Facilities Report 01

Energy-saving and access systems in community sports facilities

sportscotland

Foreword

This report has been produced by **sport**scotland to present the findings of external consultants *Hummocky Moraine*, who were commissioned to evaluate the benefits of installing energy-saving and access systems to a community sports facility at Guildtown, Perthshire.

The document is one of a series of reports published by our Facilities Team to provide specific information and guidance, and examples of best practice, to owners, operators and managers of sports facilities in Scotland.

In this instance, our consultants focused on a small, rural, community-owned facility. However, the content of this and other reports is aimed at all those responsible for investing in and improving Scotland's stock of sporting facilities – large and small.

This study evaluated three systems which were installed with the aim of improving security and saving energy:

- controlled door access system;
- low-energy lighting system with PIR controls; and
- heat recovery ventilation system.

Several benefits were identified. The keyless door access system allowed the facility to remain locked when not in use, and was more convenient for members as entry did not rely on the presence of a nominated key holder.

The new lighting system ensured that no lights were left on when the building was unoccupied, while low-energy bulbs were more efficient. When savings from the new heat recovery ventilation system were also taken into account, energy costs for the period of the study were reduced by 34%.

Following positive feedback from members – and increased usage – the study concluded that energy-saving measures can benefit community facilities financially without compromising user comfort.

Produced in association with

hummocky moraine

Contents

01 Introduction

Facilities at Guildtown

The village of Guildtown is approximately five miles north-east of Perth. Guildtown Community Hall is owned and managed by the Guildtown Community Association. It provides community and sporting facilities, including a floodlit multi-sport court (see Image 1 below) and open playing fields. The facilities are provided for the benefit of Guildtown residents and the surrounding villages of Wolfhill, Balbeggie, Stormontfield and St Martins. The Community Association is a Registered Scottish Charity.

Image 1: Floodlit multi-sport court at Guildtown Community Hall

To improve facilities, Guildtown Community Association (GCA) sought funding to build a new annexe. Plans included sports changing facilities, a kitchen and a meeting room/ internet access point, plus full disabled access and toilets, and storage.

Although the work was primarily aimed at improving the quality and range of facilities for users, there was also a desire for the project to incorporate environmental 'best practice'. The objective was to create a zero-carbon emissions project that would combine on-site utilisation of renewable energy with high levels of energy efficiency and imported 'green energy' supplies.

To achieve this, the following elements were included:

- a tubular skylight to maximise natural light and reduce demand for electricity (see Image 2);
- a ground-source heat pump to meet demand for hot water and interior heating;
- a solar water-heating system to contribute to hot water demand (see Image 3);
- high levels of insulation to ensure minimal heat loss;
- installation of a heat recovery ventilation system to improve indoor air quality and prevent ventilation heat loss;
- low-energy artificial lighting with motion and time sensors; and
- keyless controlled door access system to improve security and increase autonomy of user groups.

The last three features received funding of £17,410 from **sport**scotland and are the principal subject of this evaluation. Other elements were funded by the Scottish Community and Householder Renewables Initiative (SCHRI) – a Scottish Executive programme to promote micro-renewables. Full details of other funders can be found at Appendix 3.

Image 2: Natural and low-energy lighting in changing facilities at Guildtown

Image 3: Solar collectors to provide hot water on south elevation of extension

Study requirements and methods used

In February 2005, **sport**scotland's Demonstration Programme awarded Guildtown Community Association a grant towards the cost of installing energy saving and access systems at Guildtown Community Hall.

Although the installations required a large initial investment of capital, the project aimed to demonstrate the ongoing benefits and savings – in terms of costs and manpower.

Our role was to evaluate the benefits provided by the access, lighting and heating systems, and to identify any significant problems that were encountered. Where applicable, any solutions to the problems, or improvements carried out or suggested, have also been highlighted.

The following methods were used to obtain the necessary information for the study:

- interviews of key personnel;
- surveys with user groups; and
- assessment of data collected by the project proponent.

The following sections detail the findings of the evaluation for each element. They are followed by an overall discussion and conclusion. It should be noted that only two sports groups provided user feedback. However, their comments correlate closely with those of the key personnel from GCA, and are overwhelmingly supportive.

Image 4: Guildtown Community Hall annexe

02 Controlled door access system

Description

The ‘ENTROTEC Entrotag 2000’ controlled door access system was installed to allow controlled access via a key fob for up to 2,000 users. It is programmable without the use of a PC, and enables the community association to operate the sports facility safely, conveniently and with minimum time commitment.

As well as allowing access, the system can identify individual users, provide timed access (e.g. no entry after, say, 10.30pm) and a printed record of users and usage frequencies, and has full mains power backup.

The system is linked to the fire exit system and provides safe exit in the event of the fire alarm sounding. The system was supplied from a local supplier, who will provide full customer backup and user support. The cost for supply and installation of the system was £5,705.36 (excl. VAT).

Image 5: Sensor pad for key fobs

Benefits, issues and solutions

Savings in staff/volunteer time

Feedback from key personnel at GCA indicated that significant savings have been made in staff/volunteer time. Automated access not only restricts entry to authorised users, but also ensures that the facility is unlocked during periods of use only. Previously, the changing facility was left unlocked/unsupervised for long periods of time to minimise inconvenience to the hall keeper who held the keys.

Alterations made to the present booking system

The existing booking system links well with the new access system. Regular users and members are issued with keys for the synthetic grass pitch and the bookings cabinet, together with a fob for the changing facilities.

The view of users relating to ease of use
The feedback from users is very positive. They appear to appreciate the convenience of using GCA since the installation of the system. At many other venues, users have to wait for facilities to be opened by key holders.

Using the facility until the official closing time
No problems have been experienced. The access system is shut off after 10.30pm, preventing entrance while still allowing safe exit.

Reliability of the system
Responses related to the number of system failures/problems and how the facility was managed during 'downtime'. Feedback has indicated that the system has been 100% reliable. Problems have only been experienced when the fuse switch on the power pane was accidentally switched off, and when there was a local power cut. In both instances, the facility was opened manually (see Image 6 below).

Linkage to the alarm system
There have been no issues because the fire alarm is not linked to the access system. Doors are fitted with emergency panic bars (see Image 7 below).

Image 6: Manual over-ride box (above)
Image 7: Push-bar exit

Using access system data
At the time of the report, key personnel at GCA had not used this feature. However, they believe it will be useful for any future analysis of users.

Loss/cancellation of key fobs
There have been no lost fobs (£5 returnable deposit is taken from users). One fob was cancelled when a former member failed to return it.

Any other issues
The main access door is occasionally propped open on busy match days as only the football manager has a fob, and the 1-hour delayed access period is insufficient. Steps are being taken to resolve this.

Conclusions

Feedback from users and key personnel at GCA indicates that the access system is extremely convenient for users, and has significantly improved the security of the unmanned facility.

03 Low-energy lighting system with PIR controls

Description

The low-energy lighting system with automatic PIR (Passive Infra Red) controls has been designed to light areas of the facility only when it is occupied (see Image 8 below). When someone enters the building, PIR detectors automatically activate the lights, which stay on while the building remains occupied. All lights and fittings have been selected to provide an attractive, well-lit interior. Low-energy bulbs are used to minimise electricity consumption. The cost for supply and installation of the low-energy lighting system was £3,655.94 (excl. VAT).

Image 8: Low-energy lighting in corridor with PIR detector

Benefits, issues and solutions

Indicative or measured savings

The PIR system ensures that lights are on only when the facility is occupied and light levels are low. Lights are no longer left on unnecessarily. The fluorescent fittings installed are of 'high frequency' specification. These are 20%-40% more efficient than standard fluorescent units. As this is a new facility, GCA does not have any historical data with which to compare results. They do, however, expect lighting costs to be around 50% less, due to the energy-saving features of the light units, and the fact that lights are only on when required.

Customer feedback

Users are very pleased with the lighting – they don't have to do anything. They arrive, open the facility with a fob, and the building then automatically 'comes alive' with both lighting and ventilation triggered by their movement. They do not have to worry about lights being left on when they leave. Override controls have proved to be unnecessary.

Management feedback

Responses related to problems with the system (e.g. extra energy costs/staff time required due to any malfunctions with PIR, etc), alterations to the original layout to meet user requirements, and unseen costs due to the replacement of a greater number

of low-energy lights due to increased frequency of switching on/off created by PIR. Some management time has been spent optimising the PIRs. Future work is required to ‘fine tune’ switching for WCs. There have been no noted increased energy costs as a consequence of making these adjustments. None of the fluorescent bulbs have failed to date and there is no evidence that increased switching affects their lifespan.

Any other issues
None reported by either key personnel or user groups.

Conclusions

The automated lighting appears to be working well. In addition to being energy efficient, it has created a well-lit, high quality, fully-automated changing facility and has saved considerable volunteer time.

04 Heat recovery ventilation system

Description

The heat recovery ventilation (HRV) system (see Image 9 below) removes moist stale air from the changing rooms, associated toilets and showering areas (including the referee's room) and discharges it through a heat exchanger to the outside. Fresh air is brought into the building and picks up the heat from the heat exchanger and delivers this by diffusers into the sports changing area.

The system was recommended in a report by NIFES Consultants, carried out as part of the low-energy proposals for the building. The system has been designed and specified by Vent Axia in line with Building Regulation requirements for five air changes per hour (ACH), and is linked to the PIR detection system to ensure it only operates during periods of occupancy. The cost for supply and installation of the heat recovery ventilation system was £5,456.00 (excl. VAT).

Image 9: Ducting for HRC system in loft space, sequenced hot water cylinders and heat pump (in centre of image)

Benefits, issues & solutions

Recommended air changes/hour

sportscotland recommends 10 air changes per hour but five air changes, as specified by Vent Axia, have been found to be sufficient. Users have commented on how well the changing rooms are ventilated. The shower area, in particular, clears well.

Humidity problems
No problems have been reported. The combination of under floor heating and high-quality ventilation has enabled sports teams to store kit under benches without any condensation or mould problems.

Additional heating requirements
The report assessed whether additional heating was required in the sports hall at the start of each day due to lack of heat storage in heat exchanger. None was required. The under floor heating is on continuously with setback facility on overnight. The HRV is part of an integrated space and water heating system, which uses a ground source heat pump (GSHP) and solar water heating system to feed into the under floor heating loop.

Fan settings
Fans are set to shut off 30 minutes after the last user leaves the area. Feedback suggests that it works well at this setting.

Other issues
In summer, the incoming air fan is switched off and the system is used in extract mode with limited heat exchange. This reduces the cost of running both fans unnecessarily during warmer weather. Meanwhile, positive user feedback was received for the under floor heating in the changing facilities.

Conclusions

HRV is proving to be both an energy efficient and effective means of ensuring a high indoor air quality for the sports facilities at Guildtown Community Hall.

05 Conclusion

The UK's sports sector buildings spend £700 million on energy every year, resulting in annual emissions of 10 million tonnes of carbon dioxide – the principal contributor to climate change (BRESCU, 2001).

Overview

The evaluation of the Guildtown project has indicated that the investment made by **sport**scotland in the energy saving and controlled door access systems represents excellent value for money. It has improved the ease of use of the facilities by enabling unmanned access to the building by user groups, and has provided a well-lit and comfortable indoor environment for user groups and a sustainable energy solution for Guildtown Community Association. The project has also acted as an excellent 'demonstrator' with requests from many organisations wishing to visit Guildtown Community Hall and learn from their experiences.

Planning permission has since been obtained to erect a wind turbine to meet the electricity demand for the facilities.

User responses

Feedback from user groups and members of Guildtown Community Association suggests that the facility is something to be proud of, and participation in sport locally is extremely healthy. One respondent to the user survey summed up the overall feedback, saying: "We are the envy of the league. The facility overall is tremendous."

Cost savings

Comprehensive energy demand data is not yet available for Guildtown Community Hall but is being collated by GCA and will be used to inform a comprehensive cost-benefit analysis at a later date.

However, the predicted energy demand for the facility, including the new extension, was in the region of 33,135 kWh/year. Energy bills to date have been extrapolated to provide an estimated 'real-time' energy demand for the first year of 21,799 kWh/year.

This represents an energy saving of 34% as a result of installing the **sport**scotland-funded energy-saving measures in conjunction with the renewable energy technology. It equates to a reduction in possible carbon dioxide emissions of 4,874kg a year – or 97.48 tonnes of CO_2 over the average technology life span.

The future

In an economy of rising fuel costs, energy bills will increasingly affect the ability of organisations to provide high-quality local sporting facilities. It is important to take a long-term view of operational costs when considering the funding of sports facilities.

06 Appendices

Appendix A: Interview schedule – key personnel

Element 1	Specific focus	Key personnel comments
Controlled door access system: benefits and problems encountered.	Savings in staffing/volunteer time, including any alteration made to the present booking system	
	The view of users reflecting ease/problems using the system	
	How the system has worked in terms of linkage into the alarm system	
	Any problems encountered in terms of use of the facility at the official closing time	
	Reliability of the system, including number of system failures/problems, and how the facility was managed during any 'downtime' of the system	
	Use the Community Association has made of any of the data gathered from the system	
	The number of lost fobs and the number of fobs that needed to be cancelled due to misuse of the facility	
	Any other issues	

Element 2	Specific focus	Key personnel comments
Ventilation and heating system: benefits and problems encountered. Customer feedback in terms of the quality of the environment in both the newly created extension and the existing sports hall. This will include problems such as draughts caused by the new system.	Evaluation on whether the 5 air changes per hour, as specified by Vent Axia, are sufficient (**sport**scotland recommends 10 air changes per hour)	
	Identify any problems encountered due to humidity	
	Additional heating required in sports hall at start of a day due to lack of heat storage in heat exchanger	
	Adjustments required to originally programmed time overruns of fans	
	General and any other specific issues	
Element 3	**Specific focus**	**Key personnel comments**
Low energy lighting system: benefits and problems encountered.	Indicative or measured savings achieved due to the installation of this system compared with a more typical manually switched system	
	Customer feedback covering such areas as speed of reaction of the system to movement, problems (either perceived or actual), quality of lighting and accessibility of override controls (if fitted)	
	Management's perspective to include any problems with system (e.g. extra energy costs/staff time required due to any malfunctions with PIR, etc), alterations if required to original layout to meet user's requirements, unseen additional costs due to replacement of greater number of low energy lights due to increased frequency of switching on/off created by PIR	
	Any other issues	

Appendix B: User group questionnaire

Guildtown Hall – User Groups Survey

In February 2005, **sport**scotland's demonstration programme awarded Guildtown Community Association a grant towards the cost of the installation of energy saving and access systems at Guildtown Community Hall, Hall Road, Guildtown, Perthshire. The aim of the project was to demonstrate the benefits of installing energy saving and access systems in a rural hall.

Works in this project included:

- the installation of a controlled door access system;
- the installation of a low-energy lighting system with movement sensors in the entire building; and
- the installation of a ventilation and heating system in the new extension linking into the heating system in the existing hall.

The purpose of this survey is to gauge views of users about the benefits the installations have brought to the facility, to identify any significant problems encountered, solutions to the problems and any suggested improvements.

Please take some time to complete this short questionnaire and return to me as soon as possible. If you have any questions or wish to give more detailed feedback, please email elaine@hummockymoraine.co.uk.

Many thanks – your views are greatly appreciated.

Elaine Morrison

Consultant Researcher
Hummocky Moraine

Note: If you are using this form electronically, all boxes are text boxes and you can type into them. Mark an X in the check boxes and type/write text in the freeform boxes which will expand to fit. The formatting may go a bit askew but don't worry I'll fix this end!

General

How often do you use the facilities at Guildtown Hall?

Which group do you represent

How many people are there in your group?

Which facilities do you use (list all)?

How long have you used the facilities?

Overall, how would you rate the facilities you use? Excellent ☐ Good ☐ Fair ☐ Poor ☐

About the Controlled Door Access System

Have you encountered any problems using the controlled door access system? Yes ☐ No ☐

If yes, please give details.

If yes, was the problem resolved to your satisfaction? Yes ☐ No ☐

If no, please comment.

Write any other comments about the Door Access System here:

About the Ventilation and Heating system

How would you rate the quality of the environment in the changing rooms (consider such things as humidity levels, draughts, temperature etc)

Excellent ☐ Good ☐

Fair ☐ Poor ☐

Have you encountered any problems as a result of the ventilation or heating system? Yes ☐ No ☐

If yes, please give details.

If yes, was the problem resolved to your satisfaction? Yes ☐ No ☐

If no, please comment.

If you were a user of the halls facilities prior to the new extension being built, how does the indoor environment compare?

Dramatic improvement ☐ A bit better ☐

About the same ☐ Worse ☐

Write any other comments about the ventilation and heating system here:

About the Low energy lighting system

How would you rate the reaction time for the movement sensor operated lighting system?

Satisfactory ☐ Unsatisfactory ☐ Haven't noticed ☐

Have you encountered any specific problems with the lighting system?

Yes ☐ No ☐

If yes, give details here.

If yes, was the problem resolved to your satisfaction?

Yes ☐ No ☐

If no, please comment.

How would you rate the quality of the lighting itself?

Too bright ☐ About right ☐

Too dull ☐ Unsure ☐

Write any other comments about the low energy lighting system here:

Please give us some comments about your experience of using the facilities at Guildtown overall.

Many thanks!

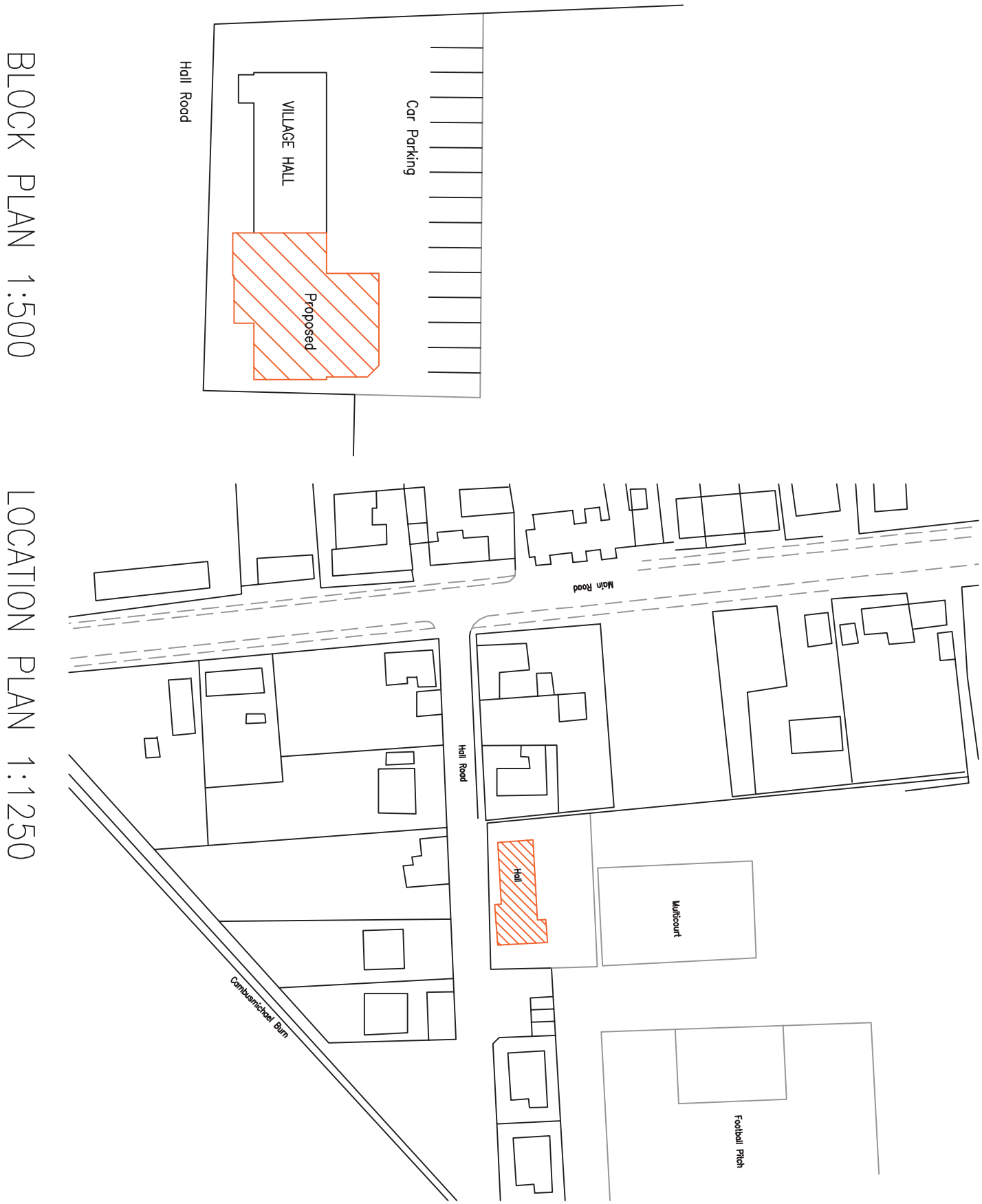
Appendix C: Funding profile

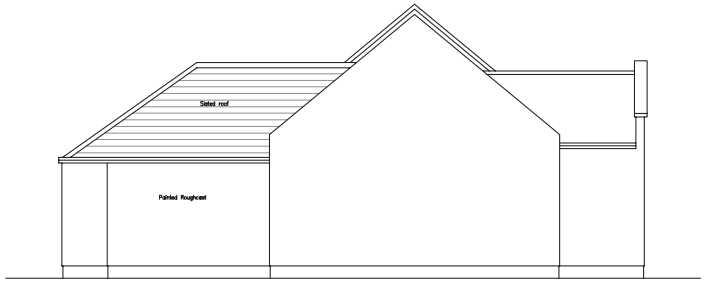
Funder profile
The following were involved in supporting and funding the extension of Guildtown Community Hall. Further information can be obtained by contacting the funder or Guildtown Community Association, Village Hall, Hall Road, Guildtown, PH2 6BX

Funder	Amount	Description	Further Information
Community fundraising	£20,433	General funding for project	Guildtown Community Association
Eglinton Trust	£400	General funding for project	Guildtown Community Association
Gannochy Trust/Perth & Kinross Leisure	£8,895	General funding for project	The Gannochy Trust, Kincarrathie House Drive, Pitcullen Crescent, Perth PH2 7HX. Tel 01738 620653
Gannochy Trust/Perth & Kinross Leisure	£6,000	3-year interest-free loan	www.pkgrantsdirect.com/pklassistance.htm
Guildry Incorporation of Perth Trust	£15,000	General funding for project	Guildry Incorporation of Perth, 42 George Street, Perth PH1 5JL. Tel: 01738 623195
Hedley Foundation	£2,000	Kitchen/youth café area	www.hedleyfoundation.org.uk
James Strathallan	£1,000	General funding for project	Guildtown Community Association
LEEP	£5,000	Kitchen/Meeting Room	Guildtown Community Association
Lloyds TSB Foundation	£5,963	Disabled access	www.lloydstsbfoundations.org.uk
Local Capital Grant Scheme, Scottish Executive	£9,188	VAT recognition – used as general funding	www.scotland.gov.uk
Local Capital Grant Scheme, Scottish Executive	£56,000	General funding for project	www.scotland.gov.uk
NPower Renewable Energy Fund	£1,500	Renewable energy systems	Email: juice.fund@npower.com
Perth & Kinross Council	£28,000	General funding for project	www.pkc.gov.uk
Perth & Kinross Quality of Life Trust	£4,000	General funding for project	www.pkgrantsdirect.com

Perth and Kinross Council	£5,000	Additional general funding	www.pkc.gov.uk
Robertson Trust	£10,000	General funding for project	www.therobertsontrust.org.uk
Scottish Community and Householder Renewables Initiative (SCHRI)	£43,000	Renewable energy systems	www.est.org.uk/schri
sportscotland	£17,410	Installation of energy saving and access systems	www.sportscotland.org.uk

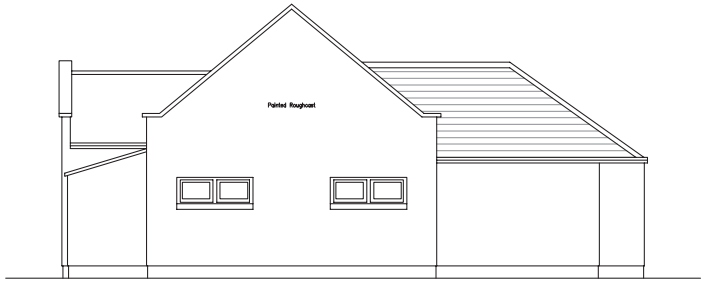
Appendix D: Plans and drawings of original building and extension





WEST ELEVATION

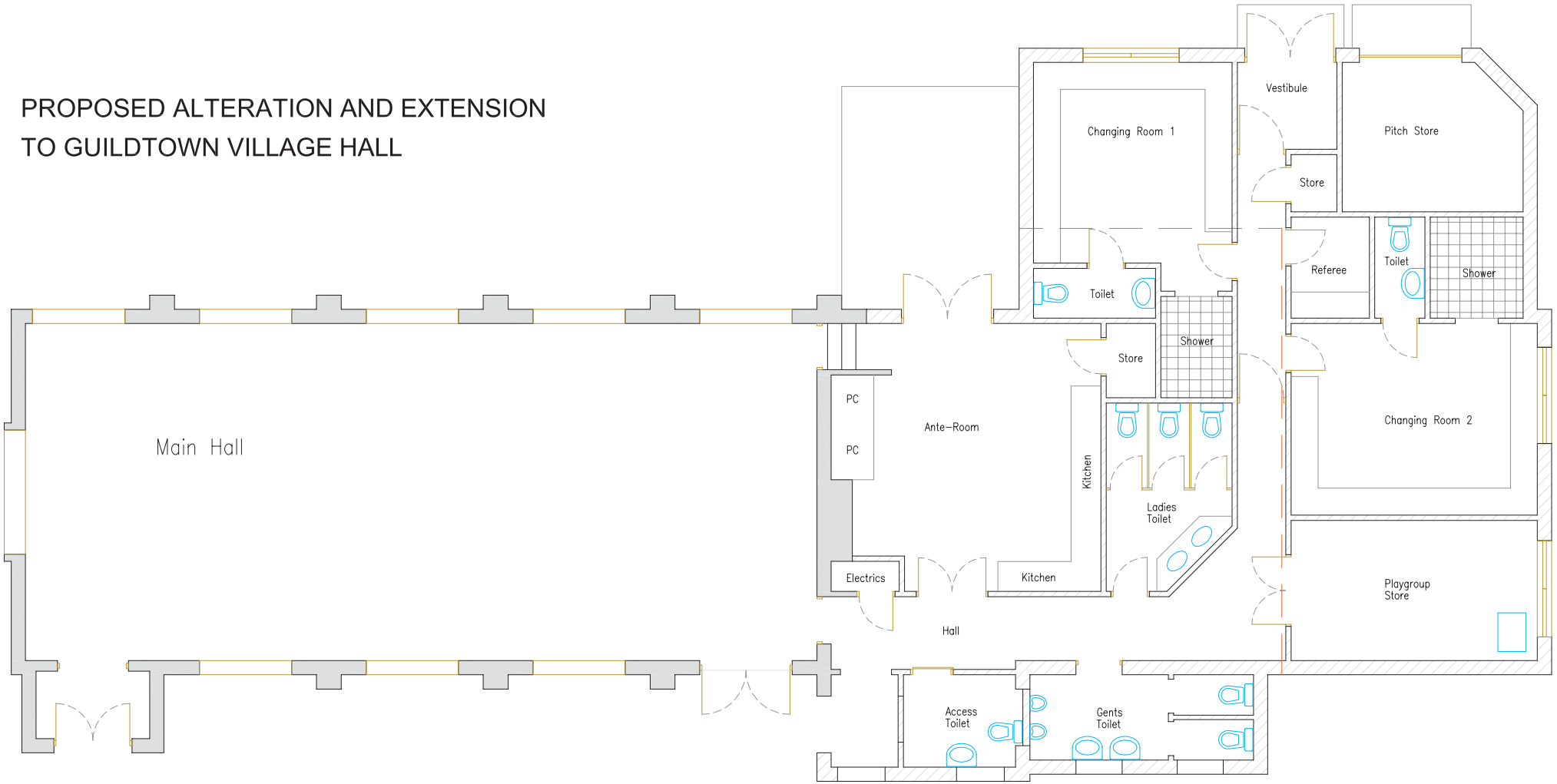
NORTH ELEVATION



EAST ELEVATION

SOUTH ELEVATION

PROPOSED ALTERATION AND EXTENSION TO GUILDTOWN VILLAGE HALL



PLAN OF EXISTING HALL

PLAN OF PROPOSED ALTERATINS AND EXTENSION.