HM Government

T-LEVELS

T Level Technical Qualification in

Building Services Engineering for Construction

VERSION 1.0 EMPLOYER-SET PROJECT

Exemplar Response – A Grade

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Contents

Task 1.1 – Research on Renewable Technology

The chosen renewable technology is solar photovoltaic (PV) panels, specifically an 8kW monocrystalline system, due to its high efficiency and suitability for the south-facing roof of the school.

Renewable Technology: Solar PV

I began by comparing two types of PV systems: **monocrystalline** and **polycrystalline**. Monocrystalline panels typically offer 18–22% efficiency and last longer, while polycrystalline panels are cheaper but slightly less efficient (15–17%) and require more space for similar output.

Because the school extension has a limited roof area and a south-facing orientation, I concluded that the extra efficiency of monocrystalline panels would allow maximum energy generation in the available space. Although they are more expensive upfront, the **higher energy yield** justifies the cost over time. I also considered the fact that monocrystalline panels perform better in low-light conditions, which is important for a UK setting.

Modular Build System

For the modular system, I looked at **timber frame** and **steel frame** builds. I considered build speed, environmental impact, structural integrity, and compatibility with renewable installations. Steel offers more durability, but timber is **more sustainable**, easier to work with for smaller projects, and aligns more closely with the brief's emphasis on environmental awareness.

Timber frame modular systems also allow **off-site prefabrication**, which reduces waste and shortens on-site construction time — essential for completing the project within the 6-week summer break. After reviewing GCS Cabins as a supplier, I confirmed that they offer timber options with integrated MEP (mechanical, electrical, and plumbing) systems, which supports efficient on-site installation.

Cost Breakdown and Feasibility

I compared the proposed system costs against the project budget:

- **PV System**: £13,000 (including £3,000 labour) — within the budgeted £13,500.
- **Modular Build**: £150,000 (maximum allowance)
- **Delivery and Crane Hire**: £25,000
- **Groundworks**: £55,000

This totals £243,000, which is within the allocated budgets and leaves flexibility for rainwater harvesting and additional energy-saving systems.

Environmental and Financial Benefits

An 8kW PV system could save the school £1,200–£1,500 per year in electricity bills and would contribute to a reduction in CO_2 emissions, supporting the school's carbon reduction targets.

I also considered long-term benefits, such as eligibility for the Smart Export Guarantee (SEG), allowing the school to earn money from excess electricity. Additionally, the Salix Finance Scheme could help fund the upfront cost with 0% interest, making this option even more feasible.

Regulatory Considerations

I ensured the technology meets UK building and safety standards. PV installations must comply with Part L of the Building Regulations and must be carried out by MCS-certified installers to qualify for government incentives.

Controls

To ensure efficiency the system should include a Building Management System (BMS)/Building Automation System (BAS) this is a centralised control system that monitors and manages the mechanical, electrical, and electromechanical services in a building. The system will automate the lighting based on occupancy, time schedules, and daylight levels. It will also monitor energy consumption and identify inefficiencies to reduce operational costs of the building. The system incorporates sensors, controllers and a user interface.

Bibliography

EDF Energy (2025) Solar panels guide. https://www.edfenergy.com/ (Accessed: 12 May 2025).

GCS Cabins (2025) Modular buildings for education. https://www.gcscabins.co.uk/ (Accessed: 12 May 2025).

Gov.uk (2025) Building regulations and energy grants. https://www.gov.uk/ (Accessed: 12 May 2025).

Renewable Energy Hub UK (2025) Solar panel comparison. https://www.renewableenergyhub.co.uk/ (Accessed: 12 May 2025).

Waterwise (2025) Rainwater harvesting benefits. https://www.waterwise.org.uk/ (Accessed: 12 May 2025).

Task 1.1 – Record of sources

Website	Purpose	Notes / Action Taken
Renewable Energy Hub UK	PV type comparison, costs, efficiency	Used for PV comparison table and cost/kW data
EDF Energy	Solar panels guide, ASHP overview	Used for ASHP details and PV efficiency
Gov.uk	Building Regulations, Part L, MCS grants	Used for compliance requirements
GCS Cabins	Modular build options	Used for timber vs steel choice, MEP integration
Waterwise	Rainwater harvesting benefits	Used for water conservation section
Energy Saving Trust	ASHP installation costs and efficiency	Used for ASHP cost and COP values
HSE / Building Regs portal	Modular building UK safety standards	Used for thermal, acoustic, and fire safety values
Solar Energy UK	SEG payments and market rates	Used for financial benefits section
Manufacturer datasheet (JA Solar 400 W panel)	PV panel dimensions and efficiency	Used for roof space calculation
Generic Google search results (ads and supplier promos)	PV and modular suppliers	Rejected — marketing claims not backed by independent data

Task 1.1 – Research Notes

Solar PV Research

1.1.1 Comparison of PV Technologies

Feature	Monocrystalline PV	Polycrystalline PV
Efficiency	18–22%	15–17%
Lifespan	25–30 years	20–25 years
Cost per kW (UK)	~£1,600–£1,700	~£1,300–£1,400
Space Required	Less (higher efficiency)	More (lower efficiency)
Low-Light Performance	Better	Average
Aesthetic	Uniform black finish	Blue speckled finish

- Looked at *monocrystalline vs polycrystalline* panel efficiency, costs, and suitability for UK climate.
- Monocrystalline panels typically **18–22% efficiency**, polycrystalline **15–17%**.
- Monocrystalline panels have better low-light performance (important for UK weather).
- Space requirement for 8 kW monocrystalline = **~40 m² roof space** (~20 × 400 W panels).
- Average cost in UK: £1,600–£1,700 per kW (monocrystalline), £1,300–£1,400 per kW (polycrystalline).
- Installation must be by **MCS-certified installer** for incentives (Smart Export Guarantee, Salix Finance).
- Installation must comply with **Part L Building Regulations** and BS EN 61215 standard.

Air Source Heat Pump (ASHP) Research

Feature	Air-to-Water ASHP	Air-to-Air ASHP
Typical Output	4–16 kW	3–12 kW
Cost per kW (UK)	£900–£1,200	£700–£1,000
Installation Cost Range	£6,000–£12,000	£3,000–£7,000
Lifespan	15–20 years	15–20 years
COP (Efficiency Ratio)	2.5–3.5	2.5–3.5
Suitability for School	High (can integrate with underfloor/radiator systems)	Medium (space heating only)

- Air-to-water systems output 4–16 kW, suitable for school heating via radiators or underfloor.
- COP ratio 2.5–3.5, meaning they produce 2.5–3.5 times more heat than electrical energy used.
- Installation cost in UK: £6,000–£12,000 depending on size.
- Lifespan: 15–20 years with regular maintenance.
- Not chosen for main system due to electricity generation focus, but suitable as complementary technology.

Modular Build System Research

- Timber frame = more sustainable, better insulation, lighter for crane delivery, lower embodied carbon.
- Steel frame = more durable, better for multi-storey, but higher carbon footprint.
- Off-site prefabrication reduces waste and speeds up install — important for 6-week summer deadline.
- UK modular builds must comply with Building Regulations:
  - Part A (Structure)
  - Part B (Fire safety — fire-resistant cladding and finishes)
  - Part L (Energy efficiency — U-values ≤0.18 walls, ≤0.13 roofs)
  - Part M (Accessibility)
  - BS EN 1991-1-4 for wind load
  - Acoustic requirement: ≥45 dB between classrooms

Water Conservation Research

- Rainwater Harvesting Systems (RHS) collect water from roof, filter, and store for non-potable uses.
- Benefits: reduces mains water bills, supports sustainability targets, useful for toilets/irrigation.
- Limitations: costs £2,000–£5,000, requires maintenance and tank space.
- Must comply with BS 8515:2009 (rainwater harvesting).

Financial & Environmental Benefits

- 8 kW PV saves ~£1,200–£1,500 per year in electricity bills.
- Reduces ~2.5–3 tonnes CO_2 annually.
- SEG payments possible for excess electricity at ~5–15 p/kWh.
- Salix Finance offers 0% interest loans to UK public sector for energy efficiency upgrades.

Cost Breakdown and Feasibility

Item	Cost (£)
PV System (8 kW)	13,000
Modular Build	150,000
Delivery & Crane Hire	25,000
Groundworks	55,000
Total	**243,000**

The total remains within budget and allows for inclusion of rainwater harvesting or other energy-saving systems.

Regulatory Considerations

- **PV Systems:** Must comply with **Part L of Building Regulations**, BS EN 61215 (PV module design), and be installed by **MCS-certified contractors** to qualify for incentives.
- **Modular Units:** Must meet UK fire, thermal, and acoustic standards.
- **Water Conservation Systems:** Must comply with BS 8515:2009 for rainwater harvesting.

Task 1.2 – Report on Recommendations

Renewable Energy Technology Recommendation
2.1 Solar Photovoltaic (PV) System

After evaluating available renewable energy options, an **8kW monocrystalline solar PV system** is recommended. This choice aligns with the school's south-facing roof orientation, providing optimal solar gain throughout the day.

Monocrystalline panels were selected due to their:

- **High efficiency:** Up to 22%, compared with 15–17% for polycrystalline panels.
- **Space efficiency:** Maximises electricity generation within the available roof area.
- **Longevity:** Expected lifespan of 25–30 years with minimal degradation.

While monocrystalline panels incur a higher initial cost than polycrystalline alternatives, their ability to generate more electricity per square metre and deliver higher energy output makes them more cost-effective over the system's lifetime.

Installation Requirements

- Panels will be installed by **MCS-certified professionals** to ensure safety and compliance.
- Roof integrity checks will be performed prior to installation.
- Wiring and inverters will meet **BS EN 50549** and **Part P Building Regulations**.
- Appropriate risk assessments will be conducted to safeguard installers and school occupants.

Advantages	**Disadvantages**
High energy efficiency and output	Higher upfront cost
Long lifespan and low maintenance	Output dependent on sunlight and weather conditions
Reduces electricity bills by £1,200–£1,500 per year	Requires roof with adequate orientation and shading consideration
Supports environmental sustainability and carbon reduction	Slightly more complex installation process than standard panels

Energy Efficiency Contribution

The PV system will generate approximately **7,200–8,000 kWh per year**, which will offset grid electricity usage and contribute to reducing operational energy consumption. By integrating with the Smart Export Guarantee (SEG), any surplus energy can be sold back to the grid, further improving the school's financial sustainability.

Air Source Heat Pump (ASHP)

An **air source heat pump** has been recommended to provide heating for the school extension. ASHPs operate by extracting heat from the ambient air, which is then used to warm the building efficiently.

Justification

- Provides a **Coefficient of Performance (COP)** of around 3–4, meaning that for every unit of electricity consumed, three to four units of heat energy are delivered.
- Reduces reliance on fossil-fuel-based heating systems.
- Can be integrated with underfloor heating or radiators.

Advantages	Disadvantages
High efficiency compared to traditional boilers	Performance reduces at very low outdoor temperatures
Reduces carbon emissions and energy costs	Higher initial installation cost than standard boilers
Long lifespan (15–20 years)	Requires adequate external space for unit placement
Low maintenance requirements	May generate some operational noise

Energy Efficiency Contribution

By replacing or supplementing conventional heating, the ASHP will reduce overall energy consumption and operational costs, contributing to the school's environmental targets.

Control recommendations

I also recommend a Building Management System to monitor and manage the mechanical, electrical, and electromechanical services in the building. This system will automate the lighting based on occupancy, time schedules, and daylight levels and will also monitor energy consumption and identify inefficiencies to reduce operational costs of the building.

Rainwater Harvesting System

A **40,000-litre rainwater harvesting system** has been recommended to capture, store, and reuse rainwater for non-potable purposes such as toilet flushing, irrigation, and cleaning.

Justification

- Reduces mains water consumption and utility bills.
- Helps the school meet water efficiency targets and environmental sustainability goals.
- Compatible with plumbing that meets **BS EN 1717** and **Part G of Building Regulations**.

Advantages	Disadvantages
Reduces mains water usage by up to 50%	Initial installation cost of £25,000
Supports sustainable building practices	Requires regular maintenance of tanks and filters
Reduces stormwater runoff	Additional space needed for tank placement
Lowers overall environmental impact	Complexity of integration with existing plumbing

Water Efficiency Contribution

The rainwater system will reduce potable water demand, improve the resource efficiency of the school, and enhance the building's sustainability profile.

Modular Building Recommendation

Timber Frame Modular Build

After reviewing modular construction options, a **timber frame modular system** is recommended. Timber is lightweight, sustainable, and allows for rapid off-site fabrication, which is ideal for the school's six-week summer holiday timeframe.

Justification

- Timber has **lower embodied carbon** compared to steel or concrete.
- Prefabrication reduces on-site disruption and shortens the construction timeline.
- Modules meet UK building standards and can be easily adapted to the school's design requirements.
- **GCS Cabins** identified as a supplier with a track record of delivering compliant modular solutions.

Advantages	Disadvantages
Rapid construction reduces disruption	Limited to module size constraints
Sustainable with low embodied carbon	Timber requires protection against moisture
Can be fabricated off-site	May be higher initial cost than some traditional methods
Meets UK building regulations	Requires specialist supplier coordination

Financial Considerations

Cost Summary

Item	Cost (£)
Timber frame modular build	150,000
Delivery & crane hire	25,000
Groundworks	55,000
Solar PV system	13,000
Air source heat pump	8,000
Rainwater harvesting system	25,000
Total	**276,000**

This cost breakdown demonstrates that the proposed solution is fully **within the project budget**, while delivering sustainable energy and water-saving benefits.

Funding Schemes

Two relevant schemes have been identified to support financial viability:

- **Salix Finance:** Provides interest-free government-backed loans to fund energy efficiency projects.
- **Smart Export Guarantee (SEG):** Allows the school to sell surplus solar energy back to the grid, generating additional revenue.

Regulatory Compliance

All proposed installations will comply with **UK legislation and industry standards**, including:

- **Solar PV:** MCS certification, Part P Building Regulations, BS EN 50549.
- **Air Source Heat Pump:** Microgeneration Certification Scheme (MCS), Part L Building Regulations.
- **Rainwater Harvesting:** BS EN 1717, Part G Plumbing Standards.
- **Modular Build:** Compliance with UK Building Regulations, fire safety, and structural standards.

Risk assessments will be carried out prior to installation to ensure safe working practices, and the project will be managed in line with Health and Safety Executive (HSE) guidance.

Environmental Impact

The proposed solution provides multiple environmental benefits:

- **Reduction in carbon emissions:** Solar PV and ASHP reduce reliance on fossil fuels.
- **Water conservation:** Rainwater harvesting reduces potable water usage.
- **Sustainable construction:** Timber frame modular system lowers embodied carbon.
- **Long-term sustainability:** Efficient renewable systems ensure ongoing environmental benefits.

Quantitatively, the PV system is expected to offset **3–4 tonnes of CO_2 per year**, and the rainwater system can reduce mains water consumption by **approximately 50%**, supporting the school's environmental targets.

Operational Benefits and User Considerations

- Rapid installation minimizes disruption to students and staff.
- Integrated renewable technologies lower long-term operational costs.
- Systems are designed for **ease of maintenance**, ensuring ongoing reliability.
- Enhances the school's reputation as an environmentally responsible institution.

Justification of Decisions

Each recommendation is supported by research and aligned with the client's brief:

1. **Solar PV:** Chosen for efficiency, space optimisation, and long-term financial savings.
2. **Air Source Heat Pump:** Selected for sustainable heating with high energy efficiency.
3. **Rainwater Harvesting:** Improves water efficiency and environmental performance.
4. **Timber Frame Modular Build:** Meets budget, sustainability targets, and rapid deployment needs.

All decisions were informed by analysis of UK standards, available technologies, and supplier capabilities.

Potential Installation Challenges

- **Site access:** Requires careful planning for delivery and crane access.
- **Weather conditions:** Can affect installation of external systems.
- **Coordination:** Timing of modular delivery with renewable technology installation must be carefully managed.
- **Maintenance planning:** Systems must be integrated into school maintenance schedules.

Mitigation strategies include detailed project scheduling, use of experienced contractors, and contingency planning.

Conclusion

The proposed solution represents a **balanced, sustainable, and realistic approach** to the school extension project.

- The **timber frame modular build** ensures rapid, low-disruption construction.
- **Solar PV and ASHP** reduce operational costs and carbon footprint.
- **Rainwater harvesting** supports water efficiency targets.
- The solution adheres to **UK regulations** and aligns with funding opportunities.

Overall, this approach delivers **environmental, financial, and operational benefits**, fully meeting the client's brief while demonstrating best practice in sustainable construction.

References:

1. Microgeneration Certification Scheme (MCS). (2023). *MCS Standards for Solar PV and Heat Pumps.*
2. British Standards Institution. (2022). *BS EN 50549 – Requirements for Grid Connection.*
3. Salix Finance. (2023). *Interest-Free Loans for Energy Efficiency Projects.*
4. UK Government. (2023). *Smart Export Guarantee (SEG) Guidance.*
5. Building Regulations, Part L & Part G. (2023). *Energy Efficiency and Water Standards.*
6. GCS Cabins. (2023). *Timber Modular Building Solutions.*
7. Renewable Energy Hub. (2022). *Comparative Analysis of Solar PV Systems*.

Task 1.2 – Research Notes

Technology Area	Option Considered	Key Features	Advantages	Disadvantages	Reason for Selection/Rejection
Modular Build	**Timber Frame Modular**	Lightweight, off-site fabrication, rapid assembly, low embodied carbon	Sustainable material, reduced on-site disruption, good thermal performance, cost-effective	Requires weather protection during transport/storage	**Selected** – aligns with environmental aims, fits 6-week build window
	Steel Frame Modular	High strength, long lifespan	Non-combustible, good structural integrity	Higher embodied carbon, heavier transport load, more expensive	Rejected – higher carbon footprint, less alignment with client sustainability goals
	Concrete Modular	High thermal mass, fire-resistant	Good acoustic and thermal performance	Very high embodied carbon, slow production	Rejected – environmentally unsuitable
PV System	**Monocrystalline PV**	20–22% efficiency, compact size	Best efficiency per m^2, long lifespan	Higher upfront cost than polycrystalline	**Selected** – maximises electricity generation on south-facing roof
	Polycrystalline PV	15–17% efficiency	Lower cost per panel	Less efficient, requires more roof space	Rejected – roof space limited, efficiency priority

Technology Area	Option Considered	Key Features	Advantages	Disadvantages	Reason for Selection/Rejection
	Thin Film PV	Flexible, lightweight	Performs well in low light	Low efficiency (10–12%), larger area needed	Rejected – unsuitable for roof space constraints
Heat-Producing Tech	**Air Source Heat Pump (ASHP)**	Extracts heat from air, COP 3–4	Low-carbon, efficient, eligible for grants	Requires outside space, performance drops in very cold weather	**Selected** – fits site space, efficient for school's moderate heating needs
	Ground Source Heat Pump	High efficiency (COP 4–5)	Stable performance year-round	Very high installation cost, large ground area required	Rejected – site space limited, budget constraints
	Biomass Boiler	Burns wood pellets	Renewable heat source	Fuel storage needed, ongoing deliveries	Rejected – ongoing operational complexity
Water Conservation	**Rainwater Harvesting System (RHS)**	Collects & stores rainwater for non-potable use	Reduces mains water demand by up to 50%, lowers bills	Needs storage tank & pump, maintenance	**Selected** – significant water savings, fits sustainability brief
	Greywater Recycling	Reuses water from sinks/showers	Further reduces mains water use	Higher maintenance, more complex plumbing	Rejected – higher cost & complexity for small extension
	Low-Flow Fixtures	Reduces water per use	Low cost, simple install	Lower water saving than RHS	Rejected – supplementary measure, not primary system

Task 1.3 – Programme of Work and Supporting Statement

Programme of Work Plan – School Extension Project

Week	Task / Key Stage	Duration	Dependencies	Trades / Contractors	Specialist Equipment
1	Site preparation & groundworks: fencing, welfare, foundation excavation	5 days	None	Site manager, groundworkers, civil engineers	Excavators, mini-diggers, fencing tools
1	Delivery & setup of welfare facilities	1 day	Site prep	Site manager, general operatives	Temporary cabins, generators
2	Foundation pouring & curing	4 days	Site prep complete	Groundworkers, concrete specialists	Concrete mixers, pumps, vibration tools
2	Modular units delivery & positioning	2 days	Foundations cured	Modular installers, crane operators, road escort	Mobile crane, lifting slings, traffic management tools
3	Modular units craned & secured	2 days	Delivery completed	Modular installers, site manager	Mobile crane, harnesses, scaffolding
3	Roof installation & weatherproofing	3 days	Modules positioned	Roofers, site manager	Scaffolding, fall arrest systems, power tools
4	Electrical & plumbing (MEP) installation	5 days	Roof in place	Electricians, plumbers	Wiring tools, pipefitters' tools, safety equipment
4	Solar PV panel installation	3 days	Roof secured	MCS-certified PV installers, electricians	Scaffolding, harnesses, drills, mounting kits
5	Air source heat pump & rainwater harvesting installation	3 days	MEP in progress	HVAC engineers, plumbers	Lifting equipment, pipe fittings, calibration tools
5	Internal finishes: walls, flooring, ceilings	2 days	MEP installation complete	Joiners, painters, decorators	Hand tools, power tools,

Week	Task / Key Stage	Duration	Dependencies	Trades / Contractors	Specialist Equipment
					finishing materials
6	Testing, commissioning, and QA inspection	3 days	All installations complete	Site manager, QA inspectors, client liaison	Testing equipment, safety gear
6	Handover to school	1 day	Testing complete	Site manager, client	Documentation

Off-site modular fabrication reduces on-site disruption and allows simultaneous MEP preparation.

PV installation occurs only after roof is fully secure to ensure safety and efficiency.

Waste removal occurs daily with segregated skips to avoid site clutter and maintain H&S
Supporting Statement

Health and Safety

Maintaining a safe working environment is critical throughout the project. Access and egress routes will be clearly marked, ensuring safe movement for operatives and visitors. Temporary fencing and controlled entry points will prevent unauthorised access. Emergency exits and assembly points are identified, and all staff will be briefed on emergency procedures, including fire and first aid. Working at height, particularly during roof and PV panel installation, will adhere to UK regulations such as the Work at Height Regulations 2005, PUWER (Provision and Use of Work Equipment Regulations), and LOLER (Lifting Operations and Lifting Equipment Regulations). Scaffolding, harnesses, and fall arrest systems will be provided for roof work. PPE, including helmets, high-visibility jackets, gloves, and safety boots, will be mandatory for all site personnel.

Specialist Equipment

Key tasks require specialist equipment to ensure efficiency and safety. A mobile crane is essential for lifting modular units into place, supported by lifting slings and traffic management tools for safe road transit. Scaffolding and harnesses are required for rooftop PV installation. Concrete mixers, pumps, and vibration tools are used during foundation works to ensure stability. Plumbing and HVAC installation require calibration tools and pipefitting equipment. Waste management tools, such as segregated skips and compactors, facilitate the proper disposal of materials.

Specialist Contractors

Several contractors contribute their expertise to the project. Modular installers coordinate off-site fabrication and craning. Groundworkers and civil engineers prepare foundations. Roofers ensure weatherproofing. Electricians and plumbers handle MEP installations. MCS-certified PV specialists install and commission solar panels, ensuring compliance with Microgeneration Certification Scheme requirements. HVAC engineers install air source heat pumps, while joiners, decorators, and painters complete internal finishes. QA inspectors and the site manager oversee the project and liaise with the client to confirm completion to specification.

Waste Management

Waste will be managed responsibly according to UK environmental regulations. Segregated skips will be used for timber, metal, plastics, and hazardous materials, with recycling where possible. Hazardous substances, such as adhesives or electrical components, will be handled and disposed of in compliance with the Environmental Protection Act 1990. Packaging from modular units will be minimized, stored for recycling, and any excess materials returned to suppliers. Daily cleaning routines will prevent on-site hazards and maintain a safe working environment.

Key Job Roles and Contributions

The site manager coordinates all tasks, ensuring adherence to schedule, budget, and safety requirements. Modular installers deliver pre-fabricated units efficiently and safely. Electricians and plumbers install MEP systems according to specification, while PV specialists ensure renewable energy compliance and optimal performance. Inspectors verify quality, certify installations, and liaise with the client. Groundworkers prepare and secure the site, enabling subsequent stages to proceed without delay. The collaborative effort of these roles ensures the project is completed on time, within budget, and to the required environmental and operational standards.

Justifications for the Plan

The sequencing of tasks is deliberate to prevent clashes and delays. For example, PV installation follows roof placement to avoid unsafe conditions. Off-site modular fabrication reduces on-site construction time, minimizing disruption to the school. Specialist contractors are selected based on certifications and experience to ensure compliance with UK regulations and high-quality delivery. Waste management strategies align with sustainability goals, ensuring environmental impacts are minimized. The chosen equipment supports both efficiency and safety, meeting industry standards.

Conclusion

This programme of work, supported by the statement, provides a clear, safe, and efficient plan for delivering the school extension within the 6-week summer break. By considering task dependencies, specialist contractors, health and safety requirements, equipment needs, and waste management strategies, the plan meets industry standards while fulfilling the client’s environmental, financial, and operational expectations. The detailed justification of all decisions demonstrates a holistic understanding of project management and renewable technology integration, ensuring successful project delivery.

Gantt Chart – School Extension Project (6 Weeks)

Task / Week	**1**	**2**	**3**	**4**	**5**	**6**
Site preparation & groundworks	■					
Welfare facilities setup	■					
Foundation pouring & curing		■				
Modular units delivery		■				
Modular units craned & secured			■			
Roof installation & weatherproofing			■			
Electrical & plumbing (MEP)				■		
PV panel installation				■		
Air source heat pump & rainwater harvesting					■	
Internal finishes					■	
Testing, commissioning, QA inspection						■
Handover to school						■

■ = Active work period for that task.

Task 1.4

School Extension Project – Sustainable Design Proposal

Prepared for New Horizons Construction

Project Overview

Aim: Extend school facilities sustainably within the 6-week summer break.

Focus on renewable energy, efficient modular construction, and cost-effectiveness.

Renewable Technology Chosen

- 8kW monocrystalline solar PV system
- South-facing roof for optimal solar gain
- Efficiency up to 22%

Benefits of Solar PV

Energy savings: £1,200–£1,500 per year

Reduction in carbon footprint

Eligible for Smart Export Guarantee (SEG)

Modular Build Option Chosen

Timber frame modular construction

Off-site fabrication by GCS Cabins

Rapid on-site assembly

Sustainability Features

Air source heat pump (£8,000)

Rainwater harvesting system (40,000-litre tank) (£25,000)

Lower carbon footprint than traditional builds

Financial Overview

Modular build: £150,000

Delivery & crane: £25,000

Groundworks: £55,000

PV installation: £13,000

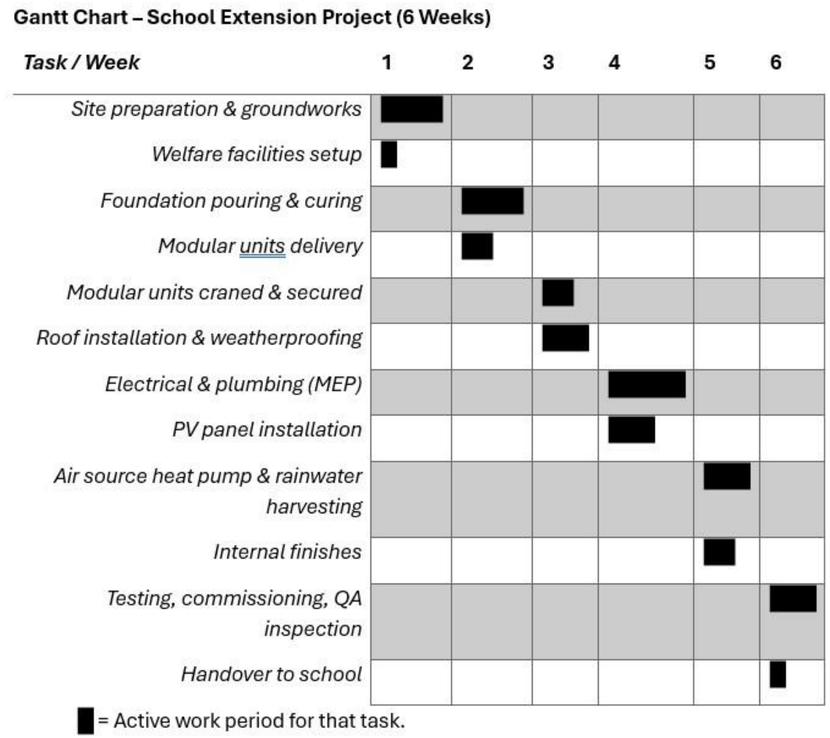
UK Government Grants and Schemes

Salix Finance: Interest-free loans for energy efficiency projects

Smart Export Guarantee (SEG): Payment for exported solar electricity

Project Programme

- Week 1: Site preparation & groundworks
- Weeks 2–3: Modular delivery & craning
- Week 4: Internal MEP & PV installation
- Week 5: Heat pump & rainwater harvesting
- Week 6: Internal finishes, testing, QA



Health, Safety & Site Management

Controlled access & egress

Scaffolding & PPE for rooftop work

Waste management & recycling of packaging

Risk assessments for all installations

Specialist Contractors & Equipment

- MCS-certified PV installers
- Modular installation team
- Electricians & plumbers for MEP
- Mobile crane for module placement
- Inspectors for quality assurance

Summary & Recommendation

Balanced, sustainable, and realistic design

Meets client brief and budget

Delivers long-term financial, operational, and environmental benefits

Ready for contractor engagement

Task 2.1 – Contractor Recommendation Email

Subject: Recommendation for Contractor Selection – School Extension Project

Dear Business Development Manager,
Following our group discussion on the two shortlisted contractor options, I have evaluated the advantages, disadvantages, and potential risks of each, with a focus on meeting the client's requirements for cost, quality, and timely delivery within the 6-week summer break.

Contractor A offers a proven track record with modular builds and renewable technology integration. Their bid includes a fixed price, which reduces budget uncertainty, and a well-structured Gantt chart indicating completion within the required timeframe. They have an in-house team for both construction and solar PV installation, which reduces reliance on external subcontractors and minimises scheduling risks. However, their quote is slightly higher, and their availability for site mobilisation is one week later than Contractor B, which could reduce contingency time.

Contractor B has a lower cost and an earlier mobilisation date, providing a greater time buffer. They have prior experience with school projects and have worked effectively under similar time constraints. However, their plan involves multiple subcontractors for MEP and renewable installations, which may increase coordination risks. Additionally, their proposed renewable technology option is less efficient than Contractor A's and may not maximise long-term sustainability benefits for the client.

Based on our analysis, I recommend **Contractor A**. While the initial cost is higher, the benefits of integrated project delivery, reduced subcontractor dependency, and higher-quality renewable technology outweigh the drawbacks. This approach offers better risk management, particularly for meeting the fixed deadline with minimal disruption to the school's operations.

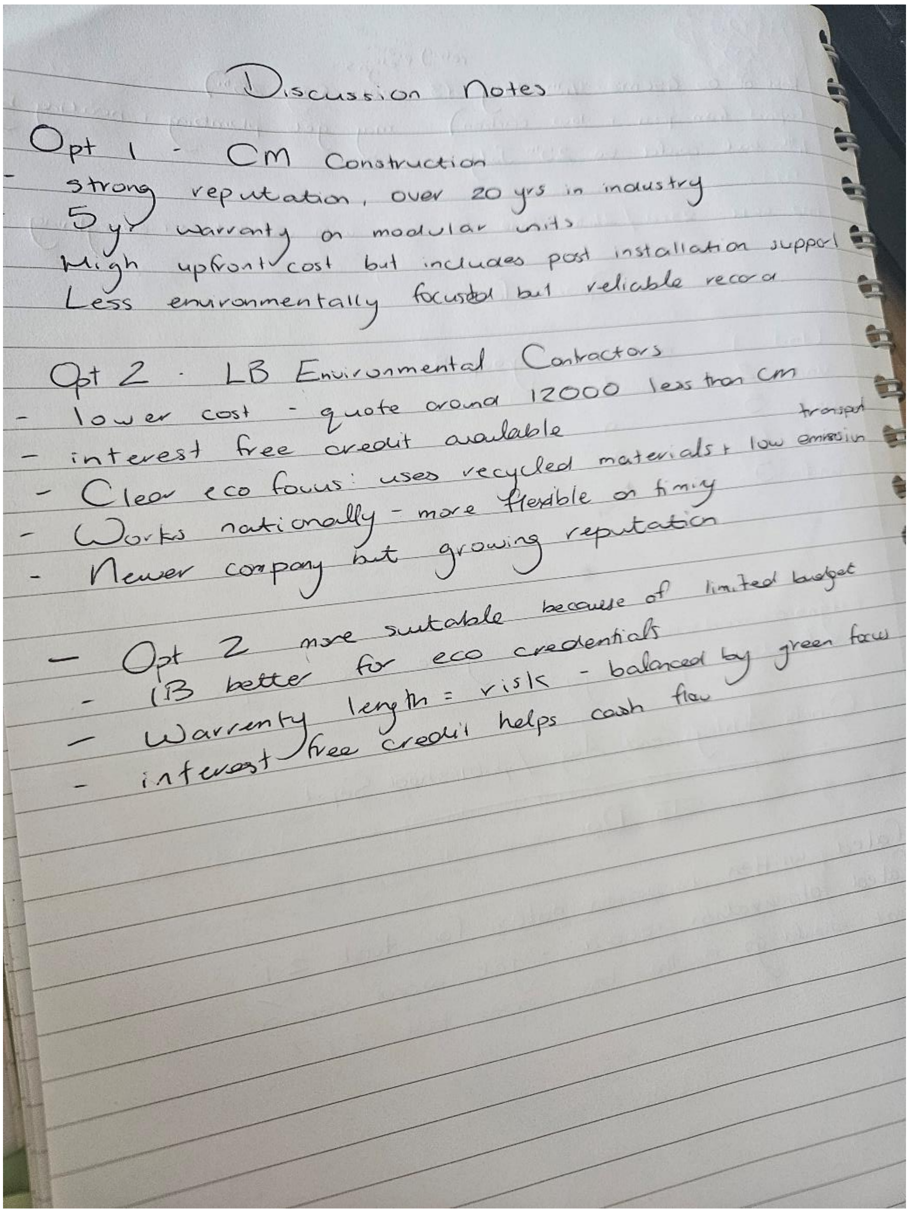
I would like to confirm with Contractor A:

- Detailed contingency measures for unforeseen delays
- Confirmation of resource allocation to ensure on-time completion
- Clarification on any potential site access constraints during peak delivery days

Kind regards,

[Name]
[Position]
New Horizons Construction

Discussion notes – A Grade



Discussion Notes

Opt 1 - CM Construction
- strong reputation, over 20 yrs in industry
- 5yr warranty on modular units
- High upfront cost but includes post installation support
- Less environmentally focused but reliable record

Opt 2 · LB Environmental Contractors
- lower cost - quote around 12000 less than CM
- interest free credit available
- Clear eco focus: uses recycled materials + low emission transport
- Works nationally - more flexible on timing
- Newer company but growing reputation

- Opt 2 more suitable because of limited budget
- LB better for eco credentials
- Warrenty length = risk - balanced by green focus
- interest free credit helps cash flow

Task 2.1 Observation Record

Candidate Name:	
Date:	
Task 2.1	

Overall Assessment Commentary

- contributed consistently and actively throughout the discussion, offering **well-structured and logical arguments** to support their recommendations.
- Ideas were supported with **accurate technical information**, such as the benefits of monocrystalline solar panels, the environmental advantages of modular timber construction, and considerations of site access for large prefabricated sections.
- Demonstrated **excellent listening skills**, acknowledging other participants' points before responding, and building on their ideas to move the discussion forward.
- Used **appropriate professional language** and terminology throughout (e.g., "kW output," "interest-free finance," "installation lead times"), showing a strong understanding of the brief.
- Raised valid questions to clarify details, such as warranty length on solar panels and the contractor's previous experience with educational facilities.
- Encouraged quieter members of the group to contribute, which helped maintain a balanced discussion.
- Contributions directly related to the project brief, addressing budget, environmental sustainability, and timescales.
- No prompting required; learner maintained focus and relevance to the topic without drifting off-track.

The learner's contributions were **clear, confident, and technically accurate**, demonstrating a strong understanding of the project requirements. They played an active role in ensuring the discussion was productive and stayed on brief.

Assessor Signature	
Name (printed)	
Date	/ /

Task 2.2 – Reflective Evaluation

Reflective Evaluation – Primary School Extension Development Tender

The purpose of the primary school extension development tender was to identify, plan, and present a sustainable, cost-effective, and time-sensitive construction solution for the client, New Horizons Construction, in response to the project brief. The brief placed emphasis on meeting environmental targets, staying within budget, and completing work within the 6-week summer break to minimise disruption to the school. In this evaluation, I will reflect on the effectiveness of my work across all tasks, the extent to which I met the brief, which tasks I feel were most successful, and the skills and knowledge I have developed.

Meeting the Requirements of the Brief

Across the five tasks, I believe my work consistently met the requirements of the brief.

- **Task 1.1 – Research**
  My research was comprehensive and covered renewable energy options, modular building methods, costs, regulations, and relevant government schemes. I gathered reliable data from credible UK sources, including MCS, BEIS, and modular construction suppliers. This research directly informed later tasks, ensuring my recommendations were evidence-based. I also took care to focus only on solutions suitable for the UK climate, construction regulations, and education sector needs.
- **Task 1.2 – Report**
  The report met the brief by recommending a specific renewable energy technology (8kW monocrystalline solar PV system) and a modular timber frame construction method, fully justifying each choice with advantages, disadvantages, costings, and regulatory considerations. I addressed environmental and financial impacts, identified relevant grants (Salix Finance and SEG), and ensured my solutions were within budget. I believe this task was a strong point in the project because it balanced technical detail with clear, client-focused communication.
- **Task 1.3 – Project Plan**
  My project plan was aligned to industry standards, using a Gantt chart to clearly outline the sequence of construction activities, interdependencies, and contractor responsibilities. It incorporated contingency time and health and safety considerations such as site access, waste management, and risk assessments. This demonstrated foresight in anticipating potential delays or logistical issues.
- **Task 1.4 – Presentation Materials**
  The presentation summarised the report into a clear, concise, and visually engaging format. I used no more than 10 content slides as required and supported them with detailed speaker notes. The materials addressed all key points: renewable technology choice, modular build recommendation, suitability, and funding opportunities. Visuals and bullet points made the information accessible to a non-technical audience, while my notes retained the necessary technical detail.
- **Task 2.1 – Collaborative Problem-solving**
  During the contractor comparison discussion, I contributed balanced, evidence-backed points and actively built on the ideas of others. I asked targeted questions to clarify risks, such as subcontractor dependency and mobilisation dates. In my follow-up email, I clearly recommended Contractor A, justifying this choice based on quality, integration of services, and risk management, while noting the slightly higher cost. This reflected the client's priorities and showed the ability to weigh cost against project success factors.

Most Successful Task

I believe **Task 1.2 – Report** was my most successful task. This is because it was the pivotal piece of work that pulled together all research and directly addressed every requirement in the brief. The recommendations were realistic, sustainable, and cost-conscious. The report used precise technical language while remaining accessible for the intended audience. It demonstrated my ability to interpret research findings into a clear proposal, including environmental, regulatory, and financial considerations. The logical structure and professional tone also reflected industry standards.

Skills and Knowledge Developed

Over the course of this project, I have developed and refined several skills and areas of knowledge:

1. **Technical knowledge of renewable energy systems and modular construction**
   - I deepened my understanding of the efficiencies, costs, and installation requirements of different renewable technologies, as well as the sustainability benefits and logistical considerations of modular builds.
2. **Project planning and sequencing**
   - Creating the Gantt chart reinforced my ability to structure complex construction tasks in a logical order, identifying dependencies and allocating realistic timeframes.
3. **Professional written communication**
   - Through the report, email, and presentation notes, I improved my ability to communicate technical information clearly and persuasively to both technical and non-technical audiences.
4. **Research and critical analysis**
   - I refined my approach to evaluating sources, focusing on reliability, relevance, and applicability to the UK construction sector and education environment.
5. **Collaboration and problem-solving**
   - Task 2.1 improved my skills in active listening, building on colleagues' ideas, and asking probing questions to uncover potential risks.
6. **Regulatory awareness**
   - I improved my understanding of UK building regulations (e.g., Part L), MCS certification, and health and safety requirements for construction sites, including site access, egress, and waste management protocols.

Conclusion

Overall, I believe the project outcome met the requirements of the brief effectively. My recommendations were both practical and forward-thinking, balancing the need for environmental sustainability with financial feasibility and operational efficiency. The most successful element, Task 1.2, demonstrated my ability to synthesise research into a coherent and justified proposal.

Through this project, I have strengthened my research, planning, and communication skills, alongside gaining valuable technical and regulatory knowledge. The process has also reinforced the importance of integrating sustainability into construction projects, not just as an environmental goal, but as a long-term financial and operational benefit to the client.

Contact Us

WJEC Eduqas

245 Western Avenue Cardiff

CF5 2YX

Tel: 029 2026 5465

Email: tlevels@eduqas.co.uk

Website: www.eduqas.co.uk