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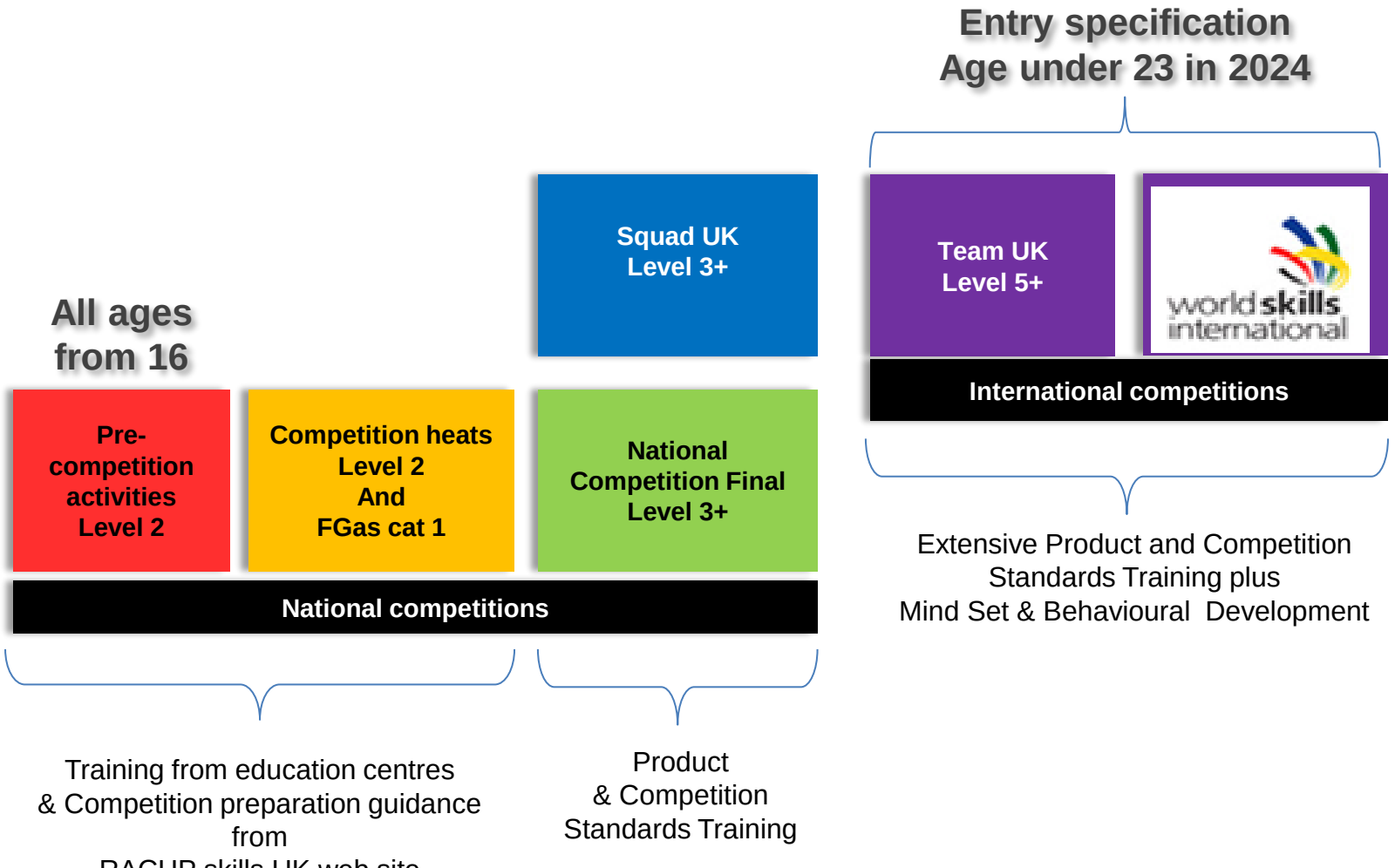
National Skills Competition Cycle 2022

Guidance for Tutors

Karena Cooper (Competition Organiser)

Mark Forsyth (Competition Technical Manager)

National Competition Cycle



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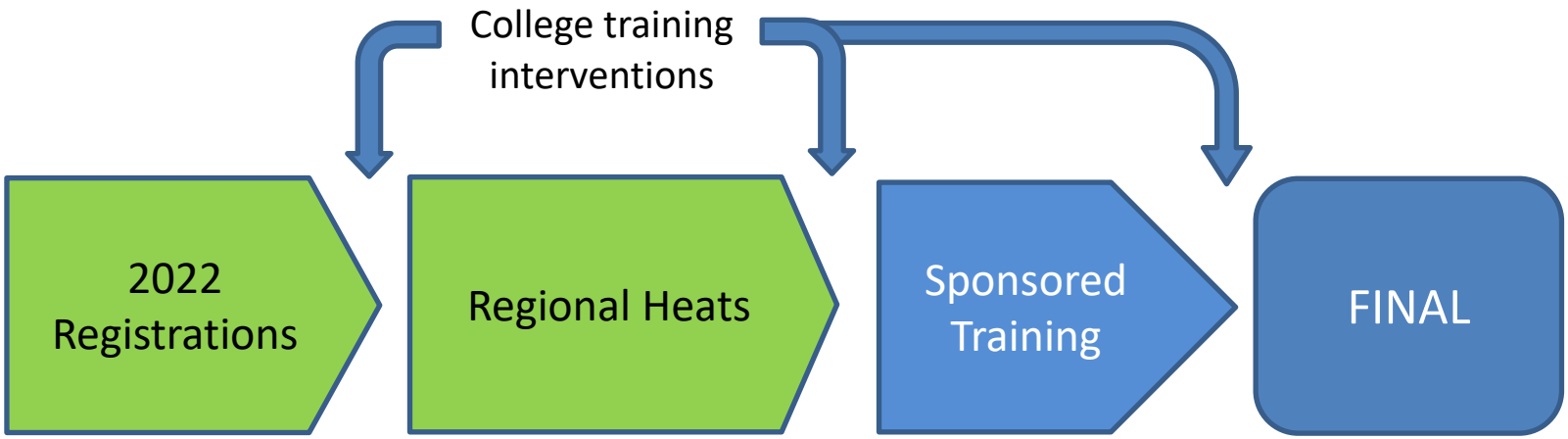
Dates and locations on route to WSUK National Final



Registration window
28TH Feb to 31st March 2022

Eastleigh	26 April
Bath	27 April
SERC	4 May
Cardiff	12 May
Grimsby	17 May
Burnley	18 May
Glasgow	24 May

Others depending on registrations

Preparation for final tests
Week commencing
24 October

9 to 12 November
or
16 to 20 November

Venue TBA

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Regional Venues and Dates for your diary

Date	Lead Judge	Venue	Address
26 April 2022	Steven Burge	Eastleigh college	Chestnut Avenue, Hampshire SO50 5FS
27 April 2022	Ian Lemmon	Bath college – Radstock campus	Wells Road, Westfield, Radstock. BA3 3RW
4 May 2022	Chris Bailie	South East Regional College	Castle St, Lisburn BT27 4SU
12 May 2022	John Broughton	Cardiff Vale College	Dumballs Road Cardiff CF10 5FE
17 May 2022	Ian Fisher	Grimsby Institute	Nuns Corner, Grimsby. DN34 5BQ
18 May 2022	Roger Smith	Practical Refrigeration Training Centre	Plumbe Street, Burnley. BB11 3AW
24 May 2022	Roger Smith	Glasgow Kelvin college	123 Flemington St Glasgow G21 4TD

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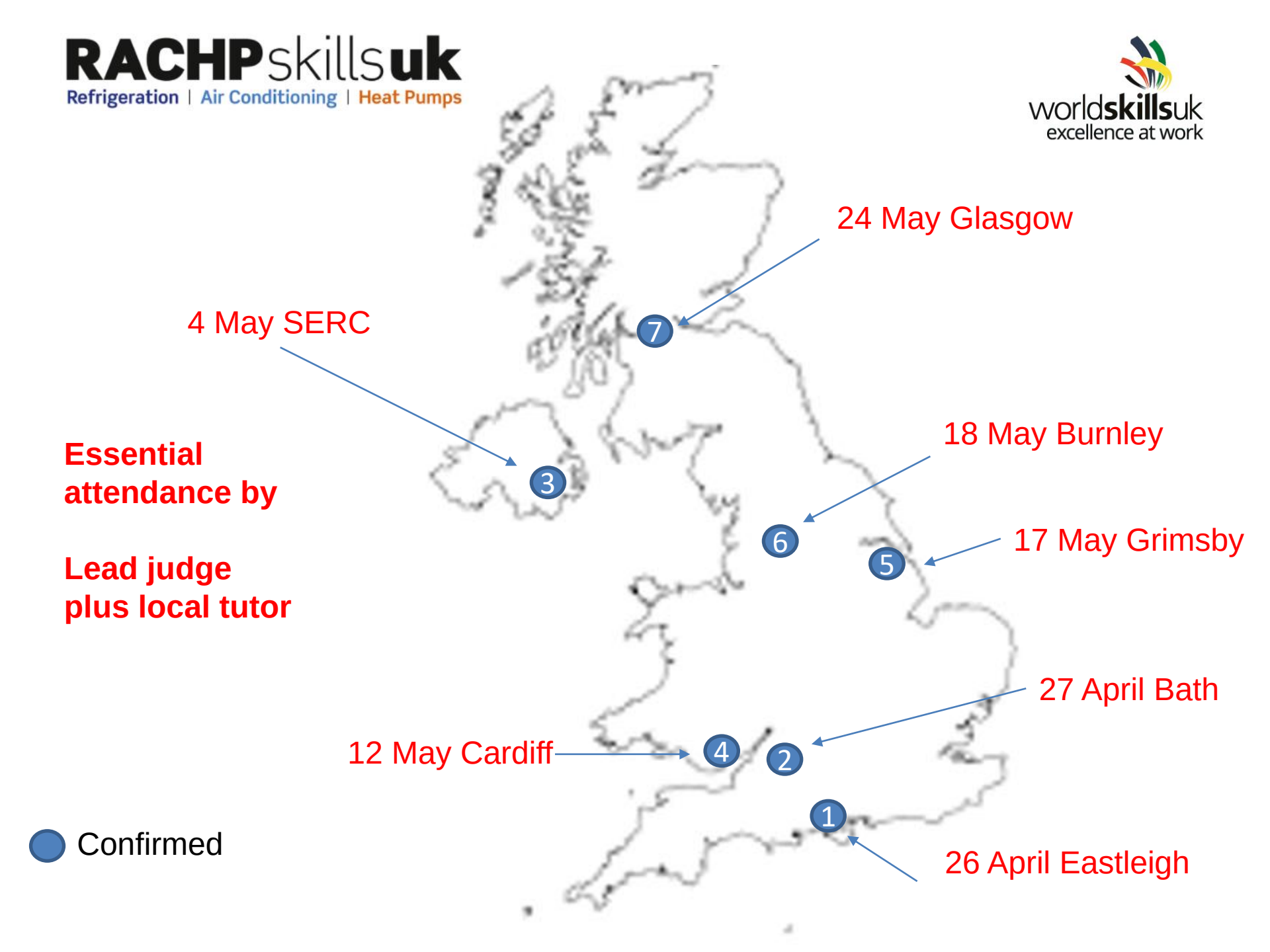

Essential attendance by

Lead judge plus local tutor

Confirmed

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Competition Heats

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Regional Heat timetable

- Please ask competitors to arrive on time
- Competition will not wait for late comers

TIME	ACTIVITY
0800	Arrival
0815 -0830	Induction and competition introduction
0830-0900	Familiarisation with tools, materials and equipment
0900-1200	Skill Competition Part A – 2.5 to 3hrs
1200-1300	Lunch
1300-1330	Familiarisation with tools, materials and equipment
1330-1630	Skill Competition Part B – 2.5 to 3hrs
1630-1730	Marking & Feedback to competitors
1730-1800	Presentations and depart

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COMPETITION MANUAL

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REFRIGERATION, AIR CONDITIONING &
HEAT PUMP SYSTEMS

COMPETITION MANUAL

QUALITY IN EVERYTHING WE DO

The aim of this manual is to advise and guide stakeholders in preparing for all stages of the refrigeration air conditioning and heat pumps national skill competition.

By working through this manual, alongside the 'WSUK Preparation Toolkit', you can ensure you are competition ready.

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February 2022
Author: Mark Forsyth

CONTENTS

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Refrigeration | Air Conditioning | Heat Pumps

COMPETITION GUIDE
TECHNICAL STANDARDS

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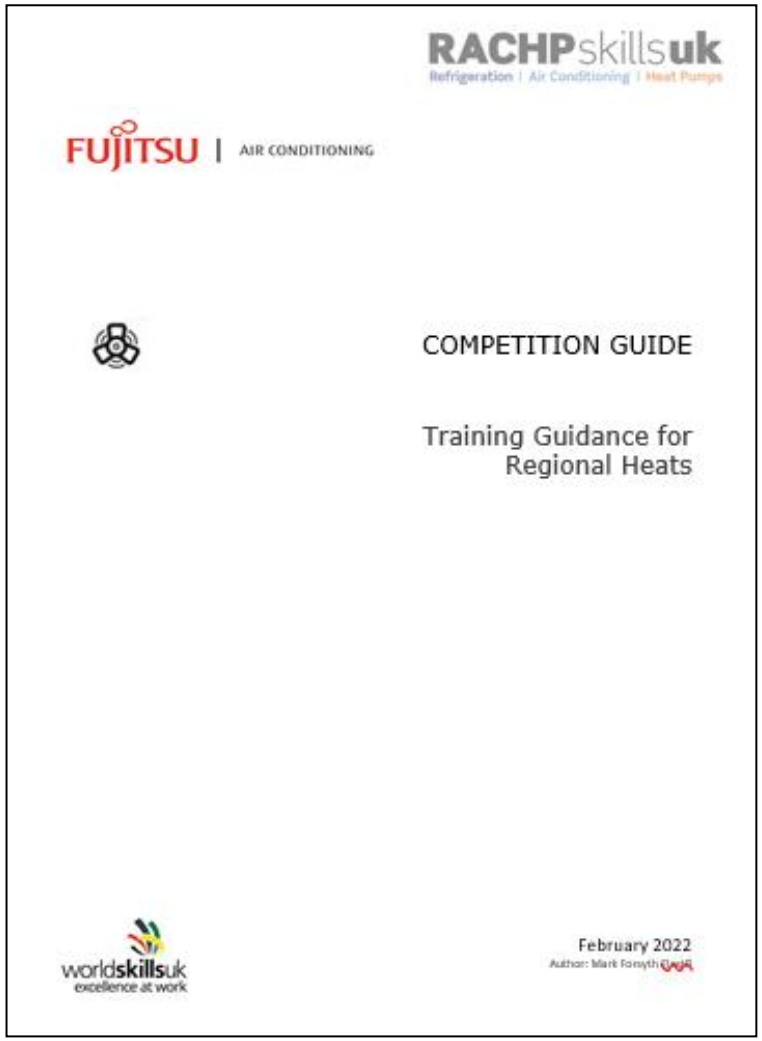


TRAINING TO PRODUCE QUALITY WORK

Introduction

The aim of this guide is to help competitors prepare for the RACHP skills UK competition heats and perform to the best of their ability during the event. It contains technical tips and advice to enable competitors to achieve their full potential. By working through this guide, alongside the 'WSUK Preparation Toolkit', you can ensure you are competition ready.

This manual contains three main sections:

Section 1: General Information - covering areas such as

- Personal preparation
- Time management
- Competition preparation
- Marking Summary
- Safe working

Section 2: Competition Outline - covering the specifics relating to the activities in the regional competition.

- Pipework fabrication
- Refrigerant handling
- Pressure testing and Evacuation
- Electrical circuit test
- Operational efficiency

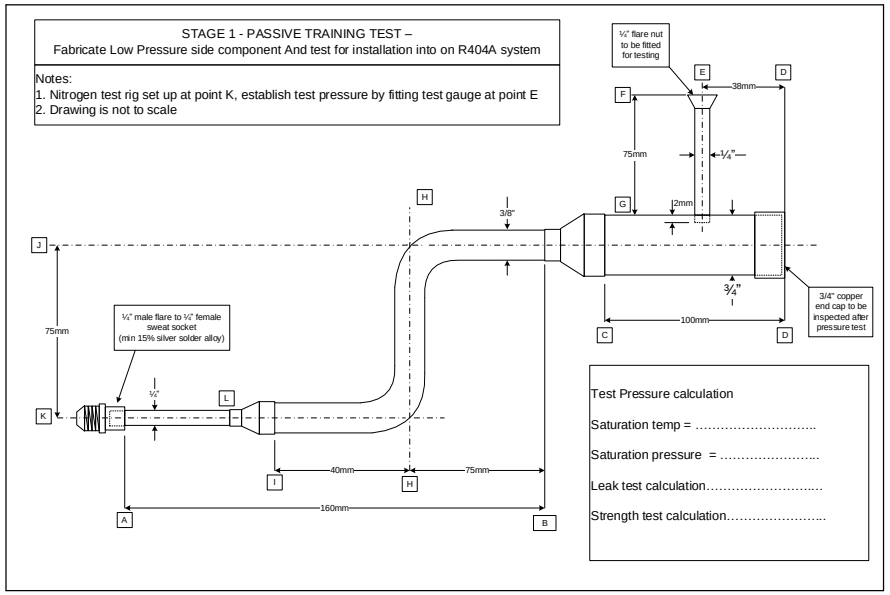
Section 3: Technical Guidance – covering specific tolerances and standards

Using the tips and advice in this training guide should help you to:

- ✓ Practice the basic skills at a higher level of accuracy
- ✓ Appreciate the standards for the tasks at this level
- ✓ Think before acting
- ✓ Check the quality of your work to see if it looks right compared to the specification
- ✓ Remember it's not a race – you are competing against a standard that is achievable

Preparation tests

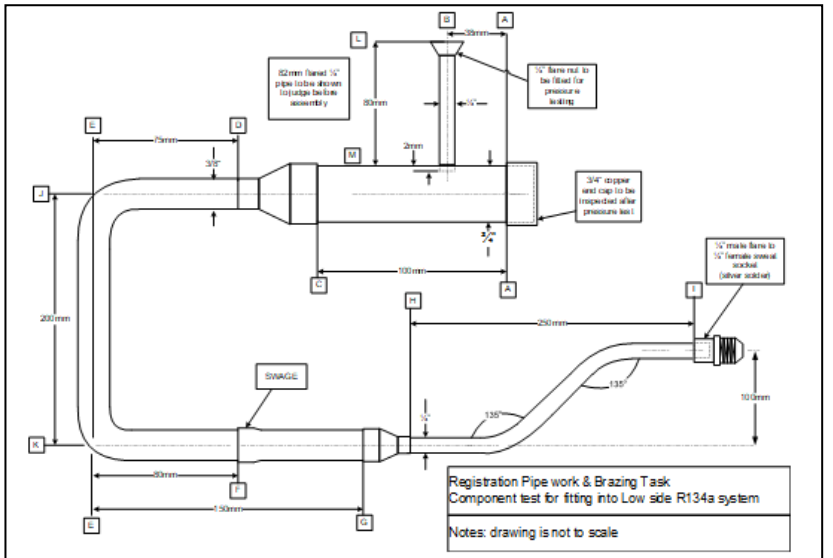
Level 2 Passive test 1



Max Mark	Measurement Criterion (+/- 2mm)	Result or Actual Value	Mark Awarded
1.0	Are the bends at 90°	Both = 1.0 One = 0.5	
1.0	Distance A to B 160mm	Tolerance +/- 2mm	
1.0	Distance C to D 100mm	Tolerance +/- 2mm	
1.0	Distance D to E 38mm	Tolerance +/- 2mm	
1.0	Distance F to G 75mm	Tolerance +/- 2mm	
1.0	Distance H to I 40mm	Tolerance +/- 2mm	
1.0	Distance B to H 75mm	Tolerance +/- 2mm	
1.0	Distance K to J 75mm	Tolerance +/- 2mm	
0.5	Both ¼" Flares are to standard and fit in the flare nut without snagging	Yes/No	
0.5	Arrangement is as per the diagram, straight and level when lay flat	Yes/No	
1.0	¼" pipe depth into ¾" tube 75mm (overall length checked before assembly)	Yes/No	
Total marks (max 10)			

Max Mark	Brazing Criterion (filled with no drips)	Result or Actual Value	Mark Awarded
1.0	Reducer to ¾" tube at C to standard	Yes/No	
1.0	Reducer to 3/8" tube at B to standard	Yes/No	
1.0	¾" Blank end cap to standard	Yes/No	
1.0	¼" stub to ¾" tube to standard	Yes/No	
1.0	Reducer to 3/8" tube I to standard	Yes/No	
1.0	Reducer to ¼" tube to standard	Yes/No	
2.0	¾" end cap - depth of braze penetration	100%	
1.0	Correct filler used for end cap	Yes/No	
1.0	Always used nitrogen during brazing	Yes/No	
Total marks (10)			

Level 2 Passive test 2



USE THIS AREA TO SHOW WORKING OUT & WRITE YOUR CALCULATED PRESSURE TESTS

A. R410A Heat pump minimum strength pressure test calculation:

B. R410A Heat pump maximum strength test pressure calculation:

C. R407C High side (evaporative condenser) minimum leak pressure test calculation:

D. R407C High side maximum strength test pressure:

E. R134a High side (air cooled) minimum pressure test calculation:

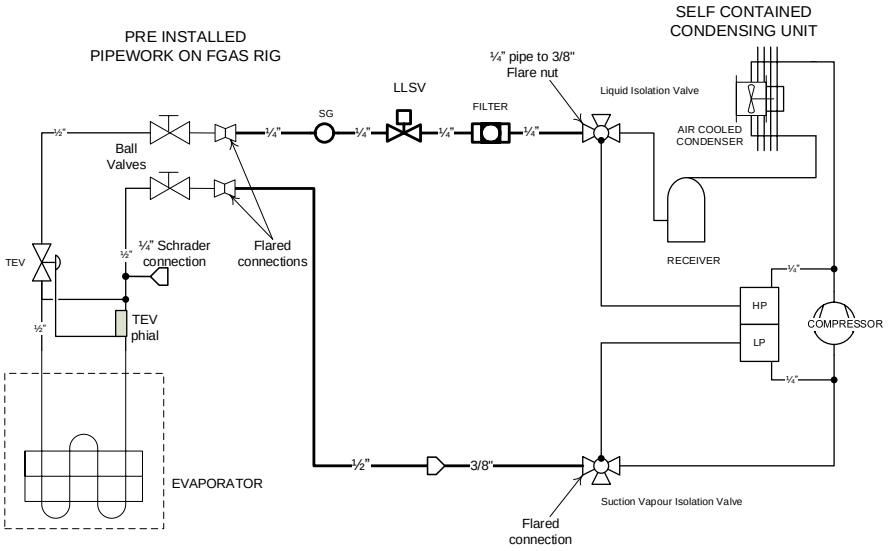
F. R134a High side maximum strength test pressure:

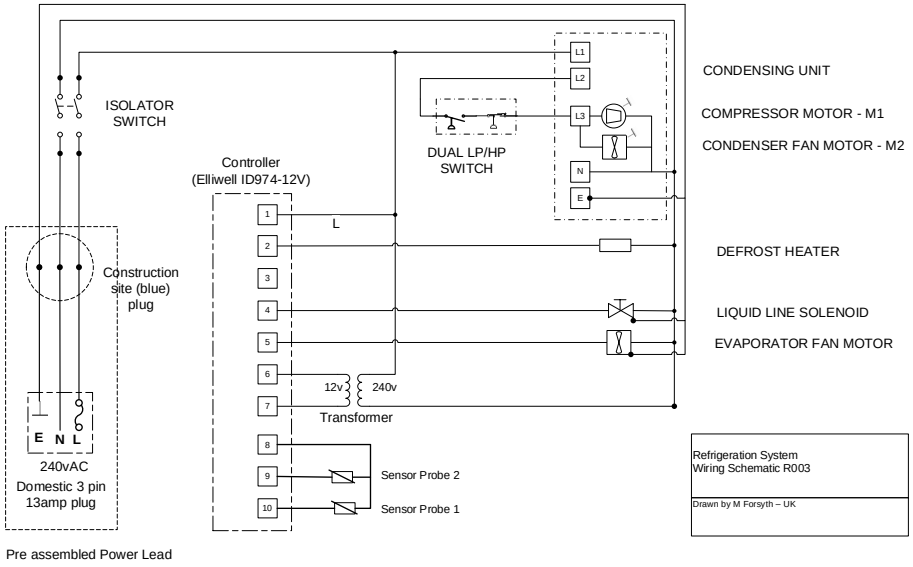
Qualifying Regional Heats

Regional heat includes refrigerant handling (F-Gas cat 1) supervised

Task A - Fabrication with flame brazing (diagram issued on the day)

Task B - Refrigerant handling & Electrical fault finding
(Pipe schematic and Wiring diagram for the installation)





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Qualifying Regional Heats

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Tools and Equipment required for Qualifying heat

Personal Protective Equipment

QTY	Personal Protective Equipment	Model/size/part no	Venue or Competitor	Sponsor	Heat
1	Coveralls (for refrigerant handling & flame brazing)		#		#
1	Safety Goggles (suitable for refrigerant handling)		#		#
1	Gloves (suitable for refrigerant handling)		#		#
1	Tinted Safety Glasses (suitable for flame brazing)		#		#
1	Gloves (suitable for flame brazing)		#		#
1	Safety footwear		#		#

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Qualifying Regional Heats

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Tools and Equipment required for Qualifying heat
Fabrication with flame brazing

QTY	Fabrication Task - Tools & Equipment	Model/size/part no	Venue or Competitor	Sponsor	Heat
1	Pen and Pencil (plus spare)	Blue or Black ink	#		#
1	Fixed steel rule	300mm	#		#
1	Mesh cleaning pad for pipework		#		#
1	Bench vice	159659	#		#
1	Adjustable Combination Set square	300mm	#		#
2	Adjustable wrench spanners	To fit 1/4” flare nuts	#		#
1	Pipe grips		#		#
1	Copper pipe benders for soft copper tube	3/8” & 1/2”	#		#
1	Copper pipe swage or expanding tool kit to suit	1/2”, 3/8” and 1/4”	#		#
1	Copper Pipe Flaring tool	1/4”	#		#
1	Rotary copper tube cutters	1/4” to 5/8 “	#		#
1	Nitrogen cylinder (oxygen free)	10ltr		Sponsor	#
1	Nitrogen regulator	GA750 (0-50bar)	#		#
1	Nitrogen hose line ¼” (braded) with valve set to regulator	¼” SAE	#		#
1	Nitrogen purge tool	Diversitech DP1		Sponsor	#
1	Refrigerant Receiver Cylinder	8kg	#		#
1	Oxygen Acetylene/Propane flame brazing kit		#		#
1	Silver Alloy 40% Ag content	Silver-Flo 40		COP	#
1	Flux Powder	Easy-flo	#		#
4	Copper Alloy min 0.8% Ag content	Rolot S2		COP	#

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Qualifying Regional Heats

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Tools and Equipment required for Qualifying heat

Refrigerant handling

QTY	Refrigerant Handling Task - Tools & Equipment	Model/size/part no	Venue or Competitor	Sponsor	Heat
1	Wireless 4 port Service manifold with micron gauge	Fieldpiece SMAN460	#		#
4	Hoses for service manifold including recovery unit	1/4” SAE,	#		#
1	Hose for evacuation	3/8” SAE	#		#
1	Refrigerant cylinder adapter to 1/4” hose		#		#
1	Refrigerant Receiver Cylinder with 5kg refrigerant	8kg	#		#
1	Recovery unit (suitable for refrigerant on site)	240v	#		#
1	Electronic leak detector	BOSCH TIF ZX-1 or alternative	#		#
1	Electronic weigh scales	12kg max weight	#		#
1	Solenoid magnetic Lifter	10mm & 15mm	#		#
1	Vacuum Pump	3cfm, 240v	#		#
1	Vacuum Gauge (digital)	read below 2000micron	#		#
1	Nitrogen cylinder (oxygen free)	10ltr		Sponsor	#
1	Nitrogen regulator	GA750 (0-50bar)	#		#
1	Nitrogen hose line ¼” (braded) with valve set to regulator	¼” SAE	#		#
2	Adjustable spanners	To fit 1/2” flare nuts	#		#
1	Refrigeration service ratchet wrench	Mastercool 70081	#		#
1	Digital thermometer	K type connections	#		#
1	Surface temperature probe	K type connector	#		#
1	Air temperature sensor probe	K type connector	#		#

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Qualifying Regional Heats

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Tools and Equipment required for Qualifying heat

Refrigerant handling / Electrical test fault finding

QTY	Electrical Control fault find Task – Tools & Equipment	Model/size/part no	Venue or Competitor	Sponsor	Heat
1	Set of screwdrivers flat and cross head		#		#
1	Insulated standard pliers - long nosed and short		#		#
1	Side cutters for cable		#		#
1	Wire stripper / crimper		#		#
1	Proving Unit		#		#
1	Clamp/Multi meter with digital thermometer & K type sensor	Fieldpiece SC440	#		#

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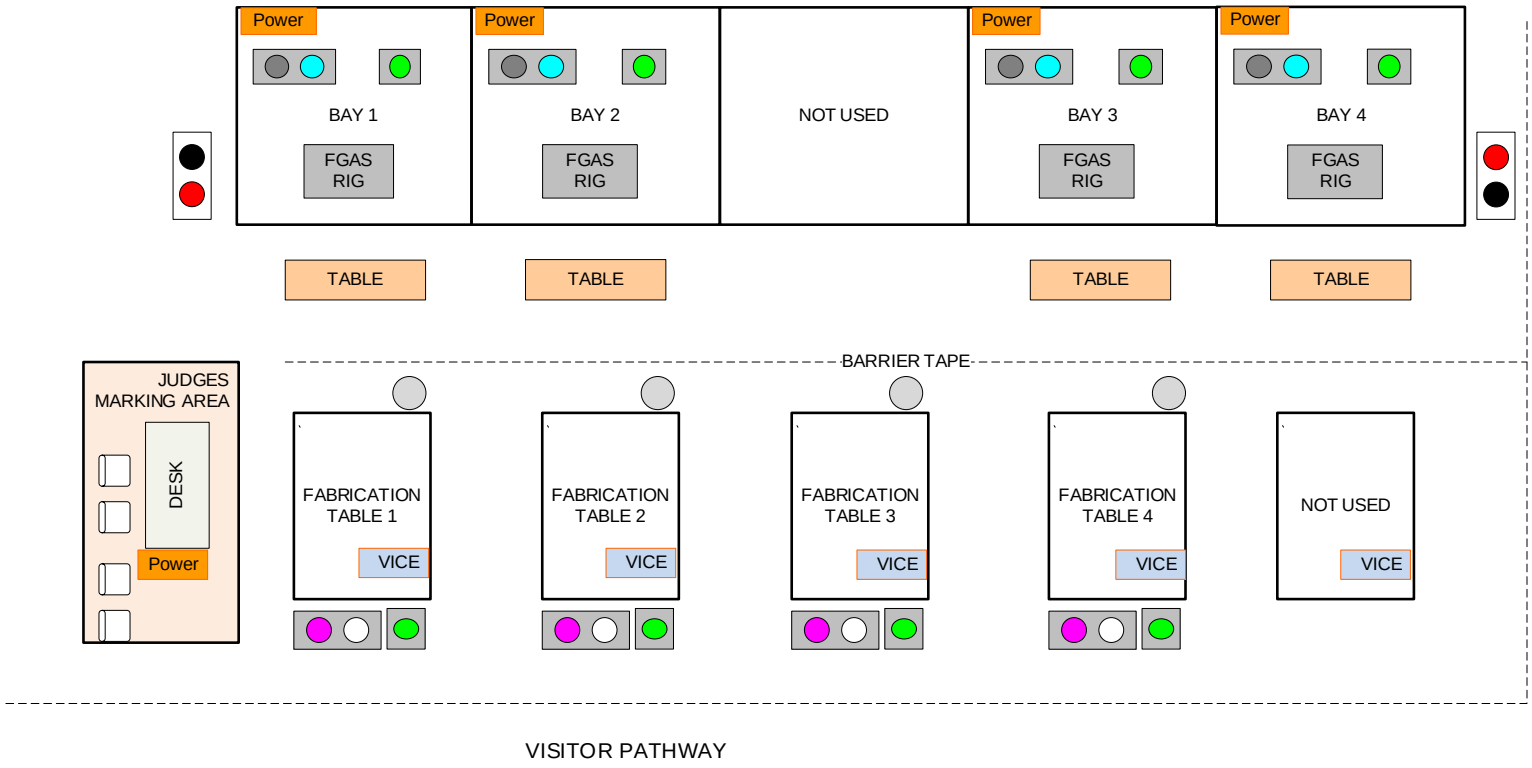
Qualifying heat area set up 1 – 8 competitors (Bath)



NOTES:
DRAWING IS NOT TO SCALE, INDICATIVE SET UP FOR MAX 10 COMPETITORS

FABRICATION AREA -
WORKBENCH WITH STEEL ENGINEERS VICE FOR ASSEMBLY OF EQUIPMENT AND FLAME BRAZING THEN PRESSURE TESTING

REFRIGERANT HANDLING / ELECTRICAL TEST AREA -
FGAS TEST RIG WITH POWER SUPPLY IN EACH BAY - 240V 3PIN DOUBLE PLUG SOCKET

RISK ASSESSMENT, METHOD STATEMENT AND MATERIAL SAFETY DATA SHEETS AVAILABLE
HOT WORK PERMIT TO BE ISSUED PRIOR TO USE OF FLAME BRAZING EQUIPMENT

Key:

- REFRIGERANT 10ltr
- RECEIVER 10ltr
- ACETYLENE (dissolved) 5ltr
- OXYGEN 5ltr
- WATER EXTINGUISHER
- CARBON DIOXIDE EXTINGUISHER
- NITROGEN 10ltr
- VICE — ENGINEERS VICE
- Power — 240Vac POWER SUPPLY 3 pin plug
- WATER BUCKET WITH RAGS

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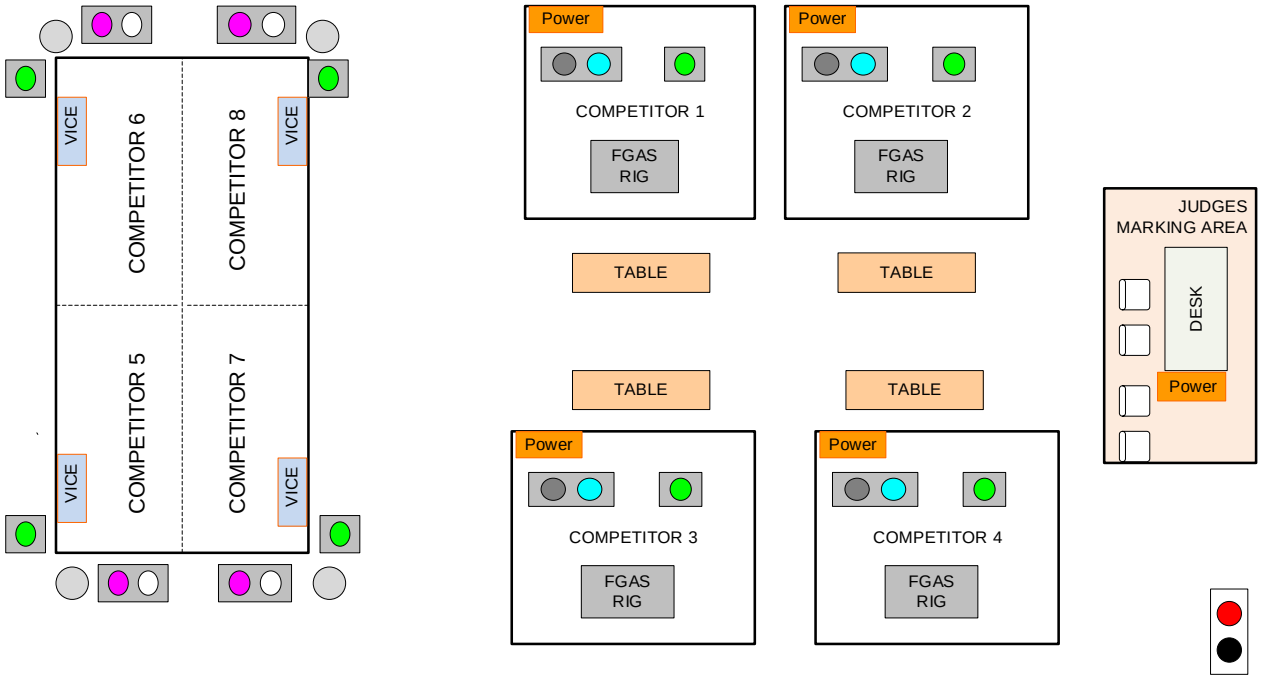
Qualifying heat area set up 2 – 8 competitors (Burnley)



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- VICE — ENGINEERS VICE
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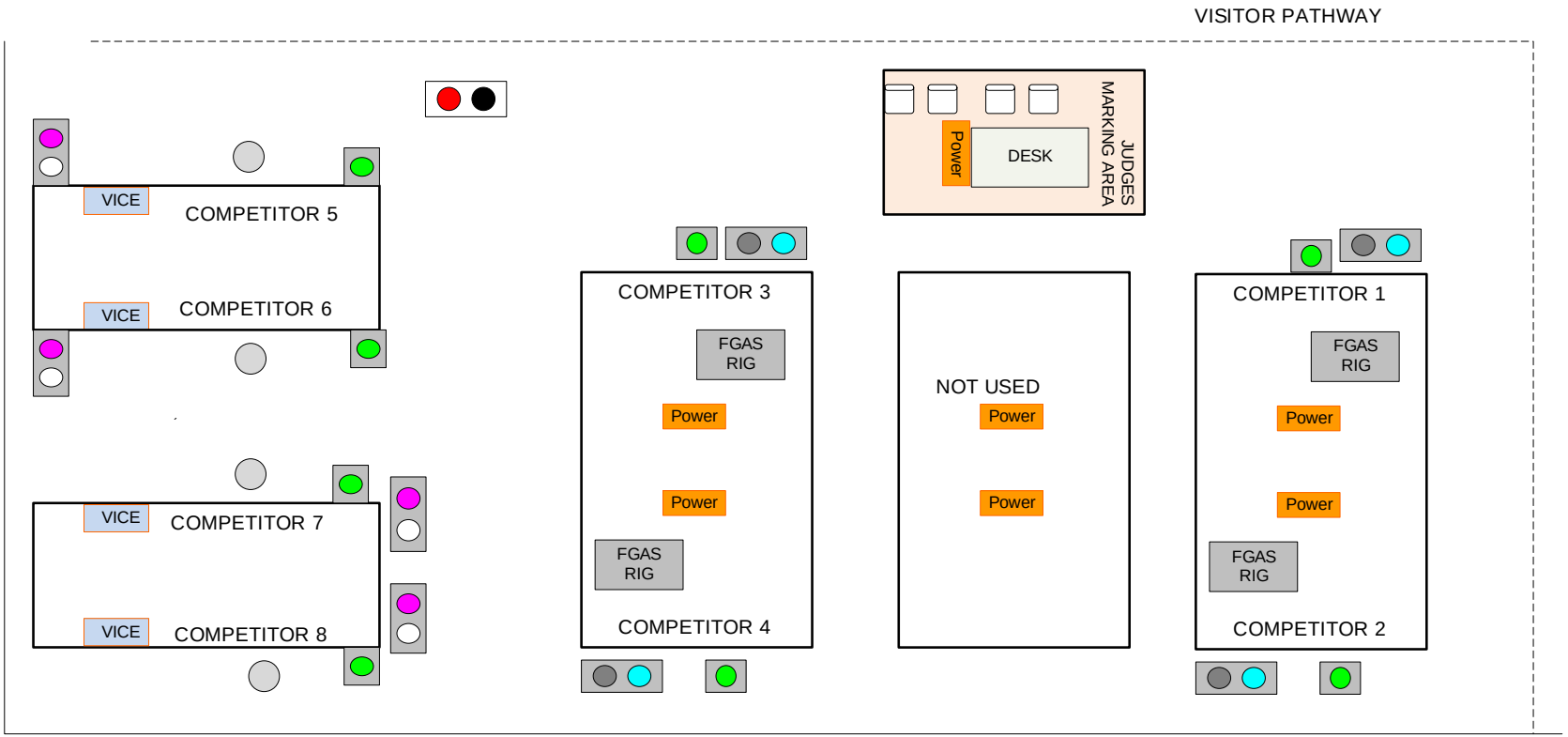
Qualifying heat area set up 2 – 8 competitors (Burnley upstairs)



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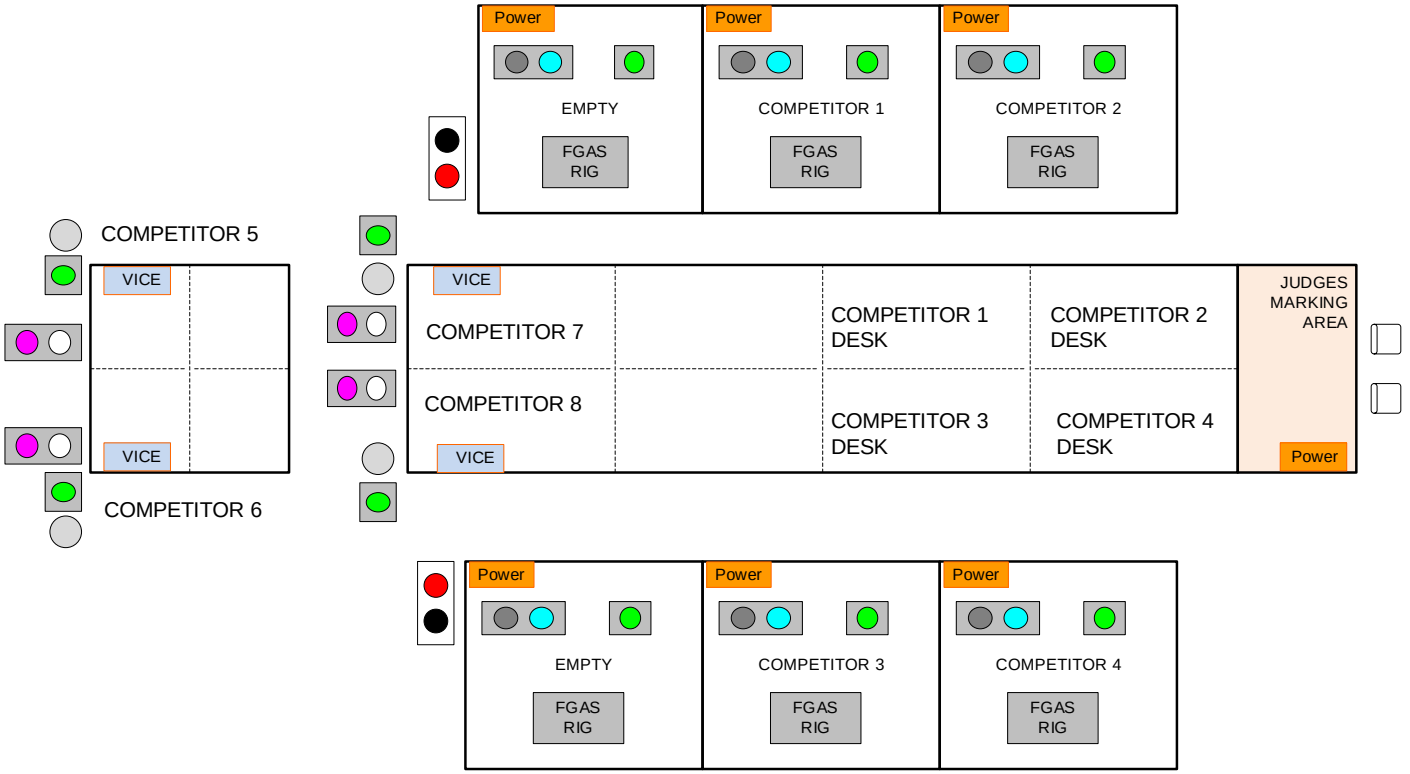
Qualifying heat area set up 3 – 8 Competitors (Eastleigh)



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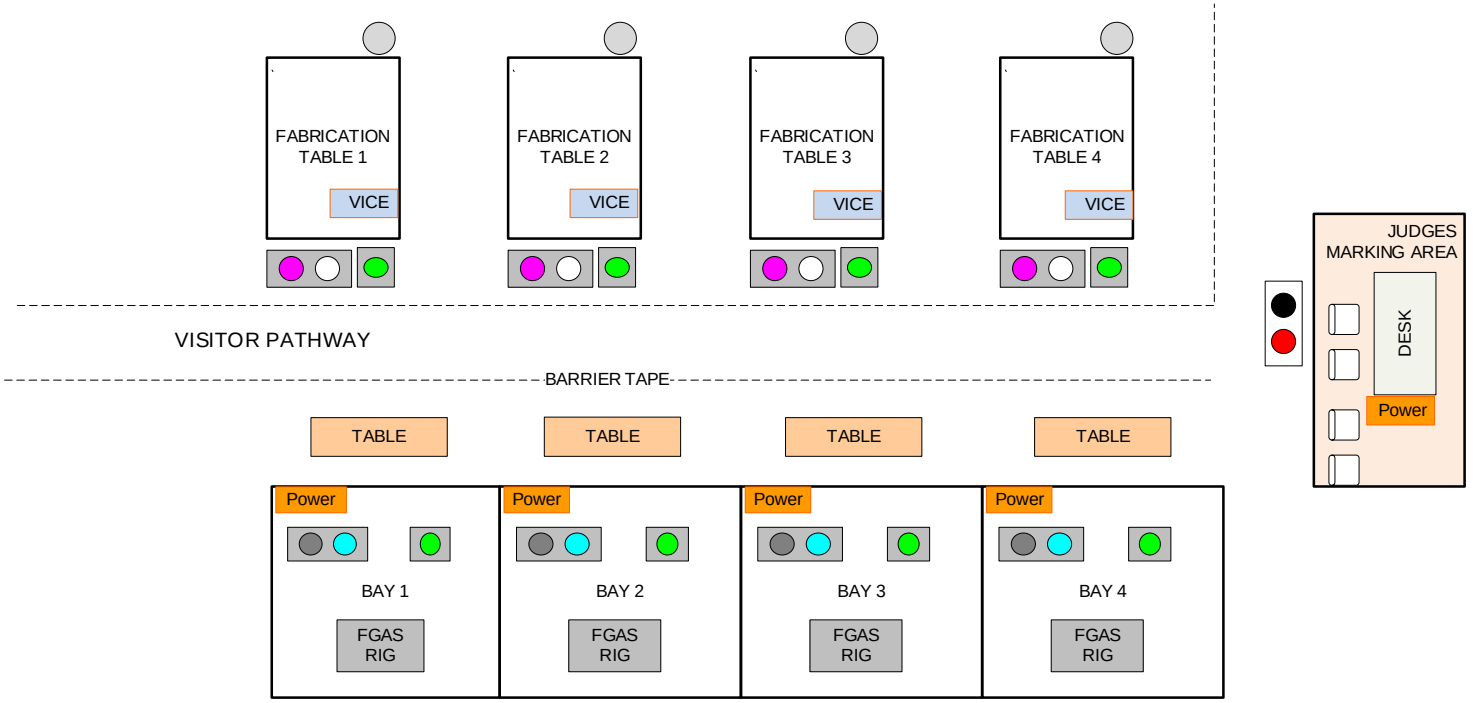
Qualifying heat area set up 4 – 8 competitors (Glasgow)



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- CARBON DIOXIDE EXTINGUISHER
- NITROGEN 10ltr
- VICE — ENGINEERS VICE
- Power — 240Vac POWER SUPPLY 3 pin plug
- WATER BUCKET WITH RAGS

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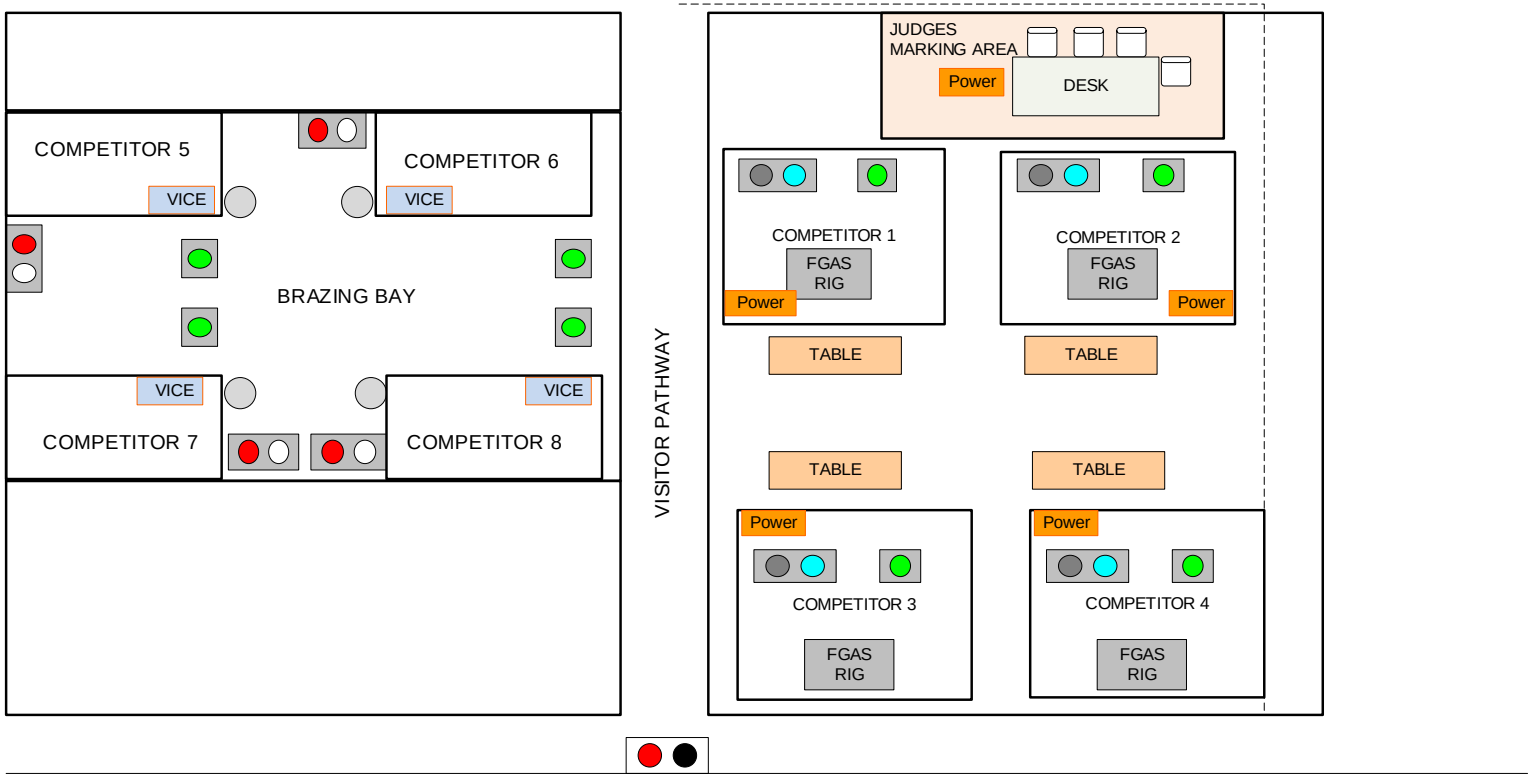
Qualifying heat area set up 5 – 8 competitors (Grimsby)



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VICE ENGINEERS VICE
Power 240Vac POWER SUPPLY 3 pin plug
WATER BUCKET WITH RAGS

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A combined commitment to improve quality and standards

RACHPskills UK is an official technical skills partner for WSUK which develops apprentices by testing and assessing their skills against their peers through national and international competition-based training programmes.

This improves apprentices' confidence, quality of work and their knowledge with positive outcomes.
*You are helping by s*upporting the competition cycle:

- In providing a unique platform to showcase industry products
- Helping to attract new and diverse talent into the sector, irrespective of their backgrounds
- Helping us to engage with industry and WSUK to promote quality standards of "excellence at work"
- Assist us in the aim of making quality matter in every college / work environment

We thank all of you for your valuable time and support

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We have covered

The new national competition organising partner.
The cycle of events for this year – registration to final.
The draft competition tasks
Tools and equipment required per competitor

Answer your questions

Thankyou

Register your competitors
Any Queries Contact Mark Forsyth

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