

# Welcome to the T Level Engineering & Manufacturing

The webinar will begin shortly

May 2021



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**T-LEVELS** |  Institute for Apprenticeships  
& Technical Education

# Welcome to the T Level Engineering & Manufacturing

**Samantha Ashman - City & Guilds  
Technical Advisor**



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## Using the webinar platform



Send any questions in the question area throughout the webinar



All attendees will be set to mute



Webinar resources will be shared on our website shortly after

## Agenda

1. Welcome
2. Background and purpose of today's meeting
3. T Levels programme composition
4. Pathway breakdown/ delivery models
5. TQ development - Sample questions
6. Digital credentials
7. Employer & Provider involvement (EIB & T Levels)
8. Useful resources for providers
9. Questions

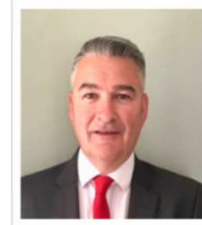
## Welcome – Industry Team for Engineering & Manufacturing



**Scott Wilkins – Industry Manager  
Engineering & Manufacturing**  
[Scott.wilkins@cityandguilds.com](mailto:Scott.wilkins@cityandguilds.com)



**Robert Stott – Industry Manager  
Engineering & Manufacturing - (T Levels)**  
[Robert.stott@cityandguilds.com](mailto:Robert.stott@cityandguilds.com)



**Michael Scarrott**  
Product Specialist- EAL  
[Michael.Scarrott@eal.org.uk](mailto:Michael.Scarrott@eal.org.uk)



**Simon Yorke – Lead Technical  
Advisor**  
Apprenticeships, EPA, Qualifications  
[Simon.yorke@cityandguilds.com](mailto:Simon.yorke@cityandguilds.com)



**Samantha Ashman – Technical Advisor  
Engineering**  
T Levels  
[Samantha.ashman@cityandguilds.com](mailto:Samantha.ashman@cityandguilds.com)



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## Background

- October 2020 City & Guilds won 3 contracts to develop the E&M TQs in D&D, MIR and MPC, in partnership with EAL – 5-year contract.
- Eligible providers must be approved by DfE in the first instance.
- Each TQ is based on content developed by an employer panel.
- The Institute are the certifying authority and own the Intellectual Property not the Awarding Organisation.
- Feedback and validation from providers and employers (be it positive or negative) is a key part of the TQ development
- It is critical for the success of T levels that we ensure the TQ is fit for purpose, aligns to employer needs and allows a young person to make informed choices about their future.



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## T Level programme composition

1400-1800 GLH hours over two years. Achievement of T Level must include all components. UCAS points will be attached and will be equivalent to 3 A levels.

### CORE

50% Total TQ time

**Graded A\* - E**

**Paper 1 Maths & Science**

**Paper 2 Engineering Concepts**

**3 ESP**

Assessment:

- External set and marked exams

### OCCUPATIONAL SPECIALISM

50% Total TQ time

**Graded Pass/merit/distinction**

Based on occupational maps

No less than 50% of the total qualification planned time

Assessment:

- practical assignment(s)



**WORK  
PLACEMENT**  
315-420 hours  
Min 45-60 days

**Maths, English and  
digital skills**  
GCSE or Functional  
Skills Level 2

**Enrichment  
– tutorial**

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## HEI Engagement

C&G has relationships with:

- University of Vocational Awards Council (UVAC) – Alison Whittle, C&G Post 16 Technical Adviser, is a member of their Higher Education and Awarding Organisation Vocational Qualifications Committee
- Russell Group Qualifications Network
- UCAS – broad understanding of UCAS tariffs and entry requirements, and how the different grading systems align to traditional academic GCEs
- Universities - Head of admissions, admission managers and teams, academics and OVCs
- Institute of Education –University College London (UCL)

**UVAC**

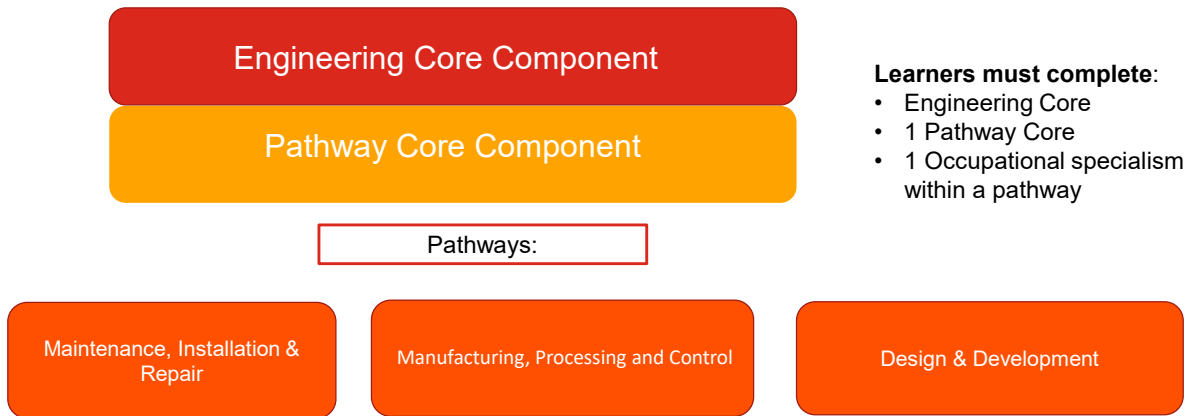
**RUSSELL  
GROUP**



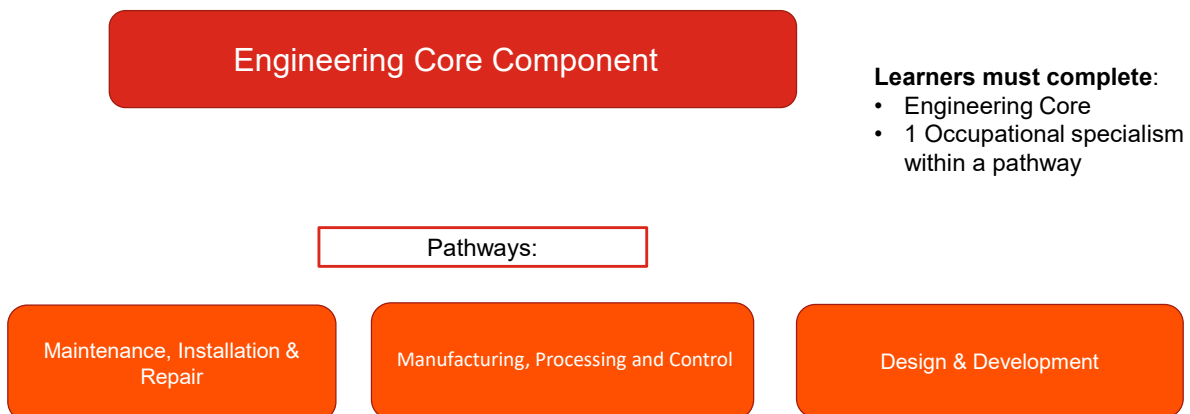
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## TQ overview for Engineering: this is how we started



## New TQ overview for Engineering:



## Route: Engineering and Manufacturing

### PATHWAY - Maintenance, Installation and Repair

#### Occupational Specialisms



## Route: Engineering and Manufacturing

### PATHWAY - Design and Development

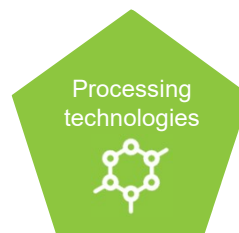
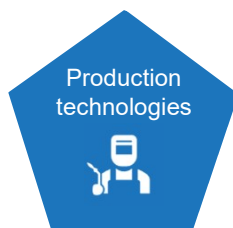
#### Occupational Specialisms



## Route: Engineering and Manufacturing

### PATHWAY - Manufacturing, Processing and Control

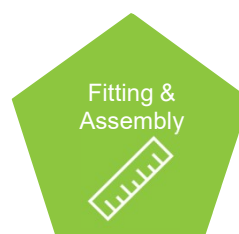
#### Original Occupational Specialisms



## Route: Engineering and Manufacturing

### PATHWAY - Manufacturing, Processing and Control

#### Proposed Occupational Specialisms – Under Development



## Guided Learning Hours

### New Proposal for Core and OS content - October – March 2021

Engineering and Manufacturing					
Design and Development		Maintenance, Installation and Repair		Manufacturing, Processing and Control	
Core Content (GLH)	Occupational Specialism (GLH)	Core Content (GLH)	Occupational Specialism (GLH)	Core Content (GLH)	Occupational Specialism (GLH)
720	400 – 500	720	360– 570	720	1290 – 1736
1120-1220		1080 - 1290		2010 - 2456	

- To put this into context:
  - 3 x A Levels = 1080 hours, with three 1.5 to 2.5 hrs exams assessing 360 hours of content for each
  - There is still currently too much content for the manageable delivery and assessment of the T Level based on GLH and breadth of content.

## Guided Learning Hours

### Proposal for Core and OS content – March 2021 onwards

Engineering and Manufacturing					
Design and Development		Maintenance, Installation and Repair		Manufacturing, Processing and Control	
Core Content (GLH)	Occupational Specialism (GLH)	Core Content (GLH)	Occupational Specialism (GLH)	Core Content (GLH)	Occupational Specialism (GLH)
600	600	600	600	600	600
1200		1200		1200	

- To put this into context:
  - 3 x A Levels = 1080 hours



## Guided Learning Hours: Sample Sequence of Delivery

Assessment in series						
		Winter Series		Spring Series		Summer Series
Year 1	Term 1	Christmas	Term 2	Easter	Term 3	Summer
Delivery	Core		Core		Core	
Placement	Core		Placement		Placement	
Assessment					ESP Window	Core exams
Year 2	Term 1	Christmas	Term 2	Easter	Term 3	Summer
Delivery	OS		OS			
Placement	Placement		Placement			
Assessment	ESP Window resit	Core Exams resit		OS assignment		

- Feasible delivery
- Space for resit opportunities
- Guided learning hours rationalised
- To deliver the programme in the 2 year window the assessments will need to be approximately sequenced in this way.

## TQ Development



## Exemplar Specifications

To achieve the T Level Technical Qualification in Engineering and Manufacturing: Maintenance, Installation and Repair (Level 3) (delivered by City & Guilds) learners must complete the three components of the Technical qualification. These are known as the core component and the occupational specialism:

- (300) plus one from (311 – 315)

### T Level Technical Qualification in Engineering and Manufacturing: Maintenance, Installation and Repair (Level 3)

City & Guilds component number	Component title	Component level	GLH
<b>Mandatory</b>			
300	Engineering common core	3	600
<b>Choose one standalone occupational specialism</b>			
<b>Standalone</b>			
311	Maintenance engineering technologies: Mechanical	3	400
312	Maintenance engineering technologies: Mechatronic	3	420
313	Maintenance engineering technologies: Electrical and Electronic	3	450
314	Maintenance engineering technologies: Control and Instrumentation	3	450
315	Vehicles	3	450



### Technical qualification scheme of assessment overview

#### Core Component – Learners must complete all assessment components

Assessment component	Method	Duration	Marks	Weighting	Marking	Grading
Exam paper 1	Externally set exam	2.5 hours	102	35%	Externally marked	This component will be awarded on the grade scale A* - E
Exam paper 2	Externally set exam	2.5 hours	102	35%	Externally marked	
Employer-set project	Externally set project	21 hours	100	30%	Externally marked	

#### Occupational Specialism Component - Learners must complete one assessment component

Assessment component	Method	Duration	Marks	Weighting	Marking	Grading
Maintenance engineering technologies: Mechanical	Externally set assignment	20 hours	90	100%	Externally moderated	All occupational specialism components will be awarded on the grade scale P, M, D
Maintenance engineering technologies: Mechatronic	Externally set assignment	20 hours	90	100%	Externally moderated	
Maintenance engineering technologies: Electrical and Electronic	Externally set assignment	20 hours	90	100%	Externally moderated	
Maintenance engineering technologies: Control and Instrumentation	Externally set assignment	20 hours	90	100%	Externally moderated	
Vehicles	Externally set assignment	20 hours	90	100%	Externally moderated	



## Core Examinations Content

### Update:

Common Core Specification reduced from 720 to 600 GLH

Paper 1: Maths and Science Principles for Engineering (2hrs 30mins)

Paper 2: Engineering in Context (2hrs 30mins)

Assessment	Overall contribution
Core examination 1	35%
Core examination 2	35%
Employer-set project	30%



## Core Content split Update

**Paper 1** – Maths and Science Principles for Engineering (6 Elements)

**Paper 2** – Engineering in Context (11 Elements)

**17 Elements in total to make up the core**

### Proposal for each exam:

- Contain 102 marks (*2 marks are reserved for QWC in ER*)
- Have a set duration of 2hrs 30mins (*TBC with scrutiny check*)
- Be weighted 35% of the overall Core grade
- Be externally-set and marked

Element	GLH
4 Essential mathematics for engineering and manufacturing	
5 Essential science for engineering and manufacturing	
6 Materials and their properties	
7 Mechanical principles	
8 Electrical and electronic principles	
9 Mechatronics	
<b>Total</b>	<b>300</b>

Element	GLH
1 Working within the engineering and manufacturing sectors	
2 Engineering and manufacturing past, present, and future	
3 Engineering representations	
10 Engineering and manufacturing control systems	
11 Quality management	
12 Health and safety principles and coverage	
13 Business, commercial and financial awareness	
14 Professional responsibilities, attitudes, and behaviours	
15 Stock and asset management	
16 Continuous improvement	
17 Project and programme management	
<b>Total</b>	<b>300</b>



## Exemplar Core Examinations Paper 1

**Q1**

The input into a gearbox is 300 revolutions per minute (rpm). The output from the gearbox is 2700 rpm. The gearbox contains two gears.

(a) Calculate the ratio of the input speed to the output speed. (1 mark)

\_\_\_\_\_

(b) The output gear has 18 teeth. How many teeth will the input gear have? (1 mark)

\_\_\_\_\_

Q1	Mark Scheme
	(a) 1:9 [1] - Do not accept marks for 9:1 (b) $9 \times 18 = 162$ teeth [1]
<b>Total marks</b>	2
<b>AO</b>	AO2 = 1 + 1
<b>Qual spec reference</b>	4.1

**Q8**

Describe how galvanic protection can be used to prevent corrosion of a mild steel water tank. (4 marks)

Q8	Mark Scheme
	Award one mark per relevant point, up to a maximum of 4 marks.  A metal coating or attachment forms an electrochemical circuit with the base metal [1] in the presence of an electrolyte [1]. The coating/attachment acts as the anode [1] and is sacrificial/corrodes in preference to the base metal [1].  Credit similar wording.
<b>Total marks</b>	4
<b>AO</b>	AO1b = 4
<b>Qual spec reference</b>	5.5



## Exemplar Core Examinations Paper 2

Q1

A company manufactures engines for cars on a production line. This involves a series of machining operations to produce a large component, followed by manual assembly of the finished engines.

- (a) Explain **one** reason why the company may use condition-based monitoring rather than preventative maintenance for the machines on the production line. (2 marks)

Q1 (a)	Mark Scheme
	One mark for the reason and one mark for the explanation of the reason, up to a maximum of two marks.
	<ul style="list-style-type: none"> <li>Continuity of operation [AO1b] due to the reduced risk of unplanned downtime because of premature failure of parts between service intervals [AO1b]</li> <li>Reduced cost of parts [AO1b] as parts are only replaced when necessary rather than at fixed intervals [AO1b]</li> </ul>
	Credit other suitable responses.
Total marks	2
AO	AO1b = 2
Qual spec reference	1.2

- (b) The company currently inspects every machined part to ensure that it meets the requirements. Explain **three** potential implications for the company changing from 100% inspection to statistical process control for every machined part. (6 marks)

Q1 (b)	Mark Scheme
	One mark per implication and one mark per explanation of the implication to the company, up to a maximum of six marks.
	<ul style="list-style-type: none"> <li>Statistical Process Control takes less time and money to carry out (AO2) this could increase the profitability of the production for the company (AO3)</li> <li>SPC could allow for immediate process adjustments to identified issues by operators (AO2) this would result in fewer parts being produced and scrapped for faults reducing the cost per machine part (AO3)</li> <li>There is a statistical risk that defects would not be detected without 100% inspection compounding quality issues through the manufacturing stages (AO2) this could result in reputational damage and reduce sales where quality is important (AO3)</li> </ul>
	Credit other suitable responses.
Total marks	6
AO	AO2 = 3 AO3 = 3
Qual spec reference	11.1

- (c) Describe **two** legal responsibilities for health and safety that apply to employees operating machining processes on a production line. (2 marks)

Q1 (c)	Mark Scheme
	One mark per correct description of a legal responsibility up to a maximum of two marks.
	<ul style="list-style-type: none"> <li>Employees must behave safely to ensure not to harm themselves or other working on the production line (AO1b)</li> <li>Employees must not undertake any tasks they are not authorised or properly trained to reduce risks operating the machining processes (AO1b)</li> <li>Employees are responsible to ensure that they use machinery appropriately to ensure safety devices are used correctly <u>e.g.</u> machine guards (AO1b)</li> </ul>
	Credit other suitable responses
Total marks	2
AO	AO1b = 2
Qual spec reference	12.3



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## Exemplar Employer Set Project

### Design specification

#### Performance requirements for the bollard

Train Express Limited wish to develop a bespoke bollard to be sited in public realm spaces outside their stations across the UK (refer to Photograph 1). The company wish to 're-engineer' the standard self-righting internally illuminated bollard (refer to Photograph 2) used frequently in streetscapes across the UK. The new bollard is also required to monitor the number of people using a station and should be energy efficient. The specific performance requirements of the bollard are:

- The bollard shall have an overall height of 1000 mm and width of 300mm.
- Each bollard needs to be able to sustain an impact loading from a vehicle. The force applied to the barrier should be calculated in accordance with BS EN 1991-1-1:2002 (refer to Table 1).
- The bollard is to be manufactured from a recycled or sustainable material.
- The bollard is to be fitted with technology that is able to count human presence.
- The bollard is to be lit by a low energy lighting source.
- The bollard is to have an internal light source like the original, which ensures that it is highly conspicuous from all sides.
- The overall aesthetic design of the bollard is to be modern and reflect the intended siting outside a railway station.
- The bollard shell should be able to withstand a minor vehicle impact and be easily replaceable.
- Train Express Limited wish to limit or eliminate any mains power source to the bollard.
- The bollard should be designed as far as possible to be vandal proof.

Table 1: Loading applied to the bollard

The horizontal characteristic force  $F$  (in kN) should be equal to that delivered by the impact of a vehicle given by:

$$F = \frac{0.5 m v^2}{\delta c + \delta b}$$

Where:

$m$  is the gross mass of the vehicle in (kg)

$v$  is the velocity of the vehicle (in m/s) normal to the barrier.

$\delta c$  is the deformation of the vehicle (in mm)

$\delta b$  is the deformation of the bollard (in mm)

#### Photographs



Photograph 1: Typical area outside a Train Express Limited Station

(Source of image: Shutterstock)



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## Exemplar Occupational Specialism Practical Assessment

### 2. Assignment brief

You are a mechanical engineer employed by an engineering company. The company have a large stores area for parts and materials.

You have been asked to design a manually-powered mechanical lifting device that will be used in the stores area. The aim of this device is to reduce the effort required from the workers in the stores area. Figure 1 shows an illustration of the lift required.

The device must be capable of lifting a cuboid box of maximum mass 25 kg. The maximum width, depth and height of the box are each 500 mm. The box arrives in the stores area on a roller table and is then pulled by a human worker onto the flat platform of the lifting device. The surface of the lifting platform should be 30 mm above ground level, so it is at the same height as the top of the rollers. The box must then be safely raised to a height of 1 m. It will then be pushed off onto another roller table by a human worker and the platform will be lowered to await the next box.

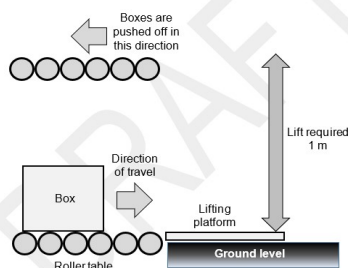


Figure 1



### Time

The time allocated for the completion of the tasks and production of evidence for this assessment is 30 hours. Timings for completion of specific tasks are outlined below.

- Task 1 – 14 hours
- Task 2 – 12 hours
- Task 3 – 4 hours

### Resources

Candidates must have access to a suitable range of resources to carry out the tasks and, where appropriate, to have the opportunity to choose materials demonstrating the ability to select from a range of appropriate materials.

Candidates should have access to a range of the following:

- tools and equipment
- PPE
- Manufacturer's manuals and handbooks for any processes required
- internet access for research for: costs, component data and production information.
- access to appropriate CAD drawing software.

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## Get Involved - Make a difference

### Employer Industry Board (EIB)

- Quarterly meeting with all panel members to discuss industry matters. Some of these can include; apprenticeships, FE, HE, T Levels, new developments (standards, qualifications), new technology and any other business.

### T Level Project

- Regular meetings to review key documentation for the T Levels. These can include; specifications, exams, specialist content. Sessions are skill specific and generally for 1 hr. **You can get involved in:** Writing content, Developing assessment materials, Reviewing, Validation
- **Composite Manufacturing experts** required for MPC, please get in touch

[Samantha.ashman@cityandguilds.com](mailto:Samantha.ashman@cityandguilds.com)



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## **Bringing learning to life**

Digital credentials are clickable image files with embedded information that can be viewed when shared online.

**This can include:**

- Date of issue
- Date of expiry
- Description
- Criteria
- Standards
- Skills tags (linked to LMI)
- Recommended pathways
- Evidence
- Issuing organisation
- Endorsements
- Hyperlinks



digitalcredentials

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## **Benefits of digital credentials to Centres**

- ✓ No additional cost to centres
- ✓ Helps promotes the development of future qualification.
- ✓ Centres are recognised for their valued input.
- ✓ Opportunities to link to job boards and add their credentials to CVs
- ✓ Opportunity to link other internal training via purchasing access to Credly via CG



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## Support and Guidance

Ready to Support eligible providers and stakeholder engagement

- New Webpages for T Levels
- Timelines
- Webinar for eligible providers
- Provider focus groups
- Employer Industry Boards
- E-bulletins
- Draft specification
- Dedicated technical advisors

City & Guilds: [cityandguilds.com/tlevels/engineering](https://cityandguilds.com/tlevels/engineering)  
EAL: [eal.org.uk/T-Levels](https://eal.org.uk/T-Levels)

### Engineering and Manufacturing T Levels timeline 2020-2022

[www.eal.org.uk/t-levels](https://www.eal.org.uk/t-levels)  
[www.cityandguilds.com/tlevels](https://www.cityandguilds.com/tlevels)

2020					
September	October	November	December	January	February
<p>Employer engagement</p> <p>Employer engagement</p> <p>Employer engagement</p> <p>Employer engagement</p> <p>Employer engagement</p>	<p>Employer engagement</p> <p>Employer engagement</p> <p>Employer engagement</p> <p>Employer engagement</p> <p>Employer engagement</p>	<p>Employer engagement</p> <p>Employer engagement</p> <p>Employer engagement</p> <p>Employer engagement</p> <p>Employer engagement</p>	<p>Employer engagement</p> <p>Employer engagement</p> <p>Employer engagement</p> <p>Employer engagement</p> <p>Employer engagement</p>	<p>Employer engagement</p> <p>Employer engagement</p> <p>Employer engagement</p> <p>Employer engagement</p> <p>Employer engagement</p>	<p>Employer engagement</p> <p>Employer engagement</p> <p>Employer engagement</p> <p>Employer engagement</p> <p>Employer engagement</p>
2021					
March	April	May	June	July	August
<p>Employer engagement</p> <p>Employer engagement</p> <p>Employer engagement</p> <p>Employer engagement</p> <p>Employer engagement</p>	<p>Employer engagement</p> <p>Employer engagement</p> <p>Employer engagement</p> <p>Employer engagement</p> <p>Employer engagement</p>	<p>Employer engagement</p> <p>Employer engagement</p> <p>Employer engagement</p> <p>Employer engagement</p> <p>Employer engagement</p>	<p>Employer engagement</p> <p>Employer engagement</p> <p>Employer engagement</p> <p>Employer engagement</p> <p>Employer engagement</p>	<p>Employer engagement</p> <p>Employer engagement</p> <p>Employer engagement</p> <p>Employer engagement</p> <p>Employer engagement</p>	<p>Employer engagement</p> <p>Employer engagement</p> <p>Employer engagement</p> <p>Employer engagement</p> <p>Employer engagement</p>

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## Websites to Support Providers

T Levels next step for providers

<https://www.gov.uk/guidance/t-levels-next-steps-for-providers#selecting-providers-to-deliver-t-levels-from-september-2023>

### Approaches to delivery

[https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/904518/Annex A different models and approaches to delivery.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/904518/Annex_A_different_models_and_approaches_to_delivery.pdf)

### Industrial placement

<https://www.gov.uk/government/publications/t-level-industry-placements-delivery-guidance>

T Level transition programme framework for delivery 2020 to 2021

<https://www.gov.uk/government/publications/t-level-transition-programme-framework-for-delivery-2020-to-2021>

Strategic Development Network | T Level and industry Placements

<https://www.strategicdevelopmentnetwork.co.uk/t-levels/>

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# Questions & Answers