T-LEVELS | Institute for Apprenticeships & Technical Education

T Level Technical Qualification in Design and Development for Engineering and Manufacturing

Employer-Set Project (8714-033)

Sample Brief

First teaching from September 2022

Version 1.0

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Contents

The employer

Component Tech Limited is an established supplier of street furniture throughout the UK. The company provides products such as seating, planters, litter bins, bicycle stands and bollards to local authorities and contractors for installation into public realm spaces. Public realm spaces are spaces that are free and open to anyone. These spaces might be located between buildings, in squares, forecourts, parks, or outside railway stations.

The project

Component Tech Limited has been approached by Train Express Limited to develop a new bollard, a short post used to prevent traffic from entering an area. The bollard is to be sited in the public realm spaces immediately outside their stations to prevent unauthorised vehicular access. Railway stations are places frequented by people catching and alighting trains daily. It is useful for rail passenger companies to keep track of the number of people using their infrastructure.

You are part of the team at Component Tech Limited who are working to plan the design and manufacture of a new bollard (illuminated post) for Train Express. You have been tasked with researching and providing initial design solutions and a technical specification for the design of the bollard in line with requirements provided by Train Express Limited.

An extract of the design brief relating to your part of the project has been provided: this includes performance requirements, pictures, budget constraints and timescale requirements.

Product design specification

Performance requirements for the bollard

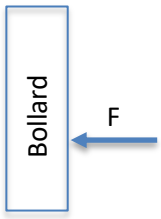
Train Express Limited wish to develop a bespoke bollard to be sited in public realm spaces outside their stations across the UK (refer to Photograph 1). The company wish to 're-engineer' an internally illuminated bollard (refer to Photograph 2) used frequently in streetscapes across the UK. The new bollard 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 a height of 1000 mm (tolerance 50mm)
- each bollard needs to be able to sustain an impact loading from a vehicle. The force applied to the bollard should be calculated in accordance with 'BS EN 1991-1-1:2002 Eurocode 1: Actions on Structures Part 1-1: General Actions- Densities, Self-weight, Imposed Loads for Buildings. (refer to Table 1)
- the bollard's outer housing is to be batch manufactured from fifty percent recycled or sustainable material to aid a Green Design approach
- the bollard is to be fitted with current and mature technology that is able to count people who pass by it
- the bollard is to be lit by a low energy lighting source to provide 600 lumen. The cost of running the bollard should be less than £35 a year, assuming electricity charged at 14p per kilowatt hour
- the bollard is to have an internal light source, which ensures that it is clearly visible from all sides
- the overall shape, ergonomic features, and aesthetic design of the bollard is to be modern and reflect the intended siting outside a railway station
- the is no requirement for the bollard to have the same colour scheme or signage as the example given in Photograph 2
- a base connection and foundation base for bollard should be designed
- the bollard's outer shell should be easily replaceable in case of damage
- Train Express Limited wish to limit any mains power source to the bollard
- the bollard should be designed to be vandal proof
- the bollard should be designed to operate in external environmental conditions
- the bollard should be reliable and require minimum maintenance during its life.

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:

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



Where:

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

v is the velocity of the vehicle (in m/s) normal to the bollard

∂c is the deformation of the vehicle (in mm)

∂b is the deformation of the bollard (in mm)

NB - The force could be applied at any location on the bollard.

Photographs

Photograph 1: Typical area outside a Train Express Limited Station

(Source of image: Shutterstock)

Photograph 2: A standard internally illuminated bollard

(Source of image: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/244067/traffic-bollards-low-level.pdf)

Budget
Trains Express Limited have budgeted for a supply price of £500 per bollard unit and wish to purchase 800 units a year from Component Tech Limited, who manufacture in the UK. They have not set a budget for the installation cost of a bollard unit within station forecourts.

Project duration
Train Express Limited would like to limit the installation time for each individual bollard to an overnight possession of the station forecourt area.

The project manager at Component Tech Limited has indicated that the overall planning, design, prototype development and manufacturing time is to be 62 weeks.
There are 32 stations, with 25 bollards proposed at each station.

The T Level is a qualification approved and managed by the Institute for Apprenticeships and Technical Education.