# T Level Technical Qualification in Maintenance, Installation and Repair for Engineering and Manufacturing (8730-12)

## 8730-033 Employer-Set Project Exemplar – A Grade

## Summer 2025

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# Introduction

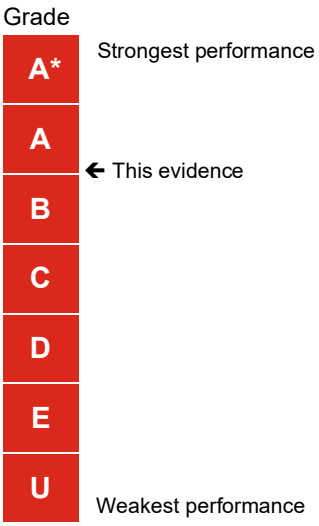
### Summer 2025 Results

This document is aimed at providers and learners to help understand the standard that was required in the summer 2025 assessment series to achieve an A grade for the 8730-033 Maintenance, Installation and Repair for Engineering and Manufacturing Employer-Set Project (ESP).

Providers and learners may wish to use it to benchmark the performance in formative assessment against this to help understand a potential grade that may be achieved if a learner was to attempt the next summative assessment series.

The Employer-Set Project is graded A* to E and Unclassified.

The exemplar evidence provided for the A grade displays the holistic standard required across the tasks to achieve the A grade boundary for the summer 2025 series.




The Employer-Set Project brief and tasks can be downloaded from here.

**Important things to note**:

- We discussed the approach to standard setting/maintaining with Ofqual and the other awarding organisations before awarding this year. As in 2024, we have agreed to take account of the newness of T Level qualifications in how we award, to recognise that students and teachers are less familiar with the assessments in the first years of awards, whilst also recognising the standards required for these qualifications (https://www.gov.uk/government/publications/ofqual-guide-for-schools-and-colleges-2025/ofqual-guide-for-schools-and-colleges-2025#grading). Ofqual guide for schools and colleges 2025
- The exemplar evidence presented, as a whole, was sufficient to achieve the A grade. However, performance across the tasks may vary (i.e. some tasks completed to a higher/lower standard than an A grade).

Marking of this Employer-Set Project is by task and Assessment Objective, below is a summary of these along with the mark achieved by the evidence presented and the maximum mark available for each aspect.

| Task | Assessment Objectives | Mark achieved | Max mark available |
|---|---|---|---|
| **Task 1 Research** | - AO1 Plan their approach to meeting the project brief<br>- AO2a Apply core knowledge<br>- AO3 Select relevant techniques and resources to meet the brief | 5 | 9 |
| | - AO2b Application of core skills | 4 | 6 |
| **Task 2 Report** | - AO1 Plan their approach to meeting the project brief<br>- AO3 Select relevant techniques and resources to meet the brief | 5 | 6 |
| | - AO2a Apply core knowledge | 4 | 6 |
| | - AO2b Application of core skills | 4 | 6 |
| | - AO5a Realise a project outcome – was the right outcome achieved<br>- AO5b Review how well the outcome meets the brief, how well the brief was met, the quality of the outcome in relation to the brief | 4 | 6 |
| **Task 3 Plan** | - AO1 Plan their approach to meeting the project brief<br>- AO3 Select relevant techniques and resources to meet the brief | 5 | 6 |
| | - AO2a Apply core knowledge | 4 | 6 |
| | - AO2b Application of core skills | 4 | 6 |
| **Task 4 Present** | - AO1 Plan their approach to meeting the project brief<br>- AO3 Select relevant techniques and resources to meet the brief | 5 | 6 |

| | | | |
|---|---|---|---|
| | - AO2a Apply core knowledge | 4 | 6 |
| | - AO2b Application of core skills | 3 | 6 |
| | - AO5a Realise a project outcome – was the right outcome achieved<br>- AO5b Review how well the outcome meets the brief, how well the brief was met, the quality of the outcome in relation to the brief | 4 | 6 |
| **Maths** | - AO4a Use of Maths skills | 2 | 3 |
| **English** | - AO4b Use of English skills | 3 | 3 |
| **Digital skills** | - AO4c Use of Digital skills | 2 | 3 |

**What evidence was being assessed for the Maths, English and Digital skills:**

Maths:

- Research Notes - calculations relating to costings (and consideration of estimations) (Task 1)
- Tolerances and dimensions on diagrams (Task 2)
- Calculations of estimated cost of replacement and installation (Task 2)
- Calculation of the total length of the conveyor belt to be used on the conveyor system and how long it will take to the package to travel the entire belt at the maximum speed of 3.05 meters per minute (Task 2)
- Calculation of cost, timescales and critical path within the planning chart (Task 3)
- Any calculations within the supporting statement (Task 3)

English:

- Research Notes (Task 1)
- Report (Task 2)
- Supporting statement for the plan of work (Task 3)
- Presentation delivery (orally) and materials to support presentation (e.g. slides etc) (Task 4)

Digital:

- Types of sources used for Research (Task 1)
- Presentation of the planning chart (Task 3)
- Presentation materials (slides, handouts, notes etc) (Task 4)

# Task 1 Research

| | |
|---|---|
| **Assessment number (eg 1234-033)** | 8730-033 |
| **Assessment title** | Employer-Set Project |

| | |
|---|---|
| **Candidate name** | <first name> <surname> |
| **City & Guilds candidate No.** | ABC1234 |

| | |
|---|---|
| **Provider name** | <provider name> |
| **City & Guilds provider No.** | 999999a |

| | |
|---|---|
| **Task(s)** | 1 |
| **Evidence title / description** | **Evidence expected for marking:**<br>Research notes<br>List of sources/references<br><br>**Evidence submitted for marking:**<br>Research notes<br>List of sources/references |
| **Date submitted by candidate** | DD/MM/YY |

## Introduction

Eastchester Delights has hired the work of PEMIR Ltd to replace their existing roller conveyor belt system with a better system for packaged food distribution. This has a budget of £40,000 and a time limit of 9 days, which includes removal, pre-installation, installation, and post installation activities. The site is open from 8AM to 6PM from Monday to Friday, and if needed, can be open on Saturdays from 8AM to 4PM.

## Regulations and Laws

HSE – Conveyor Belt Workstation Design

*Health and Safety Executive. (n.d.). Available at: https://www.hse.gov.uk/pubns/geis4.pdf*

This document covers the risk factors of developing MSD when working with conveyor belts, this covers aspects such as the workstation dimensions, how the work is organised, and the psychosocial factors.

A lot of this impacts the installation of the conveyor belt, as we need the consider:

The hight and width of the belt, which would impact the workers posture making them have to stretch or stoop. The access to the belt surface, if its obstructed, and the visibility of the work area.

Other things we will need to consider based off of this document are:

The speed of the belt for the concerning task, the ability to stop the conveyor, and whether workflow will be disrupted by a problem somewhere else on the conveyor.

Food Safety Act 1990 & Hazard Analysis and Critical Control Points principles

*GOV.UK (1990). Food Safety Act 1990. [online] Legislation.gov.uk. Available at: https://www.legislation.gov.uk/ukpga/1990/16/contents.*

Businesses must comply with general food safety laws such as the Food Safety Act of 1990 outlines the basics of food handling and processing.

*Food Standards Agency. (n.d.). HACCP model documents. [online] Available at: https://www.food.gov.uk/document/haccp-model-documents.*

HACCP is a set of principles which ensure the hygiene and safety in food handling and distribution.

## Conveyor Belt Types

I have looked at different conveyor types and decided to focus on two different types, Modular Belt Conveyors and Belt Conveyors.

Modular Belt Conveyor

*www.lacconveyors.co.uk. (n.d.). What are Modular Conveyors | L-A-C Logistics Automation. [online] Available at: https://www.lacconveyors.co.uk/what-are-modular-conveyors.*

These belts are designed for hygiene in mind, they are typically made of individual plastic (Polyurethane or Nylon) or steel modules which are linked together using joint rods. Modular belt conveyors offer several advantages such as: being robust, able to tolerate high and low-temperature products, versatility and durability, easy maintenance and chemical resistance, and a modular belt system made from Polypropylene can withstand temperatures of up to 100 degrees Celsius.

*Chase, A. (2019). Designing Your Modular Belt Conveyor. [online] Dodman Limited. Available at: https://www.dodman.com/designing-your-modular-belt-conveyor/*

Belt Conveyor

*Lacconveyors.co.uk. (2025). Standard Belt Conveyor Range | LAC Conveyors. [online] Available at: https://www.lacconveyors.co.uk/standard-conveyor-belt-range.*

A belt conveyor is typically used in industrial or manufacturing environments. It consists of a continuous loop of flexible material, otherwise known as the ‘belt’, which is moved across pulleys, allowing products to be efficiently moved across various distances and angles. These conveyors are very versatile, and are commonly used in industries such as food production. Key benefits of belt conveyors are: efficiency, durability and the customisation

*FMH Conveyors. (2021). Curved Belt Conveyor. [online] Available at: https://fmhconveyors.com/products/cbc-120-curved-belt-conveyor/*

*OCS. (2019). Advantages and Disadvantages of Different Conveyor Systems. [online] Available at: https://ocssystem.co.uk/conveyor-expertise/advantages-and-disadvantages-of-different-conveyor-systems/*

admin (2021). What is a Modular Conveyor? [online] SPG Conveyor Systems. Available at: https://www.conveyorsystems.co.uk/conveyor-guide/what-is-a-modular-conveyor/

Both of these belt types have their advantages, but they also have disadvantages, the Belt conveyor systems disadvantages are that the belts can be difficult to clean, which could also lead to sticky material getting stuck on the belt and transferring to the return side, the rolls, idlers and pulleys, and the difficulty in cleaning may run a risk of cross contamination in the foods. And Modular belt conveyors can be expensive due to the labour required to create the interlocked mesh, these conveyors also cannot run at high speeds without getting loud, which could be problematic, and they also have a set pitch, which means any belt replacement has to be an exact match to the existing sprockets.

Out of these two conveyor systems, I have decided to choose the Modular Belt Conveyor, as I think it will be a perfect fit for this, due to being easy to clean, being robust and durable and easy to maintain.

**Monitoring and Maintenance**

The belt requires condition-based monitoring and a maintenance plan.

*AI, M. (2024). Condition-Based Monitoring for Conveyors Systems. [online] Multisensorai.com. Available at: https://blog.multisensorai.com/condition-based-monitoring-for-conveyors-systems*

admin (2021). What is a Modular Conveyor? [online] SPG Conveyor Systems. Available at: https://www.conveyorsystems.co.uk/conveyor-guide/what-is-a-modular-conveyor/

Condition-based monitoring systems provide a view of the performance of a conveyors equipment and its critical components, allowing companies to reduce operational disruptions, prevent downtime, and optimize material use and energy consumption.

A condition-based monitoring system establishes a baseline thermal profile of equipment so it can identify temperature anomalies, in conveyor systems it can signal problems such as friction, blockages and overheating.

However, due to the small scale of these conveyors, and the employees which will be working alongside these conveyors, a condition-based monitoring system would not need to be implemented, as workers would be able to spot any blockages, and a modular belt system made from Polypropylene can withstand temperatures of up to 100 degrees Celsius, so any overheating would not become a problem, the modular conveyor belt doesn't get misaligned from lateral forces, which would prevent friction from within its casing.

Hairise (2025). What are the maintenance requirements for modular belt conveyors? [online] Hairiseconveyor.com. Available at: https://www.hairiseconveyor.com/a-news-what-are-the-maintenance-requirements-for-modular-belt-conveyors

A maintenance schedule would be more suitable for this. A maintenance schedule should include a daily or weekly visual inspection to identify problems, such as wear and tear, or accumulating debris, and also checking drive components, including pulleys and tensioners.

The conveyors, as they are used in food processing and distribution, would need to be cleaned daily after a shift to ensure hygiene standards are met.

And the mechanical parts would have to be lubricated regularly based on the manufacturer's standards.

**Costs**

We have a budget of £40,000, firstly we need to look at the labour cost of working multiple workers over a 9 day period, as this doesn't include weekends, we only have 7 working days, working from 8AM to 6PM, that is 10 hours of work, 70 Hours total, locally, the wage of these engineers can range from £15-£20 hourly, we will use £18 an hour for this, this is based on job listings from indeed, Mechanical Engineer Work, jobs in Bedford (with Salaries) | Indeed United Kingdom

AAB Conveyors (2020). AAB Conveyors. [online] AAB Conveyors. Available at: https://aabconveyors.co.uk/online-price-list.

AAB Conveyors price a 800mm wide conveyor 2m long at £2664, with £56 extra for every 100mm added to the length, one 16m long conveyor would cost £11,880, and three 6m conveyors would cost £5040 each and, £15,120 total. The total spent on the conveyors is £27,000, leaving £7960 left.

Other costs will include equipment, such as safety gear, gloves, goggles, hard hats, and steel toe boots, hand tools, such as wrenches, screwdrivers and electric drills and drill bits would be needed, cleaning supplies, and lifting equipment such as forklifts for the heavy sections of rollers. The company PEMIR Ltd offers installations and relocations in their services, which would mean they would have such equipment for the job already, meaning these items would not need to be added to the costs.

Rs-online.com. (2024). Contactor & Thermal Overload Relays | RS. [online] Available at: https://uk.rs-online.com/web/c/automation-control-gear/contactors-auxiliary-contacts/contactor-overload-relays/?msockid=2202f5bff7b36c3e1b96e066f6946d2e

Other items needed for the conveyors are a variable speed control start stop station, which AAB conveyors sell for £354, an emergency stop button, for £57, an overload protection relay for each conveyor would be around £50 each, coming to £200, a PLC would come with the conveyors, which then would be programmed to control the speed and direction of the conveyors. Each conveyor would also come with its own direct motor driven sprocket.

**Parameters**

Tolerances:

Belt width and length -- +-1mm

Speed variation -- +-5%

Set Points:

Speed Control – the variable speed control start stop station.

Operating Parameters:

Speed – 3.05m/min

Calibration Requirements:

Motor & drive calibration – ensuring consistent speed and torque.

Power Supply:

230V

10A

60Hz

**Additional photos and drawings**

List of sources

*Health and Safety Executive. (n.d.). Available at: https://www.hse.gov.uk/pubns/geis4.pdf*

*GOV.UK (1990). Food Safety Act 1990. [online] Legislation.gov.uk. Available at: https://www.legislation.gov.uk/ukpga/1990/16/contents.*

*Food Standards Agency. (n.d.). HACCP model documents. [online] Available at: https://www.food.gov.uk/document/haccp-model-documents.*

*www.lacconveyors.co.uk. (n.d.). What are Modular Conveyors | L-A-C Logistics Automation. [online] Available at: https://www.lacconveyors.co.uk/what-are-modular-conveyors.*

*Chase, A. (2019). Designing Your Modular Belt Conveyor. [online] Dodman Limited. Available at: https://www.dodman.com/designing-your-modular-belt-conveyor/*

*FMH Conveyors. (2021). Curved Belt Conveyor. [online] Available at: https://fmhconveyors.com/products/cbc-120-curved-belt-conveyor/*

*OCS. (2019). Advantages and Disadvantages of Different Conveyor Systems. [online] Available at: https://ocssystem.co.uk/conveyor-expertise/advantages-and-disadvantages-of-different-conveyor-systems/*

admin (2021). What is a Modular Conveyor? [online] SPG Conveyor Systems. Available at: https://www.conveyorsystems.co.uk/conveyor-guide/what-is-a-modular-conveyor/

*AI, M. (2024). Condition-Based Monitoring for Conveyors Systems. [online] Multisensorai.com. Available at: https://blog.multisensorai.com/condition-based-monitoring-for-conveyors-systems*

Hairise (2025). What are the maintenance requirements for modular belt conveyors? [online] Hairiseconveyor.com. Available at: https://www.hairiseconveyor.com/a-news-what-are-the-maintenance-requirements-for-modular-belt-conveyors [Accessed 25 Apr. 2025].

Mechanical Engineer Work, jobs in Bedford (with Salaries) | Indeed United Kingdom

AAB Conveyors (2020). AAB Conveyors. [online] AAB Conveyors. Available at: https://aabconveyors.co.uk/online-price-list.

Rs-online.com. (2024). Contactor & Thermal Overload Relays | RS. [online] Available at: https://uk.rs-online.com/web/c/automation-control-gear/contactors-auxiliary-contacts/contactor-overload-relays/?msockid=2202f5bff7b36c3e1b96e066f6946d2e

# Task 2 Report

| | |
|---|---|
| **Assessment number (eg 1234-033)** | 8730-033 |
| **Assessment title** | Employer-Set Project |

| | |
|---|---|
| **Candidate name** | <first name> <surname> |
| **City & Guilds candidate No.** | ABC1234 |

| | |
|---|---|
| **Provider name** | <provider name> |
| **City & Guilds provider No.** | 999999a |

| | |
|---|---|
| **Task(s)** | 2 |
| **Evidence title / description** | **Evidence expected for marking:**<br>Written report (typically 2000 words)<br>Annotated drawing(s) (typically one side of A3)<br><br>**Evidence submitted for marking:**<br>Written report (typically 2000 words)<br>Annotated drawing (s) (typically one side of A3) |
| **Date submitted by candidate** | DD/MM/YY |

## Introduction

This report is for Eastchester Delights, in this report, it will present our decision on what conveyor system we have chosen to solve your issue, a detailed plan on the installation process, the cost of labour and the machinery needed, the layout of the conveyor belt system, and all the operating parameters needed. In this report we will also talk about the laws and regulations, and also talk about any hazards and risks during the removal and installation process.

## The issue

The issue presented is that the original roller conveyor system was fit for use according to Eastchester Delights, and they have hired us, PEMIR Ltd., to find them a solution, with a new conveyor system. They have also requested the full removal of the previous system, and the installation of the new conveyor. We were given a budget of £40,000 and we did not exceed this budget, we were also given 9 days to complete this task, with about 10 hours each day, however the distribution company only runs Monday to Friday, meaning out of the 9 days we had to complete this task, we only have 7, with a total of 70 hours. If we needed too, the company can also run on a Saturday for 8 hours, giving us a total of 78 hours if we need the extra time.

## The solution

### *The conveyor belt system*

The conveyor belt system we have chosen for this is a *Modular Belt Conveyor*, this conveyor belt system was chosen for many reasons, these reasons include the hygiene rating for them, these conveyor belts are some of the most hygienic belts as they are easy to clean, and some are even resistant to chemicals such as modular conveyors made from stainless steel, however the material we have chosen for this specific conveyor, is Polypropylene, which is a heat resistant plastic, able to

withstand temperatures of up to 100 degrees celcius. Another reason that this conveyor belt is the right choice is that modular conveyor belts have a robust and durable design, as they are made from individual pieces of plastic, fixed together with metal or plastic rods, making a mesh like structure which doesn't misalign from lateral forces, and is also easy to maintain, as any parts of this conveyor belt can be removed and replaced to keep it in top condition. The conveyor is also driven by a sprocket, which is the reason that misalignment from lateral forces can't happen, and it also means that the belt has a direct drive, rather than being driven by a pully system.

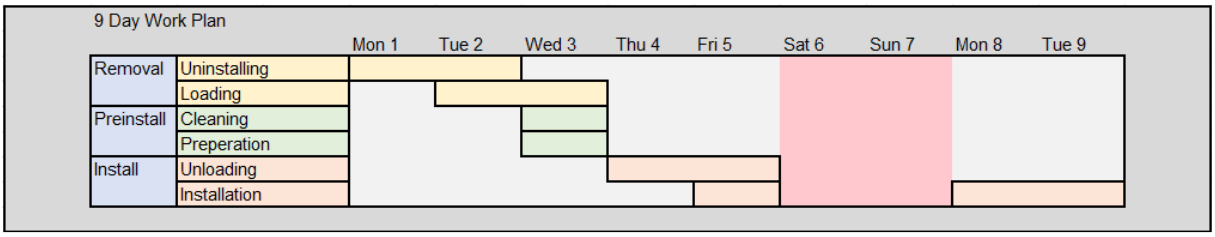
### *Brief Requirements*

The requirements state that the belt width needs to be between 600mm and 1000mm, our belt is 800mm, which fit this requirement. Another requirement was that thee belt length is

34m, which we also got. The requirements for the specifications of the belt, such as the speed being adjustable up to 3.5 meters per minute, having a direct drive system, and being compatable with relevent Food Safety Regulations have all been met. Other requirements such as it being controled by a programmable logic controller, having an emergency stop button, and having overload protection have also been accounted for, however we did not manage to incorperate a quick release for the belt tension, which means the tension would have to be manually released and then tensioned again after any maintenance or service. It also has an included warrenty of 1 year, and an extendible warrenty for £350 per year and piece of machinery, we have four conveyor belts, meaning it would cost £1400 for that extra year of warrenty.

*Removal and Installation*

For the removal and installation of the conveypr belt systems, four of our mechanical engineers from PEMIR Ltd. Have been put to work on this job, there must also be constant acces to site for the employees, but restricted access for anyone who isnt meant to be on the premises, as dangerous machinery will be operated at this site, this chart I made shows a basic day to day explination to how time will be allocated.




1. Removal

The removal will consist of two main parts, the uninstalling of the conveyor belt, and the loading it into a truck to be removed from the premises. Uninstalling the Conveyor belts will take over 10 Hours of work to do, as not only will it be removal from its fixtures from to the ground, but also the dissasembly of the belts themselves for easy transport and removal.

The four engineers will be using our company tools which we already own, the tools at their disposal will be screwdrivers, wrenches, drills and drill bits, and other and tools such as prybars just in case some of the old conveyor system is broken or have broken pieces which are difficult to remove. The engineers will also be wearing safety gloves, steel toe capped boots, goggles and hard hats for their safety, other items they will have with them are cleaning supplies for future use.

Prior to removal the electricity in the distrobution centre will be turned off, and worklights will be set up for the engineers to have the lighting they need, without the risk of any electricity still be running during the uninstallation and installation processes, other things needed are a couple pallets, ratchet straps and a forklift.

The workers will spend the first and second day uninstalling the original conveyor belts, and breaking them down into smaller pieces, such as the rollers themselves, and large bits of metal which cannot be broken down, the workers will place these pieces of machinery or rollers onto pallets, securing them with ratchet straps, and loading them into the back of a lorry using a forklift, these bits of machinery may be sold or recycled.

2. Preinstall

The pre-installation process should not take more than a day of work, this just requires a clean of the area, which will be a sweep and a mop of the area, the preperation will be a bitlonger than the cleaning, as it will require measuring and marking the positions of where everything will go, making sure the wiring is in place where needed, as well as drilling any new installation holes as needed, and installing new wiring for other pieces of important control systems such as the emergency stop buttons.

3. Install

The install will take the majority of the time as we have to unload all the machinery, install it, and also test it to make sure it works as we go along. Firstly, all the machinery would arrive on pallets or for the smaller pieces of machinery, in wooden crates. These would have to be unloaded, unboxed, and sorted, which would take over a day.

The next day the installation process would begin, the first conveyor, the largest one at 16 meters long, would be installed first, the hight this one would be installed at is 85cm as this is the averege middle height of a person, and the HSE guidelines state that the conveyors must be installed at a height to prevent stretching or stooping of the workers, as constant stretching or stooping can lead to MSD.

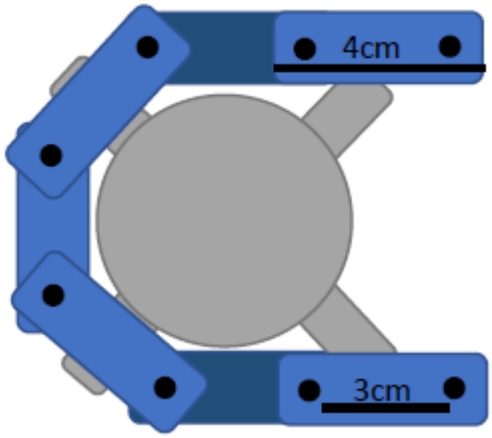
After this conveyor is installed, it will be fitted with a variable speed control start stop station, which will allow the speed to be controlled, later we can connect this to our PLC which we will allow us to control the speed of all the conveyors, and an overload protection relay would also be installed. After this conveyor is installed, we can install the other three, 6m long conveyors the same way, once this is all done, we will install three emergency stop buttons across the room, which will allow any worker to call an emergency stop in case of a major issue.

And after machinery is installed, most of the final day will be used to program the PLC to be able to change the speed using the variable speed start stop controller, and also testing whether the emergy stop buttons work, and if the conveyor belt is running as correctly.

## Calculations

*Conveyor belt length*

The conveyor belt system is 34 meters long, however the belt itself is over 34 metres long, as it has to cover both the top and bottom, and also bend around the edges of the sprocket and the bearings keeping it tensioned.




This is a basic drawing of the sprocket, each link of modular belt is 4cm long, and from the centre of each connecting rod is 3cm long, and the darker blue belt link signifies the end of each top and bottom part of conveyor. Using these lengths we can calculate the total length of belt we need, starting with the 16m long conveyor, we have a base length of 16, multiplied by 2 for both sides, makes 32m, we know that each link is 4cm long, but theyre connected 0.5cm in from each edge, meaning that when when you add a link onto an exsisting one, you only gain 3cm of length, and we can also see that it only takes 3 links on a sprocket to conect both the top and bottom, this would also be the same case for the other shaft with the bearing, only without the teeth of the sprocket being there, so 6 links added total to the length, and at 3cm a link, would mean 18cm, so the total length of belt for the longest conveyor would be 32.18m or 3218cm. And we can apply this for each 6m long conveyor too, multiplying 6 by 2 to get 12m, and adding 18cm on makes 12.18m or 1218cm, we can multiply this by three to get the length of all three 6m long conveyors combined, totalling to 36.54m or 3654cm, adding the length of the other conveyor we get a total length of 68.72m or 6872cm.

*Travel time*

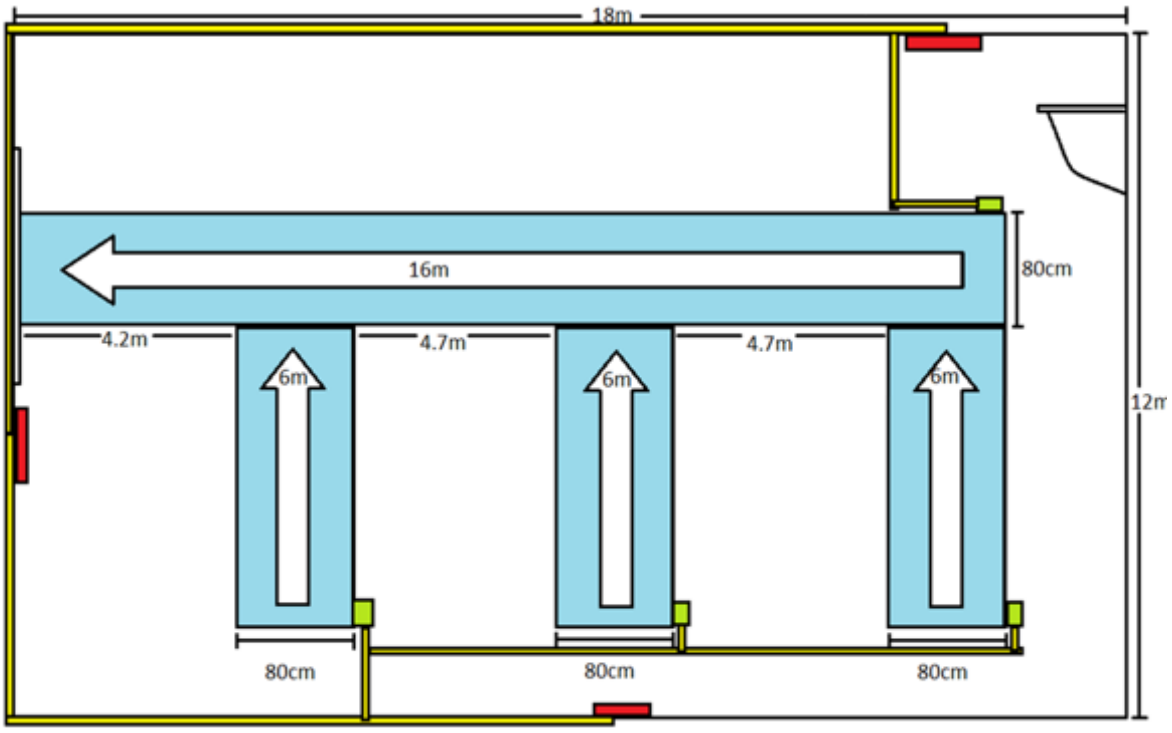
If a box, 50cm x 50cm x 50cm, starts on the far right conveyor, at the bottom of it, with its centre on the centre line of the conveyor, and it travels straight until the whole box is completely on the next conveyor before travelling left across the long conveyor, and it stopping once it has reached the garage door, measuring from the exact centre of the box, it would travel exactly 6m before reaching the second conveyor, as we said it would only move once it was completely on the second conveyor, then the rest of the journey can be worked out by doing first (80-50)/2, to find out the distance from the edge of the box to the edge of the first conveyor, which is 15cm, adding 25cm to 15cm as we are not measuring the distance from the edge of the box but rather the centrepoint, making it 40cm, and then the box stops once it edge reaches the garage door, adding another 25cm as it measures from the centrepoint, which gives us 65cm, which we then remove from 16m leaving us with 15.35m, and finally we add the initial 6m of travel, which gives us 21.35m.

If the box were to travel at your max speed you requested, 3.05, it would mean that it would take 21.35m/3.05mpm (mpm meaning Meters Per Minute) which is 7 minutes.

If we want to work out the other conveyor belt times, all we do is count how many from the right conveyor is, and then subtract the distance between and the width of the conveyors to the right of it from 21.35m, so for the middle one it would be 21.35 – (4.7+0.8) = 21.35 – 5.5 = 15.85m as the travel distance, and the time taken is 15.85m/3.05mpm which roughly equals 5 minutes and 12 seconds.

And for the far left conveyor, it would be 21.35 – (5.5x2) = 21.35 – 11 = 10.35m travel distance, and the time taken is 10.35m/3.05mpm which roughly equals to 3 minutes and 24 seconds.

On the image below, you will see a drawing showing how the box with the longest path, is being measured.




The green line following going through the orange boxes show the path the box will follow, the dimensions of every stage was explained previously, this is just a visualisation of the distance the box travelled.

**Monitoring**

As a company, we decided that for the scale of your distribution plant, a condition-based monitoring system would be an expensive waste of resources. A condition-based monitoring system would require more electronics that would be outside of the £40,000 budget, rather than a condition-based monitoring system, we think that a preventative maintenance plan would be a better suit for your company.

We think this because the modular conveyor belt system we have picked for you wont need a lot of maintenance, as the belt is veryb robust and durable, it wont break easily, and problems other belts face are misalignment from lateral forces, a modular belt is moved by sprockets, which go between the gaps of the belt, meaning that for misalighnment to happen, all the teeth on the sprocket would have to break off, to allow lateral movement, and as there is no lateral movement, there will be no friction against the edges, meaning the whole belt will wear down evenly over time and wont cause any specific faliures on the edges.

And if friction anywhere else was present, heating up would not be a problem as weve decided to use polypropylene, which is resistant to temperatures up to 100 degrees celcius.

The plan we have come up with for you is simple:

**Daily** visual checks, every morning before turning the belts on, have your employees look over it just for any signs of damage, or any loose pieces fo tape or cardboard that may have come off the packaging you use.

**Bi-Weekly** lubrication, every two weeks, lubricate the bearings and the sprockets to ensure theyre moving smoothly.

**Bi-Monthly** servicing, every two months, have a maintenance engineer have a good look over all the machinery, see if it's working correctly, signs for wear and tear on the insides, recalibration to ensure constant speeds and torque, and a safety check on all emergency stop buttons.

With this preventative maintenance plan, it won't take much time out of your daily work, and it will save money on on a condition-based monitoring plan.

**Cost**

The budget given was £40,000.

Our 4 technitials get paid £18 an hour each, over the total 70 hours, we spent £5040 on labour.

We found a company that sold 800mm wide conveyors, the base one was 2m long, which costed £2664, and each 10cm of length added costs an extra £56.

The 16-metre-long conveyor costed £11,880, the maths for this is 16-2 is 14, 14x100 is 1400cm, 1400/10 is 140 extra length segments, 140x56 is £7840, plus £2664, makes £10504, and plus the included PLC, and the direct motor driven sprocket, came out to £11,880

The three 6-meter-long conveyors costed £5040 each, each one started as a base of £2664, with 4m extra, so 4x100/10 making 40 extra pieces, at £56 a piece, costed £2240, plus the base making £4904, plus the motor driven sprocket makes £5040, three of those is £15,120.

All conveyors add up to cost £27,000.

All the extras, the cost of the transport lorry for delivery of the conveyors, £300, and for the removal, £300, the warrenty on all four conveyors for the two years rather than one, £1400, the electrical work costing £100 , variable speed control start stop stations at £354 each, we needed four, which came out to, £1416. Emergency stop buttons at £57, which we used three of, which came to £171. And Each overload protection relay for each conveyor, at £50 each, coming to £200.

All the costs totalled up come to £35,927.

Meaning we stayed well within the budget.

**Health and Safety Regulations**

*Food Safety Act 1990*

The food safety act of 1990 states that all businesses that work with food, must comply to their regulations, the food safety act outlines the basics of food handling and processing.

*Hazard Analysis and Critical Control Points*

The HACCP is a complex set of principles which are often used by businesses that handle food products to ensure that they are following the correct standards of hygiene and safety if food handling and distribution.

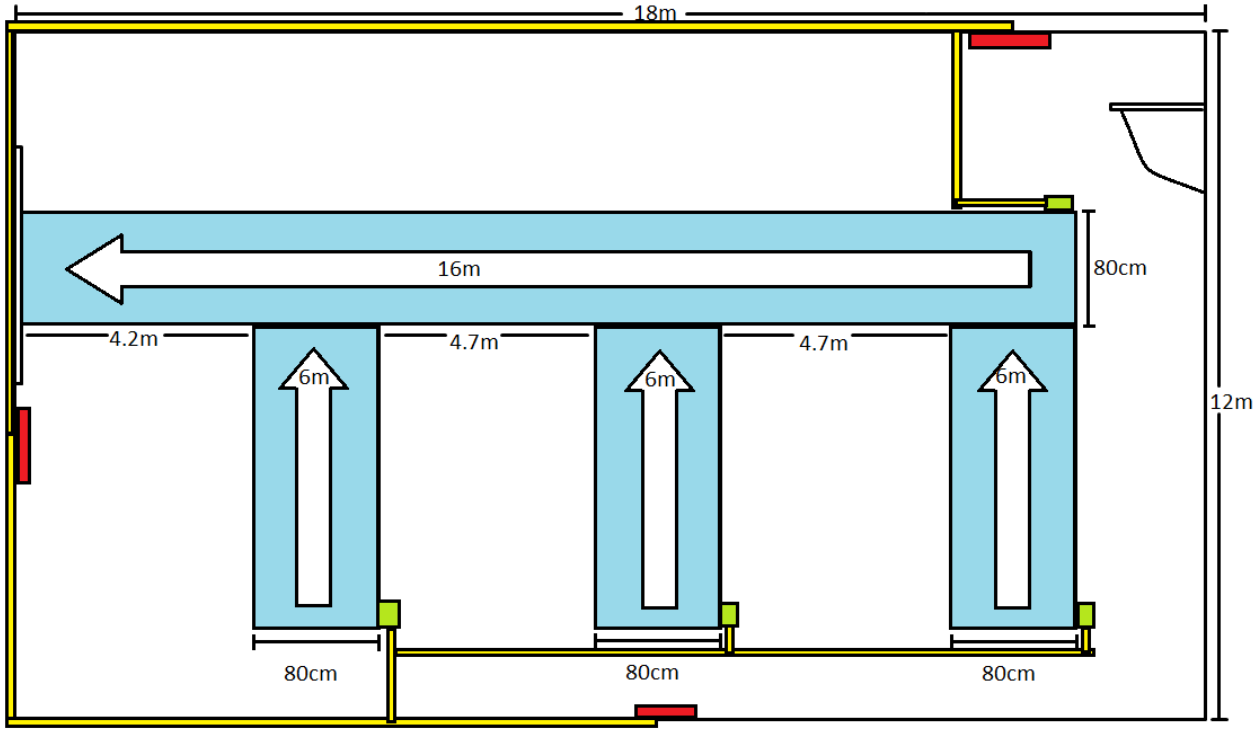
*HSE – Conveyor Belt Workstation Design*

We briefly discussed this earlier, but this HSE document covers a lot of the risks in developing MSD while working with conveyor belts, which is why we chose to put them at the specific height, other factors which are outlined in the HSE document, such as the workstation dimensions, how its organised and the psychosocial factors. Mostly we will focus on the workstation dimensions as our job is the installation process, what we focused on are:

The height and width of the belt, which would impact the workers posture, making them stretch or stoop which may lead to MSD as said previously.

And other things like the speed, and the ability to stop the conveyor were taken into account.

In Yellow, the electrical connections are drawn, in Green are the Variable speed control start stop stations, in Red are the emergency stop buttons, in Blue are the conveyor belts, the arrows show in which direction they are meant to be moving any boxs, each width and length are labelled other than the distances i do not know.



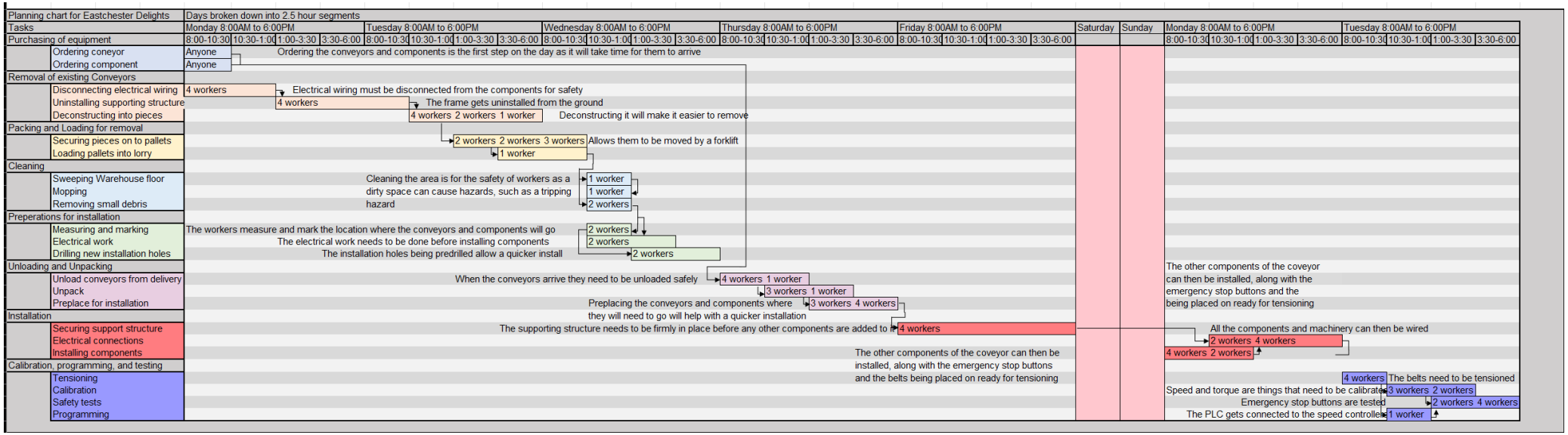
# Task 3 Plan

| | |
|---|---|
| **Assessment number (eg 1234-033)** | 8730-033 |
| **Assessment title** | Employer-Set Project |

| | |
|---|---|
| **Candidate name** | <first name> <surname> |
| **City & Guilds candidate No.** | ABC1234 |

| | |
|---|---|
| **Provider name** | <provider name> |
| **City & Guilds provider No.** | 999999a |

| | |
|---|---|
| **Task(s)** | 3 |
| **Evidence title / description** | **Evidence expected for marking:**<br>Planning chart (typically one side of A3)<br>Support statement (typically 1000 words)<br><br>**Evidence submitted for marking:**<br>Planning chart (typically one side of A3)<br>Support statement (typically 1000 words) |
| **Date submitted by candidate** | DD/MM/YY |


Planning chart for Eastchester Delights
Days broken down into 2.5 hour segments
Tasks
Monday 8:00AM to 6:00PM
Tuesday 8:00AM to 6:00PM
Wednesday 8:00AM to 6:00PM
Thursday 8:00AM to 6:00PM
Friday 8:00AM to 6:00PM
Saturday
Sunday
Monday 8:00AM to 6:00PM
Tuesday 8:00AM to 6:00PM
8:00-10:30 10:30-1:00 1:00-3:30 3:30-6:00
Purchasing of equipment
Ordering coneyor
Ordering component
Anyone
Ordering the conveyors and components is the first step on the day as it will take time for them to arrive
Removal of existing Conveyors
Disconnecting electrical wiring
Uninstalling supporting structure
Deconstructing into pieces
4 workers
Electrical wiring must be disconnected from the components for safety
The frame gets uninstalled from the ground
2 workers
1 worker
Deconstructing it will make it easier to remove
Packing and Loading for removal
Securing pieces on to pallets
Loading pallets into lorry
3 workers
Allows them to be moved by a forklift
Cleaning
Sweeping Warehouse floor
Mopping
Removing small debris
Cleaning the area is for the safety of workers as a dirty space can cause hazards, such as a tripping hazard
Preperations for installation
Measuring and marking
Electrical work
Drilling new installation holes
The workers measure and mark the location where the conveyors and components will go
The electrical work needs to be done before installing components
The installation holes being predrilled allow a quicker install
Unloading and Unpacking
Unload conveyors from delivery
Unpack
Preplace for installation
When the conveyors arrive they need to be unloaded safely
Preplacing the conveyors and components where they will need to go will help with a quicker installation
Installation
Securing support structure
Electrical connections
Installing components
The supporting structure needs to be firmly in place before any other components are added to it
The other components of the coveyor can then be installed, along with the emergency stop buttons and the belts being placed on ready for tensioning
The other components of the coveyor can then be installed, along with the emergency stop buttons and the belts being placed on ready for tensioning
Calibration, programming, and testing
Tensioning
Calibration
Safety tests
Programming
All the components and machinery can then be wired
The belts need to be tensioned
Speed and torque are things that need to be calibrated
Emergency stop buttons are tested
The PLC gets connected to the speed controller

**Statement**

I feel that this planning chart I created outlines clearly what and when something will be time, it clearly shows how the days are broken down, how many tasks are being done at that time, and how many workers have been delegated for each task at hand.

Each worker is always doing something, we have no wasted time meaning we can be extreamly efficient with what and how we do it, but in this statement, I will break down why the ammout of workers are doing any given task, what responsibilities those workers have and any health and safety conserns that may arise.

Ordering the conveyor and components can be done by anyone from our company, it does not have to specifically be a worker.

Disconnecting electrical wiring, and uninstalling the support structures are both jobs that we need to get done quickly before we can start seperating tasks, the tools we would need for this are wire cutters, drills,

screwdrivers, possibly prybars and wrenches. Some health and safety considerations here are that the electricity would need to be shut off before working on the wires, as working on live wires can cause death.

Deconstructing the structure into pieces is a task that all workers will start doing, but after enough to be packaged is deconstructed, the workers will split into two, one group packing and the other still deconstructing, after some pallets have been loaded, another worker will move on from deconstructing and operate a forklift to load these pallets into a removal lorry. Some safety considerations for this are the forklift opperator will be working around people, meaning that they will have to be careful when driving, lifting, and loading the heavy pallets.

All the cleaning tasks can be split up between the workers, but this is an essential step for safety, as debris, or a wet or sticky floor can be a tripping hazard.

The measuring and marking, and the electrical work can be done at the same time, as two workers can plan out where the holes for the new conveyor will be drilled, and where the wiring will need to go for the emergency stop buttons, and while the measuring and marking is being done, the electrical work for the connections for the new conveyor can be done, and once the marking is done, the electrical work for the emergency stop buttons can be done, while the other workers drill the installation holes for the conveyors support structure. The same hazard goes for this, that working on wires can be deadly if left live, that’s why we would need to check that the electricity is shut off.

Once the shipment arrives, all workerswill start unloading the conveyors from the delivery, which means moving them from the lorry onto a worklift then using the forklift to place them where needed, doing it all together will allow the shipment to be unpacked quickly. All workers start doing this but when all the major conveyors are removed, three workers split off to to start unpacking the conveyors themselves, while one worker unloads the smaller components, such as the boxes of emergency stop buttons, the PLC, the speed controllers and other smaller, more managable parts. Some hazard considerations for this are lifting

heavy items, or pieces of machinery, if done incorrectly can cause serious pain and damage, another hazard consideration is dropping any of the machinery, the machinery is very heavy, not properly lifting it with a forklift can cause it to fall, killing or injuring someone and doing serious damage.

Then after the lorry is unloaded, the workers will preplace the conveyors and other components for installation, before doing any installation. This is done so that rather then having to go retrieve pieces for the installation once you finish a piece, each piece that is needed is within reach of where it will be needed. This will allow a much quicker and smoother installation process.

The support structure is the first thing that needs to be installed and all the components will be fitted to it. The tools needed for this are bolts and screws, along with screw drivers and wrenches.

The components can then be fitted to the support structure, after they are fitted, two workers can start doing the electrical work on the conveyor belt components, while the other two workers start installing the emergency stop buttons in their respective locations. The components in the conveyor belt are fitted first, as the electrical work for them will take the longest.

Once the emergency stop buttons are installed, the two workers who installed them would also do the electrical work, while the others continue doing the electrical work on the conveyors.

For the electrical work, wiring, a crimping tool and wire crimps, and different electrical components such as splitters are needed.

And finally, 4 workers will be needed for the tensioning, one for each conveyor belt, once that is done, everything else can be worked on, the tensioning is done first as the conveyor belt is needed to be able to properly run so it can be calabrated, programmed and safety tested.

The conveyors are then individually calabrated for their speed and torque by three workers, while one worker programs a PLC so that all the conveyors run together and can have their speed adjusted together. After that, 2 workers continue to calibrate the conveyors while the other 2 workers run safety tests, ensuring the emergency stop buttons are connected, and testing whether every component is fastened properly. Anf

finally, all the workers finish the safety testing with testing all the conveyors and the emergency stop buttons at the same time, this is done last, as everything was required to be running properly, to test whether it can be stopped properly.

# Task 4 Present

| | |
|---|---|
| **Assessment number (eg 1234-033)** | 8730-033 |
| **Assessment title** | Employer-Set Project |

| | |
|---|---|
| **Candidate name** | <first name> <surname> |
| **City & Guilds candidate No.** | ABC1234 |

| | |
|---|---|
| **Provider name** | <provider name> |
| **City & Guilds provider No.** | 999999a |

| | |
|---|---|
| **Task(s)** | 4 |
| **Evidence title / description** | **Evidence expected for marking:**<br>Presentation materials<br>Video recording of presentation<br>Presentation Q&A Record<br><br>**Evidence submitted for marking:**<br>Presentation materials<br>Video recording of presentation<br>Presentation Q&A Record |
| **Date submitted by candidate** | DD/MM/YY |

# Conveyor Belt Solution

From PEMIR Ltd.

## The belt we've chosen

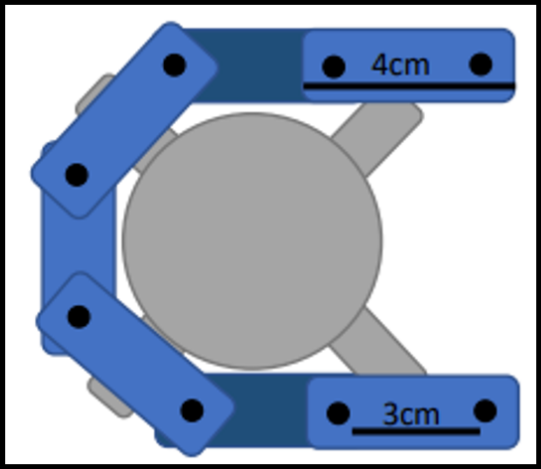
### A modular belt conveyor system.

- Hygiene, easy to clean and maintain.
- Chemical resistant.
- Heat resistant, if made with polypropylene, it can withstand up to 100 degrees Celsius.
- Doesn't misalign from lateral forces.
- Easy maintenance and replacement of broken pieces.

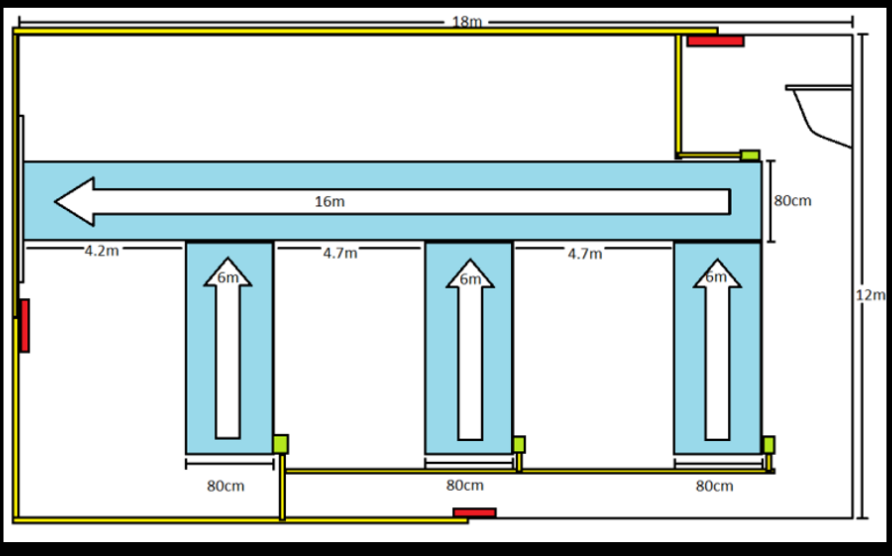
# How it functions and your requirements

- Interlocking pieces to form the belt.
- Motor driven sprocket
- Programmable PLC

- Belt between 600mm and 1000mm
- 34 meter length, as original
- Adjustable speeds of 3.05m/m
- Warranty
- Overload protection
- Emergency stop buttons

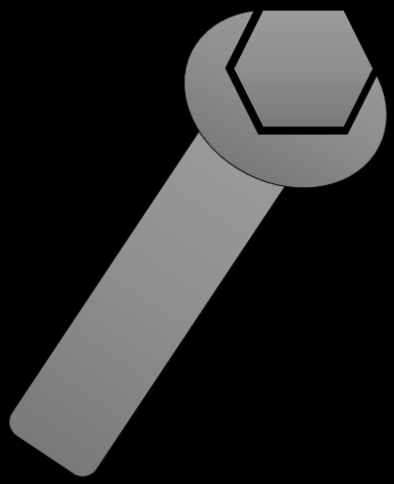



# The system



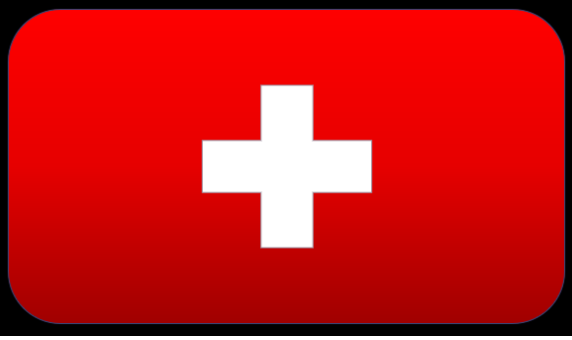
## Preventative maintenance system

- Daily visual checks
- Bi-Weekly lubrication
- Bi-Monthly servicing



## Health and Safety Considerations

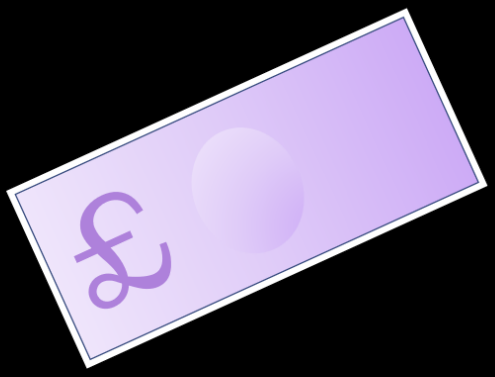
- HSE – Conveyor belt workstation design
- Food Safety Act 1990
- Hazard Analysis and Critical Control Points



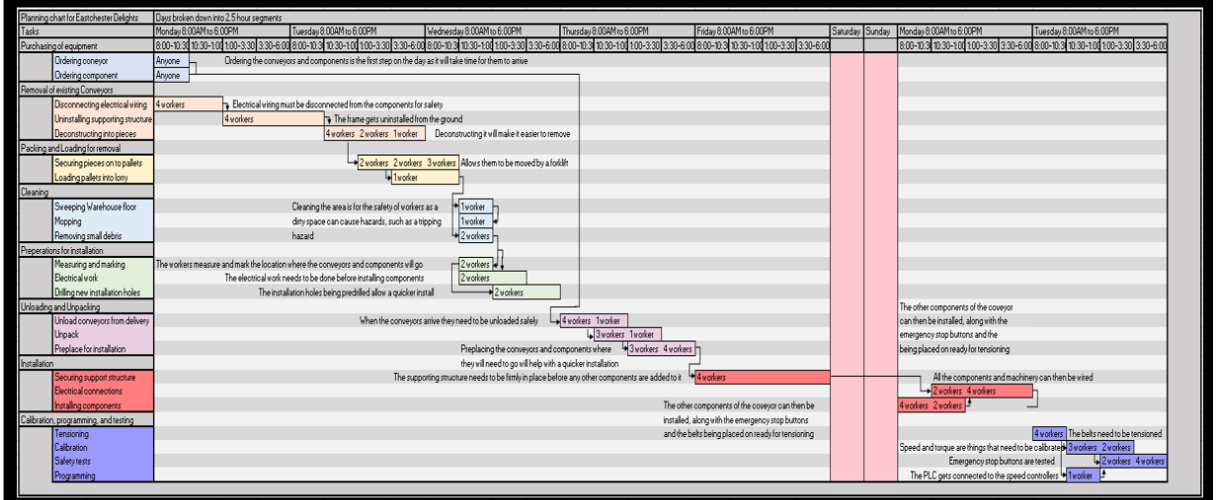
# Budget

- £40,000 to work with

- £5040 on labour
- £27000 on conveyor belts
- £1400 on warranty
- £2487 on components
- Total spent £35,927
- Total saved £4073




# Work Plan



## Challenges we've overcome

- The original budget
- The conveyor belt system provider
- Timing
- Good Working schedule

## Things we would do differently

- More thorough research
- More thorough planning
- Deeper dive into the regulations

Thank you for listening

# Employer-Set Project – Presentation Q & A Record (Task 4)

**8730-12 T Level Technical Qualification in Maintenance, Installation and Repair for Engineering and Manufacturing**

**8730-033 Employer-Set Project (Summer 2025)**

| | |
|---|---|
| **Candidate name** | <first name> <surname> |
| **City & Guilds candidate No.** | ABC1234 |
| **Date** | DD/MM/YY |

| | |
|---|---|
| **Provider name** | <provider name> |
| **City & Guilds Provider No.** | 999999a |

Record observation notes below to inform external marking. **Notes must be detailed, accurate and differentiating.**

| Tutor questions to candidate | Candidate responses |
|---|---|
| What additional information would have been useful for us to have provided in the project brief? | The assignment brief provided a lot of information including layout of the warehouse but no information of what kind of package food, kind of packaging or any chemicals could have been used, if chemicals been specific. |
| How did you go about answering the calculations in your report? | I used the ABB conveyors, it is on their website. For the product we are looking at is 800mm conveyor belt for £2864 along with 100mm extra length could work as £10800 incl them with shipping. |
| Why you have chosen a modular belt conveyor system? | When I conducted the research searches most of the result comes up for processing food + distribution are modular + polyethelyne conveyor belt. I've chose module because a lot easy to maintain, a lot cleaner. |
| | |

| | |
|---|---|
| | |

| Any other comments |
|---|
| |

| Tutor signature | Date |
|---|---|
| | DD/MM/YY |

If completing electronically, double click next to the 'X' to add an electronic signature once the record is **finalised**.

## Get in touch

The City & Guilds Quality team are here to answer any queries you may have regarding your T Level Technical Qualification delivery.

Should you require assistance, please contact us using the details below:

Monday - Friday | 08:30 - 17:00 GMT

T: 0300 303 53 52

E: **technicals.quality@cityandguilds.com**

W: **http://www.cityandguilds.com/tlevels**

Web chat available **here**.

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