

T Level Technical Qualification in Building Services Engineering for Construction (8710-30)

**8710-033 Employer-Set Project
Exemplar – A Grade
Summer 2024**

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Introduction

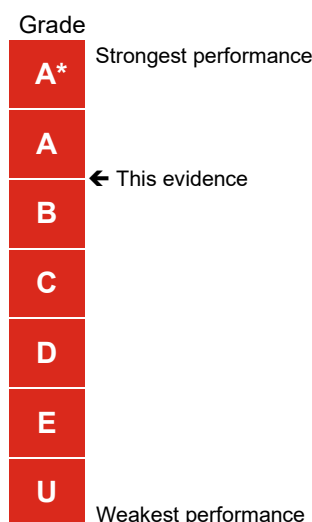
Summer 2024 Results

This document is aimed at providers and learners to help understand the standard that was required in the summer 2024 assessment series to achieve an A grade for the 8710-033 Building Services Engineering for Construction 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 2024 series. A slightly weaker performance would have resulted in a B grade result being issued.



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. We have agreed to take account of the newness of qualifications in how we award this year to recognise that students and teachers are less familiar with the assessments whilst also recognising the standards required for these qualifications ([grading-arrangements-for-vtqsand-technical-qualifications-within-t-levels-in-the-academic-year-2023-to-2024](#)).
- 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 1.1 Research	<ul style="list-style-type: none"> - AO1 Planning skills and strategies - AO2a Apply knowledge to the context of the project - AO3 Analyse contexts to make informed decisions - AO4c Use digital skills 	6	9
Task 1.2 Report	- AO1 Planning skills and strategies	5	6
	- AO2 Apply knowledge and skills to the context of the project	9	12
	- AO3 Analyse contexts to make informed decisions	2	2
	- AO4 Use maths, English and digital skills	4	6
Task 1.3 Project plan	<ul style="list-style-type: none"> - AO1 Planning skills and strategies - AO3 Analyse contexts to make informed decisions - AO4a Use maths skills 	6	8
	- AO2 Apply knowledge and skills to the context of the project	8	16
Task 1.4 Presentation	<ul style="list-style-type: none"> - AO1 Planning skills and strategies - AO3 Analyse contexts to make informed decisions - AO4b Use English skills 	4	6
	- AO2 Apply knowledge and skills to the context of the project	8	12

Task 2.1 Collaborative problem-solving	<ul style="list-style-type: none"> - AO2 Apply knowledge and skills to the context of the project - AO3 Analyse contexts to make informed decisions - AO5a Carry out tasks 	10	15
Task 2.2 Evaluation	<ul style="list-style-type: none"> - AO4b Use English skills - AO5b Evaluate for fitness for purpose 	5	8

Task 1.1 Research

Assessment number (eg 1234-033)	8710-033
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)	1.1
Evidence title / description	Research notes (with record of sources)
Date submitted by candidate	DD/MM/YY

Research 1.1

EV chargers

There are many different types of EV chargers and to make it easier to understand we can categorise them into speed and location, in terms of speed there are typically 4 types of chargers, **Slow, Fast, Rapid, Ultra Rapid**.

In terms of location: **Home EV** chargers - these are designed for residential properties and are generally slow to fast electric vehicle chargers.

Public EV chargers - these are found in areas such as supermarkets or car parks and can vary in speed all the way up to ultra-rapid.

When it comes to the hardware that is used there are many different connector types which can depend on what electric vehicle you have, and the power rating of the EV charging point you are trying to use. In the UK there are 5 main plugs that are used on EV charging systems.

- UK 3 pin plug – This is the standard plug system used in homes which is often not suitable for charging electric vehicles as they have a maximum power output of 3kW which is around 5 miles of range per 30 minutes of charging.
- Type 1 plug - These offer a power output of around 3 - 7kW, which can get you about 12 miles for every 30 minutes of charging. Type 1 plugs are less common in modern electric cars and have no locking mechanism when the car is connected to an electrical supply.
- Type 2 plug - These are becoming the standard European charging connector type and offer a power output of around 3 - 40 kW. Type 2 plugs are compatible with both single and three-phase electricity supplies and can give you approximately 75 miles of driving range for every 30 minutes of charging.
- CHAdeMO plug - CHAdeMO plugs offer a power output of around 50kW and are generally found in older types of EV rapid chargers, offering 85 miles ranges per 30 minutes charge. CHAdeMO plugs are compatible with Japanese vehicles and one reason for their popularity is that they work with the Nissan Leaf.
- Combined charging system (CCS) plug - The CSS plug is on its way to becoming the most popular DC connector standard and enables high power output of 50 - 300kW. This can support ultra-rapid chargers and can give you 85-200 miles per 30 minutes of charging.

In my opinion I think that the CCS system plug would be most suitable when installing EV charging points on this project as it provided a fast-charging solution for people who wish to charge their vehicle while shopping or partaking in leisure activities.

Reference – 16/04/2024 – 09:58

https://www.eonnext.com/electric-vehicles/ev-guides/ev-charging-connector-types?gad_source=1&gclid=EAlaIQobChMIhsW1iazGhQMvYpVQBh0ewg9wEAAYASAAEgJHf_D_BwE

Different types of charging systems

- **Low speed and standard charge points** - Low speed and standard charge points are often the cheapest to use and are suitable when vehicles are parked for several hours, such as during working hours or overnight. These include on-street public chargers in residential areas of villages, towns, and cities and off-street private charging points in households with off-street parking availability. **Power output ranges from 2.0kW – 8kW.**
- **Fast chargepoints** - Fast charge points ideal when vehicles are parked for a few hours. This can include hotels, shopping centres, leisure centres, tourist destinations or car parks used for more than two hours. **Power output ranges from 8kW – 49kW.**
- **Rapid and ultra-rapid charge points** - Rapid charge points are the quickest way to recharge a vehicle, typically recharging a vehicle to 80% in around 30 minutes. However, rapid charge points can be the most expensive to use, and they cannot be installed at home. This can include quick shopping trips, service stations or car parks used for less than two hours. **Power output ranges from 50kW – 150kW+.**

Reference – 16/04/24 – 10:20

https://energysavingtrust.org.uk/advice/charging-electric-vehicles/?gad_source=1&gclid=EAlaIQobChMIhsW1iazGhQMvYpVQBh0ewg9wEAAYAAEgK60vD_BwE

Installing EV charging points and regs

When it comes to installing EV charging systems it is advised that a qualified electrical engineer should be subcontracted to carry out the work and this minimised the risk of issues with the charger in the future allowing the system to be certified and signed off to be safe for us by a professional. In terms of regulations to do with the charging point, the government has recently released “The Public Charge Point Regulations” on the 24th of November 2023. The regulations build on 4 key areas of the consumer experience to ensure:

- Consumers can easily locate the right public charge point to fit their needs
- Ease of payment across public charge points
- Consumers can be confident that public charge points will be in good working order
- Consumers can compare prices across multiple public charge point networks

Reference – 16/04/24 – 10:35

<https://www.gov.uk/government/publications/the-public-charge-point-regulations-2023-guidance/public-charge-point-regulations-2023-guidance>

Space heating technology

When it comes to heating and ventilating large retail units like the ones in question it is crucial that the system is capable of heating such a large area consistently without any issues, due to this reason I think that **air source heat pumps** would be most suitable to use on this project. Air source heat pumps are ideal for office premises, business parks, commercial enterprises, factories, and many more. Heating commercial premises with a heat pump can significantly reduce heating costs and increase your organisation's green credentials. The low-level constant heat will also create a better working environment for employees. An air source heat pump (sometimes referred to as an air-to-water heat pump) transfers heat from the outside air to water. This in turn heats rooms in your home via radiators or underfloor heating. It can also heat water stored in a hot water cylinder for your hot taps, showers, and baths.

Advantages

- Environmentally friendly
- Low maintenance
- Efficient models
- Eligible for various grants
- Safer than combustion boilers
- Long lifespan
- Can be paired with solar panels
- Minimal noise
- Can provide both heating and cooling

Disadvantages

- Expensive running costs
- Expensive upfront cost
 - Not suitable for all properties
- Relies on electricity, which isn't always green
- Needs to be paired with large radiators or underfloor heating
- Can be tricky to install
- Planning permission

Installation requirements for an ASHP

Installing an air source heat pump requires a competent professional with a thorough understanding of several key areas including low-temperature heating systems, vapour compressors, weather compression and heat pump controls, in order that the system can be set up correctly for best performance and efficiencies. ASHPs have refrigerant circulated in the compressor and function at low temperatures to optimise their efficiency. They are not devices that can simply be switched on and off like a conventional boiler, so need to be set up correctly to achieve the right level of efficiency and avoid using more electricity than it needs to. This heat pump will have electrical connections that have to be set up by appropriately qualified electricians as well as plumbing circuits that need to be made by unvented system qualified and experienced installers.

- By installing ground source heat pumps on site it will create a more sustainable and energy efficient environment which is crucial when considering the UK's plans to go net 0 by 2030, air source heat pumps will also save a lot of money in the long run on energy bills along with the fact that these systems can be easily paired with solar PV systems to create an even more sustainable system.

How do air source heat pumps work?

A heat pump works a bit like an inside-out fridge. It captures heat from outside and moves it into your home, using electricity to do so. Here's how it works:

- Outside air is drawn in over a network of tubes filled with refrigerant gas, which circulates at -28°C to extract heat energy from the air outside.
- The gas passes through a compressor which increases the pressure and temperature causing it to change from a cold gas to a hot liquid.
- The compressed hot liquid passes into a heat exchanger that heats water for both your radiator heating circuit and your taps. The refrigerant then turns back into a cold gas and starts the cycle all over again.

Air source heat pumps work at a lower internal temperature than a gas or oil-fired boiler, so your radiators will not feel as warm - this is because they are now more efficient and don't need to be as hot. It will provide gentle heating over longer periods rather than quick boosts of heat on demand.

Reference – 16/04/24 – 10:36

<https://heat-pumps.org.uk/air-source-heat-pump-installation/#:~:text=Installing%20an%20air%20source%20heat%20pump%20requires%20a%20competent%20professional,for%20best%20performance%20and%20efficiencies.>

Reference – 16/04/24 – 10:40

https://www.googleadservices.com/pagead/aclk?sa=L&ai=DChcSEwjTiaCytMaFAxVZmFAGHUKDDJ0YABAQGgJkZw&ase=2&gclid=EAlaIQobChMI04mgsrTGhQMVWZhQBh1JAWydEAAAYASAAEgL6CvD_BwE&ohost=www.google.co.uk&cid=CAASJORo46A91xwrmyqM0Y0W7_is_SL1ck7XTj85ml2NG2vfdXWmUA&sig=AOD64_0SPxZ0nRk9O7jUA0Rxq63D2JpXdA&q&nis=4&adurl&ved=2ahUKEwifwZqytMaFAxUFUUEAHaI8AY8Q0Qx6BAgLEAE

Reference – 16/04/24 – 10:50

<https://www.edfenergy.com/heating/heat-pumps/air-source-heat-pump-guide>

Solar PV

Different types of solar PV

There are three main types of solar PV systems: **grid-tied, hybrid and off-grid**. Each type of solar panel system has their advantages and disadvantages, and it really comes down to what the customer wants to gain from their solar panel installation.

1. **On grid solar system** - An on-grid solar system or grid tied, is a solar PV system which connects directly to the National Grid. This kind of Solar PV System is the most common amongst home and business owners. This type of system is perfect for someone who is already connected to the Grid yet wants to reduce their carbon footprint and energy bills.

An on-grid solar system doesn't require a battery storage system and is connected to the National Grid directly via a Solar or micro inverter. As the solar panels convert sunlight into energy, your home uses this green energy supply to power your appliances. When you generate any excess solar energy, this electricity is exported back to the Grid where you are either paid through the Feed-in-Tariff or SEG. Which is a bonus. A key advantage of an on-grid system is the security of knowing that your energy supply will always be supported by the National Grid.

2. **Hybrid solar system** - Hybrid Solar systems combine the technology of Solar Panels and Solar batteries to create a green energy solution which provides a back-up supply of energy. Although a hybrid PV system remains connected to the National Grid, any solar energy generated is first stored in a home battery solution before going to the grid. The main advantage of a hybrid solar system is that by storing your surplus energy in a battery, you can use your solar energy to power your home during the night and will export less energy back to the Grid. What's more, unlike an on-grid system, when the national grid is down, you can also draw energy from your battery supply. This is known as islanding and is particularly ideal for property owners who live in areas prone to power outages. Hybrid solar panel systems offer great flexibility, as when you have used up all your energy in your battery, you still can draw from the grid. This makes a hybrid solar system the perfect in between solution. As an in between solution, a hybrid solar system is more budget-friendly compared to an off-grid system, however, is more expensive than an on-grid system. A huge advantage of a hybrid solar system is that you can expand your battery storage system at any time, and because you are still connected to the grid, you can also charge your

batteries from cheap-off peak rates. However, because there are more components involved in a hybrid solar system, it is less efficient compared to a grid-tied system.

3. **Off grid solar system** - Unlike an on-grid solar system, an off-grid system has zero ties to the national grid. Making it desirable for those who can't connect to the grid easily or wish to be energy independent. With energy prices rising, energy independence is more in demand than ever. A complete Off-Grid Solar System contains everything you need to generate your own solar energy. Unlike hybrid systems, Off-grid systems tend to feature back-up generators and other types of renewable sources, to ensure your battery is charged fully all year round. This is because your off-grid system is the only means of energy supply you have. Off-grid solar systems have the ability provide electricity even in the remotest of locations. Through an off grid solar system, you can be energy self-sufficient, with a supply of power no matter where you decide to live.
The benefits of an off-grid system include, having no energy bill, as well as relying only on environmentally friendly resources.

Reference – 16/04/2024 – 11:05

<https://www.deegesolar.co.uk/different-types-of-solar-pv-systems/#:~:text=There%20are%20three%20main%20types,from%20their%20solar%20panel%20installation.>

Installation and cost

- When being installed, Solar panels must not be installed above the highest part of the roof (excluding the chimney) Panels should protrude no more than 20cm from the surface on which they are installed (roof slope/wall face) Panels should be installed, so far as is practicable, to minimise the aesthetic impact upon the building's exterior.

Approximate costs of UK commercial solar systems, including VAT and typical installation

Power output	Number of panels	Cost
10 kWp	30	£16,260
25 kWp	50	£39,000
50 kWp	100	£78,000
100 kWp	200	£156,000

- Most commercial solar panels will generate around 200 – 350 kWp of energy in strong sunlight, but the cells don't need direct sun to work and can still generate power on cloudy days. Many businesses will also install a commercial battery storage system to prevent the loss of solar power.

Reference – 16/04/24 – 11:15

<https://swoopfunding.com/uk/business-energy/commercial-solar-panels/#:~:text=Most%20commercial%20solar%20panels%20will,the%20loss%20of%20solar%20power.>

Health and Safety involving Solar PV installation on flat roofs

When installing solar systems on flat roofs, all workers should be wearing necessary PPE which would include, gloves, safety helmet, high vis, steel toe caps and a lanyard or some form of safety restraint to prevent falling from height. Along with this there should be scaffolding surrounding the area which should be bordered with toe boards to prevent any tools or materials from falling and possibly injuring somebody in the process, depending on the size of the flat roof this may vary. Along with this the workspace should be kept tidy and have no hazards laying around which could pose as a hazard to cause slips trips or falls, these precautions should also be followed:

- **Safe ladder angle**
 - **Tie ladder off**
- **Both hands on ladder**
- **Lift panels carefully**

Government grants for technologies

The following are grants that are currently available to help assist in funding the installation of new technologies in retail buildings, however during the next 5 or 6 years the government will be introducing more and more grants each year as they strive to reach net zero carbon emissions by 2030, this means that the more people installing renewable and sustainable technologies the better it is for the government.

- Industrial Hydrogen Accelerator Programme
 - Net Zero Hydrogen Fund Strand 1
 - Net Zero Hydrogen Fund Strand 2
 - Heat Pump Ready Programme
 - Low Carbon Hydrogen Supply 2
- Heat Network Investment Project (HNIP) funding
- Floating Offshore Wind Demonstration Programme
- Alternative Energy Markets (AEM) - Energy Price Signals Study
 - Biomass Feedstocks Innovation Programme

- Direct Air Capture and other Greenhouse Gas Removal technologies competition
 - Green Distilleries Competition Phase 2

Reference – 16/04/24 – 11:45

<https://www.gov.uk/guidance/find-funding-to-help-your-business-become-greener>

Task 1.2 Report

Assessment number (eg 1234-033)	8710-033
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)	1.2
Evidence title / description	Report
Date submitted by candidate	DD/MM/YY

Task 1.2 – Report

Ev charging system

While conducting my research i discovered the different types of EV chargers and their uses and analysed which system would be most suitable for a retail park EV station which would be used mostly by customers who are going shopping. Because of this reason i feel it is crucial that the system is “fast charging” due to the fact that an average shopping trip takes around 2 hours on average. The idea behind this is that by the time shoppers return to their car they will have a sufficient amount of power that has been exerted to their vehicle. Fast charge points (type 2) are typically used in residential areas such as leisure centres, shopping centre car parks and tourist destinations as it provides enough charging speed for customers with EV charging points without charging them higher rates for a “ultra fast charger. This in turn means that the EV charging station will be accessible for all EV users. In the system itself should contain a type 2 plug mechanism where it will be compatible with 2 and 3 phase supplies which is fitting for a car parking area, the power output of the type 2 chargers is around 3-40kW which will supply 75 miles of driving time for every 30 minutes of charging on average which makes the system perfect for shoppers spending around 30 minutes to 2 hours in the retail park. The install of this system will require a qualified electrician to be on site to install the systems and eventually sign them off and certify that the chargers are safe to use. Unfortunately as of this moment in time there are no active schemes available for retail parks to install EV charging points in the car park, however during the next 5 or 6 years i feel there will be a lot more funding available considering the UK’s goal to become next zero by 2030, this could mean that in the near future people with public EV stations could be liable to cashback on their investments which would hopefully be supplied by the government.

Space heating technology

During my research task i delved into the details of different types of space heating systems and where each are typically used due to their different capabilities and characteristics, for example generic boilers are typically used in domestic environments as they only output a certain amount of energy which is enough for houses etc, for example a domestic boiler would never be used in an industrial environment as it quite simply would not be able to supply sufficient energy and heating source around the whole building. Because of this research i uncovered different space heating systems that would in fact be suitable for a retail/commercial environment. In conclusion i think that an air source heat pump would be most suitable for a project like this. My reasoning for this decision is that by using this method we will be reducing our carbon footprint by over 30% each year which is astronomical considering the scale of this project. Commercial air source heat pump

systems have a high initial cost, however this small disadvantage is outweighed by the mass amount of advantages that using this system would bring to the table. Having an air source heat pump can cut energy and heating prices by almost 40% each year along with increasing the companies "green credentials". Air source heat pumps are also eligible for various grants from the government due to the systems sustainable nature, the main scheme being the "Heat pump ready program" which helps people buying air source heat pumps financially to ensure that the system is up to date and sufficient for use. This could be a huge help for this project as we will be investing in high level air source heat pump systems which have a very high up front cost, by accessing this grant it could help the project become more financially and budget friendly. Due to the large amount of energy that will be used in the retail park, i feel that an energy efficient system like an air source heat pump would be most suited as it would prevent a large carbon footprint created by the retail park which in turn would create a much more positive brand image for the company. The system itself works by extracting outside air which is drawn into a network of tubes filled with refrigerant gas which helps extract heat energy from the air outside. The gas in the tubes then passes through a compressor which in turn increases the overall pressure and temperature causing the gas to change to a hot liquid. The hot liquid then passes into a heat exchanger that heats the water to feed radiators and heating circuits along with hot water systems, this cycle will continuously repeat itself which is the main reason why air source heat pump are such a sustainable practice. The system generates heat over longer periods of time as oppose to quick boosts of heat which is yet another reason why the air source heat pump system is most suitable for this project.

Solar PV

My research regarding solar panel systems spanned far out into all different types of systems and all separate components of each, every system has its own benefits and drawbacks which are in turn suited to the location and size of the building they are placed upon. Solar energy is becoming more and more prominent as the days go by as it provides sustainable energy to the world, it is known as one of the most environmentally friendly practices of the 21st century which is the main reason why i think that it is perfect for the large scale retail buildings that we are dealing with. Due to the large amount of roof space it would allow us to install a large quantity of panels. It is for this reason that i have chosen an "On grid system" for the retail park, because of the evident large amount of roof space i feel as if it is most suited to and on grid solar system. This means that along with creating green energy for the units to use to power all electrical systems in the building, it will also allow any excess energy that is not in use to be sold back to the national grid which is a huge benefit when calculating the mass quantity of solar panels that could be placed on the roof. The key advantage of an on grid system is that it provides peace of mind and security that the energy supply will always be supported by the national grid. Along

with this i think that it is neccasary that there is a commercial battery storage system which will prevent the overall loss of any solar power. By installing this solar system it will create a near 40% drop in energy costs per year which is a huge amount of money which could in turn be used in a more productive manner, along with this it also create a green brand image for the company and drastically reduces the carbon footprint created by all of the buildings.

Total Installation Costs

The price of solar panels varies between pricing per m and pricing per panel, in my opinion i feel that we should install solar panels on Unit 5, Unit 4 and Unit 3 as these buildings have the largest roof space, by doing this it will minimise disruption on site as the installers will only have the access 3 of the 8 units. The solar panels will be feeding all of the units along with feeding any excess into the grid. Most commercial solar panel systems generate an average of 200kWp in strong sunlight, however the uk does not produce a large amount of sunlight all year round so on average the panels will generate 150kWp of energy.

Working out

TOTAL FLAT ROOF AREA = $118\text{m}^2 + 85\text{m}^2 + 80\text{m}^2 = 283\text{m}^2$

$283\text{m}^2 - \text{OUTSKIRTS OF ROOFS } (23\text{m}^2) = 260\text{m}^2$

260m² ROOF SPACE BEING USED

AVERAGE COMMERCIAL SOLAR PANEL SIZE = 2m^2

$260\text{m}^2 \div 2\text{m}^2 = 130 \text{ PANELS}$

POWER OUTPUT = 150kWp

NUMBER OF PANELS = 130

COST = £152,100

Overview

Due to the large scale of panels needed to cover the roof space this initial upfront cost seems very high, however when we compare this price, with the average energy price for a year for 8 running units, we can see that this money will be regenerated back in no time at all. When we pair the solar system with the air source heat pump we can calculate that there will be an astronomical drop in energy bills annually. It also makes the business more green and sustainable which has a huge effect of brand image and government funding, the more green a company is, the better. Along with this the government currently offers funding for solar panels meaning the VAT on a purchase can be claimed back, this means that if the solar panel plan does go through, the company will receive a large amount of money back from the purchase as a way for the government to encourage more companies to go green and become more sustainable.

Health and safety requirements

When it comes to the installation of solar PV systems it is crucial that all requirements are followed to a high standard in order to prevent injury or damage. Along with this, installing solar systems often includes working at height which means there is a specific standard of PPE that should be worn and specific precautions to take. When working on flat rooftops it is crucial that there is scaffolding surrounding the edge of the roof to reduce the risk of falling from height along with toeboards to prevent tools and materials from falling and potentially injuring people on the ground. PPE is a vital element of staying safe when installing solar PV systems, it should include, high visibility vests, safety helmets, steel toe cap boots and a form of restraint such as a lanyard to clip to the scaffold and prevent injuries caused by falling from height. The work itself should be carried out by a qualified electrician in order for the install to be signed off and certified as safe to use, it is crucial that industry professionals perform the install as the system needs to be safe and certified in order to keep people safe. When accessing the roof with a ladder it is

crucial that is placed at a safe angle to prevent it slipping or any other accidents occur, once the first person has gone up the ladder it will need to be tied to ensure that it is secure and safe.

Task 1.3 Project plan

Assessment number (eg 1234-033)	8710-033
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)	1.3
Evidence title / description	Programme of works Supporting statement
Date submitted by candidate	DD/MM/YY

Supporting Statement

Within my programme of work i clealy outline the order in which project will be taking place and when it is scheduled to be completed by, the first task to be completed is resurfacing the surrounding roads and communal areas in the retail park which will be carried out by a team of groundworkers who will have their materials delivered onto site beforehand. Next up is the team of builders who will be insulating each unit with celotex board which will be delivered on site, the time for this project is 39 days. Following this the Plumbing and Electrical technicians will be on site to install the air source heat pump systems and the solar panel systems which will be manufactured off site and supplied by the technicians themselves, the planned time for this aspect of the project is 20 days. After this another plumber will arrive on site with water conservation technologies such as: Infrared taps and flushing systems, Low volume flush valves etc. The time given for this is another 5 days. Shortly after this an electrotechnical engineer will be on site to install and certify the new fast EV chargers, the chargers and equipment are scheduled to arrive on site the day before to ensure that there are no delays in the installation process, this project should take around 15 days. Finally the retail park signage will be erected by the on site builders to create the last finishing touches for the project, the signs will be delivered pre install.

Health and safety

Health and safety is a huge aspect of this project and it is of paramount importance that all rules and regulations are adhered to when commencing work. The site will be surrounded in harris fencing to ensure that the general public will have no access to the site in order to prevent any injury or any issues in general, there will be a front entrance and a back entrance which can both be used for deliveries and general access to the site for workers. These openings are also the designated access points in the event of an emergency. All scaffolding will be up surrounding each unit during the renovations and will be fitted with toe boards and fencing the prevent workers and tools from falling from height or injuring others. All necassary PPE must be worn on site at all times (Safety hemlet, High vis, Lanyards when working at height). The site will also have signs displayed to ensure that all workers and visitors are clear on the site rules, regulations and emergency procedures. These will also be a topic of interest during toolbox talks which will take place every day before the working day begins.

Solar PV Install

The installation of the solar PV systems is a huge aspect of the project and it is vital that there are no problems or delays when the install commences. When installing the systems, the workers doing so will be required to have safety lanyards clipped onto the scaffolding fencing when necessary. The equipment needed to install the panels is essential basic tools which will be supplied by the designated installer. However when it comes to getting the panels onto the roof itself, there will need to be some specialist equipment such as a crane or cherry picker to ensure that there are no injuries when trying to transport them onto the roof. This sort of equipment will have to be booked in advance for hire so it is essential that there are no hiccups in this process as it could cause serious delays to the install of the solar panels which could then create a domino effect when factoring in the other aspects of this project.

Disruptions to the public and businesses

Throughout the project there will be many large heavy goods vehicles which will need to access the site, for example large HGV delivery vehicles. Despite this will try our best to ensure that there are no major disruptions involving the roads or public areas when large deliveries are coming in. In terms of noise and disturbance, the site itself will commence work at 8am and continue until 5pm to help reduce the noise disturbance around the local area. The harris fencing surrounding the site prevents the general public from accessing the site, however it also protects the public from the possible dangers of a building site.

Task 1.4 Presentation

Assessment number (eg 1234-033)	8710-033
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)	1.4
Evidence title / description	<p>Presentation slides</p> <p>Note: Presentation recording is not included with this document. Please refer to the Observation Record below the presentation slides for commentary</p>
Date submitted by candidate	DD/MM/YY

TASK 1.4 – PRESENTATION HANDOUT

Agenda Items

Slides 3 -6	Air source heat pumps
Slides 6 - 10	EV charging systems
Slides 11	Government Grants/Schemes

Additional information

All information is regarding Air source heat pumps, EV systems and government grants/schemes relating to the subject. Questions will take place at the end of the presentation.

TASK 1.4 PRESENTATION

Space Heating

EV Charging

Government grants/schemes

<first name> <surname>

Air Source heat pumps

What are they?

Air source heat pumps are ideal for office premises, business parks, commercial enterprises, factories, and many more. Heating commercial premises with a heat pump can significantly reduce heating costs and increase your organisation's green credentials. The low-level constant heat will also create a better working environment for employees. An air source heat pump (sometimes referred to as an air-to-water heat pump) transfers heat from the outside air to water. This in turn heats rooms in your home via radiators or underfloor heating. It can also heat water stored in a hot water cylinder for your hot taps, showers, and baths.

Advantages

- Environmentally Friendly
 - Low maintenance
 - Efficient models
- Eligible for various grants
- Safer than combustion boilers
 - Long Lifespan
- Can be paired with solar systems
 - Minimal noise
- Can provide both heating and cooling

Advantages

Air source heat pumps have many different advantages and benefits when it comes to becoming more sustainable and decreasing your environmental footprint, these systems are significantly more green than standard combustion boilers systems and are also a much safer option.

How do they work?

A heat pump works a bit like an inside-out fridge. It captures heat from outside and moves it into your home, using electricity to do so. Here's how it works:

- Outside air is drawn in over a network of tubes filled with refrigerant gas, which circulates at -28°C to extract heat energy from the air outside.
- The gas passes through a compressor which increases the pressure and temperature causing it to change from a cold gas to a hot liquid.
- The compressed hot liquid passes into a heat exchanger that heats water for both your radiator heating circuit and your taps. The refrigerant then turns back into a cold gas and starts the cycle all over again.

Air source heat pumps work at a lower internal temperature meaning that when the system is running it will not produce heat immediately as oppose to a normal boiler. Instead it will produce gentle heating throughout the building over long periods of time rather than quick boosts of heat.

Installation

Installing an air source heat pump requires a competent professional with a thorough understanding of several key areas including low-temperature heating systems, vapour compressors, weather compression and heat pump controls, in order that the system can be set up correctly for best performance and efficiencies.

By installing ground source heat pumps on site it will create a more sustainable and energy efficient environment which Is crucial when considering the UKs plans to go net 0 by 2030, air source heat pumps will also save a lot of money in the long run on energy bills along with the fact that these systems can be easily paired with solar PV systems to create an even more sustainable system.

EV charging points

What are EV chargers?

EV chargers are electrical systems that have a current flowing through them charge Electric vehicles.

There are many different types of EV chargers and to make it easier to understand we can categorise them into speed and location, in terms of speed there are typically 4 types of chargers, Slow, Fast, Rapid, Ultra Rapid.

In terms of location: Home EV chargers - these are designed for residential properties and are generally slow to fast electric vehicle chargers.

Public EV chargers - these are found in areas such as supermarkets or car parks and can vary in speed all the way up to ultra-rapid.

DIFFERENT TYPES OF CHARGERS

- **Low speed and standard charge points** - Low speed and standard charge points are often the cheapest to use and are suitable when vehicles are parked for several hours, such as during working hours or overnight.

- **Fast charge points** - Fast charge points ideal when vehicles are parked for a few hours. This can include hotels, shopping centres, leisure centres, tourist destinations or car parks used for more than two hours.

- **Rapid and ultra-rapid charge points** - Rapid charge points are the quickest way to recharge a vehicle, typically recharging a vehicle to 80% in around 30 minutes.

Due to the fact that an average shopping trip takes around 2 hours on average. The idea behind this is that by the time shoppers return to their car they will have a sufficient amount of power that has been exerted to their vehicle. Fast charge points (type 2) are typically used in residential areas such as leisure centres, shopping centre car parks and tourist destinations as it provides enough charging speed for customers with EV charging points without charging them higher rates for a “ultra fast” charger. This in turn means that the EV charging station will be accessible for all EV users. The system itself should contain a type 2 plug mechanism where it will be compatible with 2 and 3 phase supplies which is fitting for a car parking area, the power output of the type 2 chargers is around 3-40kW which will supply 75 miles of driving time for every 30 minutes of charging on average.

Which is best?

Advantages

- Accessibility for customers
- Promotes EV usage
- Green brand image

Disadvantages

- High upfront cost
- Could be considered an eyesore
- May have problems which lead to maintenance issues

Installation

- When it comes to installing EV charging systems it is advised that a qualified electrical engineer should be subcontracted to carry out the work and this minimised the risk of issues with the charger in the future allowing the system to be certified and signed off to be safe for us by a professional. In terms of regulations to do with the charging point, the government has recently released “The Public Charge Point Regulations” on the 24th of November 2023. The regulations build on 4 key areas of the consumer experience to ensure:
 - Consumers can easily locate the right public charge point to fit their needs
 - Ease of payment across public charge points
 - Consumers can be confident that public charge points will be in good working order
 - Consumers can compare prices across multiple public charge point networks

Government grants/Schemes

Space Heating

- •Heat Pump Ready Programme

EV Charging

- Industrial EV programme

THANK YOU



ANY QUESTIONS?

<first name> <surname>

Employer-Set Project - Observation Record (Task 1.4)

8710-30 T Level Technical Qualification in Building Services Engineering for Construction

8710-033 Core: Employer-Set Project (Summer 2024)

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. They should identify areas of strength and weakness to distinguish different levels of performance quality for each of the prompts below.**

Structure/detail

Good, most points covered, Candidate gave an introduction to the presentation and covered the brief in a basic manner, missing opportunities to expand. Logical order was used.

Techniques

The presentation was supported by a PowerPoint Slide Show, good fonts and simple design easy to read the text and a handout was provided. Technical language was used to explain the proposals in an accurate manner and explained the options available.

There were no images to help illustrate what the candidate was presenting.

Terminology

Good, easy to understand, used plain English, not too many technical terms. The candidate showed good use of terminology in their explanation of the process. Terminology was well used, drawing in key terms from the wider core and being applied accurately.

Theories and concepts

All decisions explained, good reasons given for decisions. The candidate showed a good understanding of different theories and concepts made. The candidate gave a lot of information and explained theories with disadvantages and advantages.

Communication

The candidate read from the PowerPoint but was clear in speech and made some eye contact. The candidate was able to fairly communicate during the presentation and when answering the questions.

Tutor questions to candidate	Candidate responses
Are there any aspects of the brief you found difficult?	The EV Charging System has quite a lot of detail in them, you're going to think about a lot more but as long as you have researched the right things considered things stuff like that it's okay but it's quite modern so it can be difficult to understand sometimes which I certainly found.
Why do you think the company should put in EV charging points?	It is a more sustainable way of doing things and as I said the government do want you to install EV systems but they want to promote electric vehicle usage as they want to go net zero by 2030 yeah that's why I think it's a good brand initiative for the company and makes them look a lot more sustainable makes company green and so forth.

Are there any disadvantages with electric cars?	They are quite new they certain models have been around for a while but right now is at most peak so it's a bit early to be considering what problems are going on maybe in a decade or so time will be able to look more depth at it however I do think it is a positive change for the environment combustion engines emissions, so at the moment there's not many charging points around certain areas, rural areas, so places like London they do a lot more EV charges somewhere a bit more down south maybe it doesn't matter much accessibility when it comes to electric cars that's one disadvantage, another would be the fact that it does take time to charge up your vehicle so it's not as easy as opening your full cap fill up with petrol you've got waiting charge it it's not instant unfortunately.
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Any other aspects

Tutor signature	Date
<div style="border: 1px solid black; height: 100px; position: relative;"> X </div>	DD/MM/YY

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

Task 2.1 Collaborative problem-solving

Assessment number (eg 1234-033)	8710-033
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)	2.1
Evidence title / description	<p>Collaborative problem-solving group discussion notes</p> <p>Draft email</p> <p>Note: Collaborative discussion recording is not included with this document. Please refer to the Observation Record below for commentary</p>
Date submitted by candidate	DD/MM/YY

Option 1

<first name> <surname>

Advantages

- More National.
- Support service.
- Warranty
- Sustainable
- Governments

Disadvantage

- More expensive.
- Delivery times vary
- New company.
- Only 5 year guarantee

option 2

Disadvantage

- Established 2018
- North branch
- No site visits.
- transportation emissions
- Global communications.

advantage

- 10 year guarantee.
- High discount.
- Web based support service,
- Less transportation.

Dear Retrofit Retail PLC,

I am writing this email regarding the recent issue that has arisen involving the usual supplier going into administration. As you know we have two main options to choose between for a new supplier. Following a recent group discussion we have come to the conclusion that we think option 1 (UK Renewable Supplies) is most suitable for the project. Firstly, UK Renewable Supplies provide a national service across the UK which makes this option a more renewable choice as it will require no overseas travelling or transportation, meaning less harmful emissions created by transportation vehicles. Another advantage is the onsite support service that the company offer, in which if there are any problems with the products, they will send somebody out to the site to resolve and fix them, this is a huge green flag when considering the sheer vastness of the renewable equipment that will be included in this project. The company also provides a 5 year guarantee on all systems which can also be extended if needed. Finally, UK Renewable Supplies stock UK manufactured components ensuring that all products are made in good working conditions by fairly paid workers, this in turn creates a positive brand image for Retrofit Retail PLC. Despite all of the advantages there are however a few risks involved with using this company, one of which is the fact that delivery times may vary on the global market, this could cause major disruption if this issue is not allowed for in the site plan. By using UK Renewable Supplies we also run the risk of going over budget as it has been made clear that the companies prices are higher than most other places. Due to the company being fairly new (est 2021) there may not be many valid reviews to go off when researching the company which could also pose as a risk. In terms of information about said company, we will need to be supplied with delivery times and scheduling of when products will arrive and in what manner is this need to be catered for prior to delivery. We should also request to see more credentials and history about this business as we need to clearly outline if it is suitable and trustworthy enough to become the main supplier for the foreseeable future.

Many Thanks,

<first name> <surname>

Employer-Set Project - Observation Record (Task 2.1 Collaborative problem-solving)

8710-30 T Level Technical Qualification in Building Services Engineering for Construction

8710-033 Core: Employer-Set Project (Summer 2024)

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. They should identify areas of strength and weakness to distinguish different levels of performance quality for each of the prompts below.**

Communication skills

The candidate was able to communicate very well with other group members.
Spoke clearly when putting forward their ideas.
Led the group.

Collaboration/contribution

Listened to others, put forward some good points.
Main contributor in the group

Methods to solve the problem

Gave some good options.
The candidate has shown good methods to solve problems.
Able to take on ideas and adapt their opinion after hearing a new viewpoint.

Any other aspects

Tutor signature	Date
<div>X</div> <div></div>	DD/MM/YY

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

Task 2.2 Evaluation

Assessment number (eg 1234-033)	8710-033
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)	2.2
Evidence title / description	Evaluation
Date submitted by candidate	DD/MM/YY

Task 2.2 – Evaluation

Task 1.1 – Research

Throughout my research i uncovered the main and important details involving all of the topics within the project, i used different websites to research different details about systems such as solar panels and air source heat pumps, along with the government grant schemes that were involved. I felt that this task went overall very well as i ended up with pages of detailed information which then helped me complete my second task with a lot less hassle or struggle.

Task 1.2 – Report

Due to my extensive research in task 1.1, i managed to compile a very informative report outlining key details from the criteria. Each section of the report explained seperate details that provide an easy understanding for the reader. I feel i met the requirements well and in an effective manner, however if i could go back and change anything, i would like to have provided a little bit more information involving different types of EV charging cables as i feel that my report on this was slightly bleak.

Task 1.3 – Project Plan

The project plan sector of this ESP was most challenging out of all in my case, i found it tricky to create an informative and clear 'Gantt Chart' which led to a lot of wasted time, in turn causing me to rush and become sloppy in my writing, despite this i managed to recover and create a plan of work along with my supporting statement which i felt could have gone better but it hindsight it also couldve been alot worse. Overall i think if i could go back and change anything, i would research more in depth about how to create a clear and detailed plan of work as this took my longer than i wouldve hoped.

Task 1.4 – Presentation

I feel that my presentation was clear and informative thanks to my in depth research and report which helped me create each slide with a good amount of information. Despite this i feel that my presentation was slightly short and brisk which was not the outcome i was looking for, i did not want the presentation to be long and boring, but i also didnt want it to be cut short, it seems i struggled to find the middle ground of these two issues which was an issue. Despite this i think that the slides i did complete were informative and helpful,

supplying readers with easy to understand information about the topics. I feel i met most of the requirements of the task bar the timing which was unfortunately not up to par.

Task 2.1 – Collaborative problem solving

In my personal opinion i feel as if the collaborate group discussion on the topic at hand was very hepful and the debate led to many different outcomes and problems that may occur with each option. Each person in the discussion had their own opinions which really helped the group bounce off of eachother and create new ideas and or solutions to the problems that we had found. Each option had its own advantages and disadvantages which fuelled to debate even more. In the end we came to a mutual agreement on who we thought would be most suitable for the role of 'supplier'. I think all in all the debate was very good and informative which led to a detailed email describing which company we thought was most suitable, the debate really helped us with justifying our choices in the email so i think we met the criteria of this task to a good standard.

Conclusion

In conclusion i feel that the most successful task for me was my report, (task 1.2), i think that my report outlined the important details of the topics in an 'easy to undertand manner' which in my opinion is a huge aspect of writing report, i think that i met all of the criteria to a high standard and provided all of the neccassary information needed. My research played a huge part in the production of my report as it allowed me to provide as much information as possible and be able to explain various different aspects of different systems without having to guess as i had all of the information i needed in my research. Throughout the project i have developed a good understanding of different space heating systems, solar systems, and EV systems along with much more. I have expanded my writing skills and improved my grammar throughout the different tasks which has helped me alot along the way. Along with this, i feel that task 1.4 enabled me to improve my speaking and presenting skills which i hope will prove its worth in the future.

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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