gynnwys: -

- Manylion am aelodau'r tîm.
- Gwaith tîm – amser a gymerwyd ar gyfer yr adeiladu.
- Cyfrifiadau dylunio a brasluniau/lluniadau.
- Maint a math y cyflenwad pŵer a ddefnyddiwyd
- Rhestr daenlen o ddeunyddiau a chydrannau a ddefnyddiwyd gyda phrisiau'r catalog.
- Tystiolaeth o gostau deunyddiau a chydrannau nad ydyn nhw'n cael eu darparu.
- Disgrifiad o ddatrysiad y prosiect gan gynnwys model 3D o'r dylunio a ddefnyddiwyd.



Bydd y treial amser yn cael ei gynnal ar drac rheilffordd ar gyfer trac lled G safonol.
Bydd y trac yn cael ei wneud o dri darn o drac rheilffordd ar gyfer trac lled G 918 mm o hyd.
Bydd y trac yn cael ei osod ar un darn o bren 100-110 mm o led.

Atodiad 2.



Bydd pob tîm yn cael dwy ddesg i gynnal y trac. Bydd y desgiau yn symudol a gall pob tîm eu trefnu i gyd-fynd â'u dyluniad unigol o gasglu a dadlwytho'r peli ping pong.

Sylwer: rhaid i'r tîm ddefnyddio o leiaf 2.554 metr o drac, gyda blaen a chefn y trên yn dod i orffwys i'w casglu a'u dadlwytho o fewn 100 mm i'r ddau leoliad priodol.