Prepared for: Northern Ireland Housing Executive (NIHE)

Electronic Assistive Technology (EAT): North Lisburn Supported Housing

Final Report

4th June 2018

CONTENTS

1. Executive Summary

Background

In November 2017, RF Associates was awarded the contract to undertake an evaluation of the North Lisburn Supported Housing Scheme, Meadowvale. Cedar Foundation run the Meadowvale facility with Triangle Housing Association acting as the landlord, having undertaken the physical development of the site.

This research was commissioned by the Northern Ireland Housing Executive (NIHE) in partnership with the Department for Communities (DfC), to do the following:

- Provide an overview of the model of care and housing support used in North Lisburn Supported Housing Scheme and in particular the role and impact of assistive technology.
- Give a balanced assessment of the impact of the technology within the North Lisburn Supported Housing Scheme on the quality of tenants' lives compared to their previous circumstances as well as the impact on their family / carers.
- To evaluate how intensively the technology is used and for what tasks. If there was no technology in the scheme, what would the structure be?
- Explore what clients are doing differently in their new accommodation compared to their previous accommodation, also what has changed in their life due to electronic assistive technology.
- Provide an overview of the capital, revenue and maintenance costs of this scheme compared to similar schemes in Northern Ireland designed to support those with a brain injury or neurological disability to live independently (using the framework / metrics developed in Phase One).
- Contribute to a growing evidence base and help inform future funding streams for this client group and more widely help guide good practice and future development of housing solutions for people with physical disabilities including neurological disabilities, brain injury and sensory disabilities.

To undertake the project RF Associates:

- Interviewed all project partners to understand the background to, and practical development of, the facility including the procurement and on-going role of the technology.
- Conducted research with all stakeholder groups – tenants, staff and care / case managers as well as family and friends of tenants - to gather their views on the use and impact of the assistive technology:
    - Two focus groups discussions were conducted with staff (11 attendees in total);
    - Two mini-group discussion were conducted with tenants (5 attendees in total);
    - One individual tenant interview;
    - Four interviews with care / case managers (in relation to 7 tenants);
    - Three interviews with family members / friends.
- Undertook analysis of all background materials provided.
- Interviewed two other housing associations to seek a wider evidence base on the role, impact and costs of assistive technologies.

Summary and Recommendations

Provide an overview of the model of care and housing support used in North Lisburn Supported Housing Scheme and in particular the role and impact of assistive technology.

North Lisburn Supported Housing Scheme or Meadowvale provides an independent living solution for people with neurological conditions and / or an acquired brain injury. It seeks to facilitate and enable individuals to gain the optimum level of autonomy, control and independence in their own home. In order to enable this a range of assistive technology is provided in each home, along with a package of care and support to enable independent living. The key principle informing the model of care, is one of being person-centred and the Cedar Foundation approach complies with principles of good practice.

Overall feedback on the role and impact of technology, from all stakeholder groups was very positive and the majority welcomed the use of Assistive Technology. The members of the steering group did not make any detailed comment on its impact as they are removed from day-to-day life at the facility, however the majority felt that the facility wouldn't work as well without the technology. Care / case managers are not so familiar with their clients' daily lives however they were all very welcoming of the technology and felt that Meadowvale was a much better placement for their clients with Assistive Technology as an important component. Staff, family members, friends and service users themselves were all also generally positive about the impact of technology, and the choice and control it enables.

In sum we consider that the assistive technology at Meadowvale functions as an enabler of supported living. Tenants could not live in their own homes without elements of the technology such as door openers, fob access, ability to let visitors in and out etc. The technology is focused on empowering and enabling day to day activities in an almost passive role, providing functions that an abled bodied person is likely to take for granted.

Give a balanced assessment of the impact of the technology within the North Lisburn Supported Housing Scheme on the quality of tenants' lives compared to their previous circumstances as well as the impact on their family / carers.

All the tenants at Meadowvale, have come from a range of prior settings:

- Six of the eleven tenants previously lived in residential care in their own single room with ensuite bathroom facilities. The only Assistive Technology at the residential care facility was a pull cord for a warden call system. Residents had access to a common space where they could socialise and watch television and meals were provided in a central dining room and a clothes laundry services was provided to them.
- Two of the eleven tenants moved from long-term hospital settings. We assume this will have had some sort of buzzer alarm system.
- One tenant moved from accommodation provided by a housing association – we don't know if this had any Assistive Technology.
- And finally, two tenants moved from their family home where they were cared for by their family members and did not have access to any Assistive Technology.

From our interviews with Meadowvale staff members, we understand that the roles of staff in a supported living facility are different from the roles in a residential care facility. Most staff interviewed came from a residential care setting. In a supported living facility such as Meadowvale tenants' needs are met from a

perspective of encouraging and supporting individuals to do as much for themselves as possible. In a residential facility staff, or the organisation, provide services to complete many of these tasks on the behalf of individual residents for example by meals and eating being organised for everyone at the same time, a cleaner/s cleaning the facility at a set time/s each day, laundry services being provided, and clothes put away by staff etc. Given this, those coming from this context of more 'institutionalised' care it would certainly seem that tenants are afforded a completely different living experience within a much more independent living environment.

Feedback on supporting independent living was very positive. The themes that came through from the research with all stakeholders included:

- Tenants now have choices in how to live day to day, they are tenants not residents.
- Support is tailored to the individual to help them care for themselves and their own home.
- Staff and tenants have had to adjust to the independent living approach.

In addition to talking with tenants about their experience of living in Meadowvale, Cedar Foundation have been able to provide RF Associates with access to data collected through the Adult Social Care Outcomes Toolkit (ASCOT). This is a survey tool which is designed to capture information about an individual's social care-related quality of life (SCRQoL). The SCT4 tool was completed by 13 Meadowvale tenants in January 2017 and then repeated again in January 2018 with 11 tenants. The overall SCQRoL score for Meadowvale in January 2017 was 0.92 where 1.00 is considered an 'ideal state'. This represents an excellent outcome. This ranges from 97.44% (Personal cleanliness and comfort) to 79.49% (Social participation and involvement). The analysis reflects no areas of high need and 4 domains with a small percentage of "some needs" (food and drink, social participation and involvement, occupation, and control over daily life). Varying degrees of "no need" are reflected across each domain, and significantly high levels of "ideal state." For 2018 the overall SCQRoL score was 0.87. Scores for 2018 range from 93.94% (Control over daily life, and Food and drink) to 78.79% (Social participation and involvement). Scores from the 2018 questionnaire are lower in most domains apart from 'Control over daily life' and 'Food and drink'. It is interesting to see that the overall score for the facility has moved downwards slightly from 0.92 to 0.87. It is thought that this is in part due to the study relying on snapshots in respondent's daily lives – and that some of the research may be conducted with service users when they are having a bad day (as well as when they are having a good day). One of the tenants has experienced deteriorating mental health in the last year which may reflect in some of the reduced scores.

When considering this data, we have been interested to look particularly at the data around 'control' as the main discussion around the technology has been as an enabler of independence. Therefore, it is interesting to see the increase in the numbers around the number of people in 2017 agreeing that they have 'as much control as I want', with the percentage agreeing with this to being 90.9 from 53.8. Further given that some assistive technologies have been commented on in passing as providing a sense of security, it is interesting that there has been a decrease in the percentage agreeing 'I feel as safe as I want' from 84.6 to 72.7 (see chart 6).

In this more independent living context it is difficult to separate out the impact of the assistive technology when, for many of the tenants, the supported living element is in itself a completely different experience.

Also in considering the impact of the assistive technology it is difficult to see particular technology impacts for staff (other facilities, for example in the dementia space, may better highlight how staff are supported to manage risk). Further it is difficult to see how particular technology impacts on friends / family members,

but our study had a very poor response to requests for engagement from this group. However staff and tenants are positive about the role that technology plays in enabling independent living.

To evaluate how intensively the technology is used and for what tasks. If there was no technology in the scheme, what would the structure be?
Explore what clients are doing differently in their new accommodation compared to their previous accommodation, also what has changed in their life due to electronic assistive technology.
It was difficult to get a sense of actual usage / volume of usage by tenants from tenants themselves due to the tenants finding it difficult to communicate or recall their specific behaviours. No monitoring data is available from the technology provider in relation to usage patterns. Only two of the seven tenants we interviewed could provide a clear estimation of usage and one tenant does not personally make use of any of the technology due to their complex physical disability. The usage comments provided in the boxes below are mostly based on staff views. In summary it is clear that the technology is used, however due to the different abilities of the tenants, each tenant uses it in their own way. The table below sets out the different components of the technology and their usage levels.

INTERCOM SYSTEM	Everyone (10 tenants) (apart from one tenant with a complex disability) uses the intercom to let visitors into the building and their apartment.
PHYSICAL SWITCHES (to open/close or turn on/off):	Seven use **only** the physical wall switches (not the tablet device). The other three use the physical switches and the tablet device.
TABLET (to control heat, let people in the building etc.):	Three tenants use the physical switches and the tablet to control the environment inside the apartment. The other eight users are not using the tablet device.

The specific tablet component of the technology at Meadowvale is not being used very much and further work is required to personalise the technology to increase its usage. Likewise, on-going work is required to support technology adoption. The amount of training and support required for this user group should not be underestimated. Support and training has been provided but there is an on-going need to support on-going technology adoption particularly if the tablet device is to be justified.

It should be noted that the evidence base around evaluating the use and impact of technologies in situ is completely lacking. Housing associations and health trusts should consider funding some useful evidence gathering work in this space. Not all technology performs the same role nor is it likely to cost the same, for example, the cost and impact of technology in the dementia space is likely to be different than that for physical disability. In particular, understanding the impact of Assistive Technology on carers (informal or formal) requires much more work.

Provide an overview of the capital, revenue and maintenance costs of this scheme compared to similar schemes in Northern Ireland designed to support those with a brain injury or neurological disability to live independently (using the framework / metrics developed in Phase One).
It should be first noted that there is a complete lack of comparable data around the cost and impact of similar schemes and it is complicated to compare this scheme to others for a number of reasons. This scheme is unique, and the costs of the Assistive Technology are therefore also unique. The costs for the

technology for this scheme seem to be more than the other two dementia schemes that we received information on (from the two other housing associations) and this seems to be due to the requirement for the physical components such as door openers / window openers – which are fundamental to a scheme for those with physical disabilities. The costs associated with these elements is significant. When these costs are removed the scheme looks less expensive than it might first appear.

The table below highlights the detailed information provided to RF Associates in relation to the assistive technology spend at Meadowvale. The table highlights that the most expensive components of the Assistive Technology relate to the installation of the door controls and the window and blind controls. Given that the user group is physically disabled, these are important and vital components. Based on the Assistive Technology data provided by Triangle Housing Association / Atlas Fire and Security the cost of Assistive Technology per apartment is in the region of £22,000 per dwelling.

TECHNOLOGY COST- Component Parts	Product cost for whole facility (All physical components)	Installation cost for whole facility (Labour)	TOTAL
Video door entry system	£6,732	£3,166	£9,898
Climate control system	£9,976	£4,790	£14,766
Lighting control	£20,639	£11,040	£31,679
Flood control	£3,586	£1,248	£4,834
Warden call system	£3,908	£1,030	£4,938
Window + blind control	£57,695	£20,320	£78,015
Door Control	£71,313	£35,310	£106,623
TV Control	£2,229	£2,538	£4,767
Hard wiring in relation to all technology highlighted above	£17,862	£12,594	£30,456
Tablet computers	£3,250 (£250 each)	NB. The cost of the tablet computers had been spread across the cost of the systems controlling the video door entry, climate, lighting, flood, warden call, windows and blinds, doors and TV.	
Software app	The app that controls the Assistive Technology system is free to download from the Comelit website. It will run on any tablet device or smart phone. The cost of developing the app is spread across the price of the hardware sold by Comelit. (All the physical hardware in the flats was provided by Comelit.) (RFA Note)		
	£197,190	£92,036	
TOTAL	£289,226		
	@£22,000 per dwelling		

Are there any components of the build that would have been adapted to facilitate the technology i.e. are the doors heavier to allow for the door openers / are the blinds specialist etc.?	Doors were made as Door sets – Extra £3,000 (we have assumed that there are about 5 doors per property, so this equates to @£50 per door) (RFA Note) Blinds extra cost £2,500 for automated (we have assumed this is a cost per apartment of @£200) (RFA Note)

Cases Provided By Radius Housing Association & Clanmil Housing Association for comparison

	Case 1: Spelga Mews (Radius)	Case 2: Grovetree (Clanmil)
Description	Supported living scheme for persons with dementia. Comprises a central block of 12 flats with 24/7 staff support and 12 bungalows in the grounds with calls diverted to the 24/7 telecare centre overnight.	Supported living scheme - high quality self-contained apartments that are opening in late spring 2018 for older people living with dementia in a supported living environment. 30 apartments – 27 are one-bedroom, 3 are two-bedroom apartments. Care is provided by Belfast Health and Social Care Trust.
Type of technology	- Speech module (home hub) combined with the door entry - Smoke and carbon monoxide detectors - Fall sensors - Chair sensors - Bed sensors - Epilepsy sensors - Exit / door opening alerts	- Warden Call speech unit at the front door of the apartments to speak to staff plus 4 pull cords across the apartment - Smoke detectors - Heat detectors - Cooker alarm sensors - Flood and water detectors - PIR sensors to control occupancy and movement within the apartment
Approximate capital cost of technology	£1,000 per dwelling = £12,000 (does not include installation)	£180,000 for 30 apartments / £6,000 per dwelling

Contribute to a growing evidence base and help inform future funding streams for this client group and more widely help guide good practice and future development of housing solutions for people with physical disabilities including neurological disabilities, brain injury and sensory disabilities

In sum, there is limited expertise around the specific technologies that meet specific user needs. The system procured at Meadowvale was, in the first instance, a home automation system rather than an Environmental Control System tailored for this specific client group. (We use the term home automation system to mean a generic system that might be used in any building to control for example heat, light and temperature. Increasingly 'smart homes' are being developed to include this type of technology.

Environmental control technology tends to be the terminology used by the health sector for more tailored systems, systems developed for those with disabilities, with the use of an individual controller with composite adaptations to a specific user group). We think this lack of expertise is, in part, due to the new and evolving nature of these technologies, the relative uniqueness of the use of these technologies and the lack of information available on these technologies and their ongoing monitoring and evaluation.

On reflection it is possible to suggest that the technology specification might have been more robust - it did not for example even mention that the facility would be used by those with complex physical disabilities. We appreciate that it is difficult to ascertain the exact user needs of future individual tenants, however as these technologies evolve organisations involved in the development of these types of facilities have a responsibility to act as educated buyers of complex systems.

We also suggest that more suppliers (aside from Atlas Fire and Security) should have been considered and more systems could have been seen in action / tested out. No partner can verify if more systems were considered or not, they may have been – as technology of this nature is constantly evolving we would suggest again that only by researching and considering the options can organisations become more educated in what differing technology solutions enable.

It has also been very difficult to access the detail of the financial spend associated with the technology and future procurement processes need to take account of this and enable greater transparency if this area is to be better understood.

2. Project Introduction & Methodology

2.1 Background & Project Objectives

In November 2017, RF Associates was awarded the contract to undertake an evaluation of the North Lisburn Supported Housing Scheme, Meadowvale. Cedar Foundation run the Meadowvale facility with Triangle Housing Association acting as the landlord, having undertaken the physical development of the site.

The facility provides an independent living solution for people with neurological conditions and / or an acquired brain injury. It seeks to facilitate and enable individuals to gain the optimum level of autonomy, control and independence in their own home. In order to enable this a range of assistive technology is provided in each home, along with a package of care and support to enable independent living. The key principle informing the model of care, is one of being person-centred and the Cedar Foundation approach complies with principles of good practice.

This research was commissioned by the Northern Ireland Housing Executive in partnership with the Department for Communities (DfC). The detailed objectives of the project are set out below:

- Provide an overview of the model of care and housing support used in North Lisburn Supported Housing Scheme and in particular the role and impact of assistive technology.
- Give a balanced assessment of the impact of the technology within the North Lisburn Supported Housing Scheme on the quality of tenants' lives compared to their previous circumstances as well as the impact on their family / carers.
- To evaluate how intensively the technology is used and for what tasks. If there was no technology in the scheme, what would the structure be?
- Explore what clients are doing differently in their new accommodation compared to their previous accommodation, also what has changed in their life due to electronic assistive technology.
- Provide an overview of the capital, revenue and maintenance costs of this scheme compared to similar schemes in Northern Ireland designed to support those with a brain injury or neurological disability to live independently (using the framework / metrics developed in Phase One).
- Contribute to a growing evidence base and help inform future funding streams for this client group and more widely help guide good practice and future development of housing solutions for people with physical disabilities including neurological disabilities, brain injury and sensory disabilities.

2.2 Methodology

To address the project specification a mixed method approach has been used, including the following elements:

I. Partner interviews
II. Stakeholder interviews / Focus Groups
III. Analysis of background information
IV. Interviews with housing associations

Relevant discussion guides for interviews and focus groups were developed by RF Associates and approved by NIHE.

I. Partner Interviews

We conducted four face-to-face or telephone semi structured interviews / meetings with individuals from the project steering group that was established for the planning and development of the Meadowvale facility. This included the following organisations:

- South Eastern Health and Social Care Trust (group lead)
- Cedar Foundation in association with Professor Suzanne Martin from Ulster University
- Triangle Housing Association

Name	Role	Organisation
Margaret O'Kane	Director for Adult Physical Disability	South Eastern HSCT
Eileen Thomson	Deputy Chief Executive	Cedar Foundation
Stephen Mathews	Chief Executive	Cedar Foundation
Suzanne Martin	Professor	Ulster University
Chris Williamson	Development Officer	Triangle Housing Association
Aidan McGeown	Housing Development Manager	Triangle Housing Association
Raymond Nichol	Director of Housing and Development	Triangle Housing Association

In order to understand the context of this particular facility and other similar facilities we also spoke to Meadowvale technology provider (Atlas Fire and Security), one technology 'super user' living at Hillmount (another of Cedar Foundation's Supported Housing facilities) and Conor Quigley of Safe Care Technologies who was recently appointed to review the technology at Meadowvale.

II. Stakeholder Interviews / Focus Groups

Tenants

RF Associates liaised with Cedar Foundation to agree the best approach to engaging with tenants. It was agreed that, as part of the consent process, tenants would be offered the opportunity to participate in an individual one to one interview, or as part of a small focus group discussion. Consent was sought from tenants for their engagement in the research, as well as consent to contact family members / friends and relevant care / case managers.

RF Associates created two versions of the consent form for tenants with a clear, short explanation of the project and why we wished to talk with them. (One version of consent form was text based, whilst the other used images / visuals to seek to aid understanding and comprehension).

Staff at Meadowvale gave all the tenants appropriate versions of the form. We asked tenants to tick boxes with 'yes' or 'no' if they wished to participate in a focus group or in a one to one interview, and if they consented to RF Associates speaking to their friends / family members and / or their care / case managers. Currently, there are 12 people living at the Meadowvale facility. We did not approach one tenant as they had just recently moved in and had not had enough time to fully explore the technology.

Eleven consent forms were returned, seven tenants consented to participate in a focus group however one changed their mind prior to the session. One tenant preferred to speak to us outside the group in a one to one setting.

Across the six tenants who had consented we conducted two focus groups, the first with four tenants and the second with two tenants. During the first focus group one tenant changed their mind and the group became three. We also completed the single one to one interview. Focus groups and the individual interview lasted around 45 – 60 minutes.

The verbal communication abilities of the tenants are very mixed and challenging; their abilities to participate and engage in detailed discussion is limited therefore the groups were at best very general discussions rather than very detailed.

Group	Tenant mix	Previous Home	Total
1	1 x wheel chair users (Limited speech)	Residential Care	3
	1 x wheel chair users (Limited speech)	Housing Association Property	
	1 x tenant with a walking aid (very limited speech)	Residential Care	
2	1 x wheel chair users (Very limited speech, usually uses lite writer but this was away being repaired)	Residential Care	2
	1 x wheel chair user (Good speech)	Residential Care	

Interview	Tenant mix	Previous Home	Total
1	1 x able bodied / partially sighted (Good speech & communication skills)	Family Home	1

Staff

The Meadowvale manager helpfully organised two focus groups with 11 staff in total. The focus groups lasted for approximately 90 minutes. The first focus group involved senior staff members (the manager, head of services and team leaders.) The second, was mainly with support workers at the facility, and two senior staff members also attended for continuity.

Group	Staff mix	No. of Attendees	Staff Background & Experience
1	Senior Staff Members	6	- Staff members with significant amounts of experience, ranging from 11 to 30 years working with Cedar Foundation - All background in residential care
2	Support workers	7	- At least half staff members with over 10 years' experience in care environments – community care, nursing care, residential care etc.

Care / case managers

Seven tenants agreed that we could speak to their care / case managers. South Eastern Health and Social Care Trust helpfully arranged an interview with two of their care / case managers who could speak about four of the tenant's previous and current living and care arrangements. Interviews were also conducted with Belfast HSCT and Northern HSCT

Interview Format	Name	Role	Organisation	No of tenants
Telephone interviews	Orla Conway	Care Manager	Belfast HSCT	2
	Rhian Mussen	Social worker / care manager	Northern HSCT	1
Face to face interview	Patricia Thompson	Social worker / care manager	South Eastern HSCT	3
	Gail McClintock	Team leader for sensory support – social work	South Eastern HSCT	1

Family / Friends

We also asked tenants to consent to RF Associates talking to their family and friends; six tenants agreed. Staff at Meadowvale sent out a letter prepared by RF Associates and approved by NIHE. Three family members / friends agreed to be interviewed, each the friend or relation of an individual tenant who had previously been living in residential care.

III. Data Analysis

All project partners were asked to provide various background information in relation to the development of the Meadowvale facility, costs associated with this, decision-making processes, the technology specification and so on.

IV. Interviews with housing associations

In order to meet the requirement to compare the Meadowvale scheme with other schemes RF Associates sought to conduct a brief review of existing literature and contacted two of the larger housing associations in Northern Ireland who might have knowledge of similar schemes. Radius and Clanmil housing associations were contacted and took part in interviews and also directed us to speak with a Belfast Trust contact for further information.
This report is divided into the following key sections:

- Section 3 focuses on the background to the Meadowvale Project, the development of the technology specification, the associated procurement process and the resulting capital and revenue costs;
- Section 4 considers the care model in use at Meadowvale, and reviews the situation of service users prior to their move to Meadowvale;
- Section 5 contains a thematic review of the views and opinions of the different stakeholder groups on the Meadowvale facility (service users, family / friends, staff, HSC trust contacts);
- Section 6 comments on other relevant literature, the discussions with other housing associations in relation to relevant facilities and provides some comparative sites in Northern Ireland;
- Section 7 draws together our final conclusions and provides recommendations.

3. Background to the development of Meadowvale

The information for this section is taken from the interviews with stakeholders and documentation provided by them.

3.1 Project Conception

Cedar Foundation aspired to provide more technology enabled supported living schemes as an alternative to residential care. Having experience with two successful supported living schemes with an Assistive Technology element for people with physical disabilities in South Belfast, they wanted to provide another facility and offer this care to another group of people. In 2012-13, the South Eastern Health and Social Care Trust (SEHSCT) raised this need with the Regional Health and Social Care team. SEHSCT gathered the relevant organisations together, who wrote a combined business case for the Housing Executive's Supporting People Programme to provide support to the project, and for capital funding from Department for Communities (Department for Social Development – DSD, at that time). The bid was successful, and Triangle Housing Association was appointed as the developer through the Housing Executive Supporting People Programme.

A project steering group was assembled, comprised of the Cedar Foundation and Triangle Housing Association, with SEHCT as lead. Cedar Foundation were to be the management agent for the scheme and the support provider, while Triangle would be the landlord of the building who would provide housing management. Triangle was responsible for identifying the development site, obtaining planning permission and engaged with Cedar Foundation to identify the building requirements.

At the start of the project there was some discussion over the funding of the assistive technology component of the scheme. The Department for Communities (DfC) have no clear funding policy regarding the capital cost of assistive technology – currently the Housing Executive do not fund the capital component of Assistive Technology.

Due to the policy vacuum, it was finally agreed that there would be a one-off contribution (of 60%) to the capital grant by DfC and a later evaluation of the scheme to consider who should pay for technology. In addition, a three way split was agreed between Cedar Foundation, Triangle Housing Association and South Eastern HSC Trust for the remaining 40% Assistive Technology capital costs.

3.2 Technology Specification & Procurement Process

As we understand it, the specification of the assistive technology to be delivered in the Meadowvale Scheme was very much based around Cedar Foundations' other facilities and their experience of managing the client group who would move into the new building. Triangle supplied us with a brief document received from Cedar Foundation in October 2013, listing the technology required for each room, for example *Hallway: Hall light on/off switch, living room light on/off switch, bedroom on/off switch, bathroom door, bedroom door, room temp thermostat* (see appendix 2) and the Project Brief and product description that Habinteg Housing Association has used for the Hillmount Court project. From our interview with Triangle we understand they did not have much involvement with writing the exact specification. This was the role of an appointed external M&E consultant from Cogan and Shackleton (who has since left) – and the afore mentioned documents were passed onto them. Therefore, there are some gaps in our understanding of how exactly the specification was derived and written.

We understand that Triangle and Cogan and Shackleton visited the Cedar Foundation facility at Ardkeen on a number of occasions to see how the system there worked in practice.
Prior to commissioning the technology provider, the M&E consultant contacted Atlas Fire and Security explaining what broadly they would like the system at Meadowvale to do. In October 2013 Atlas Fire and Security, having collaborated with the system manufacturer Comelit, demonstrated a proposed assistive technology system for Professor Suzanne Martin (representing Cedar Foundation) and Cogan and Shackleton. Cogan and Shackleton then wrote a performance specification for the technology which was included in the tender documentation for the development as a whole and Atlas Fire and Security were included in the specification as a possible supplier (see next section).

The specification below was taken from the main tendering document published at the end of 2013 (see appendix 3 for full document). It lists the main electrical engineering specifications for an electrical subcontractor to provide; only points 6, 7 and 10 refer to assistive technology, which are explained in more detail below:

Approximate Summary Electrical Specification Document
(For more detailed specification for Home automation system, door access and warden call system please see Appendix 3.)

The document requests:

1. Supply and installation of all main and sub-switchgear to apartments.
2. Supply and installation of all cabling for mains, sub-mains, sub-circuits complete with all necessary connections using PVC insulated cables, high impact heavy gauge plastic conduit, galvanised trunking, heat resisting flexible cord and cables where required.
3. All lighting points, fittings, lamps, switches, socket outlets, isolators, etc., except where noted otherwise.
4. Supply and installation of all miscellaneous power/heating circuits/mechanical services circuits.
5. Supply and installation of a fire alarm system.
6. Supply and installation of the home automation systems.
7. Supply and installation of the Warden call systems.
8. Supply and installation of telephone conduit and cabling system.
9. Supply and installation of T.V. distribution systems.

10. Supply and installation of a Video Door access system.
11. Supply and installation of all door, window and blind openers and controls as detailed within the standard details and on layout drawings.
12. Supply and installation of a complete emergency lighting system as indicated.
13. Supply and installation of all site and amenity lighting complete with cables etc.
14. Supply of "As Fitted" drawings and operating and maintenance manuals.
13. The complete electrical testing and verification of the electrical installation including the supply of all Test Schedules and Certificates.

Home Automation System and IP Door Entry

The general description provided was for Atlas / the appointed supplier to supply, install and commission a complete door entry system comprising of one flush mounted 13 button audio/video Atlas IP entrance panel. This would connect to a flush mounted IP manager monitor and apartment gateway in each apartment. The IP manager monitor would manage lighting, climate control, flood systems, automated curtain/blinds and colour video door entry in each property.
The home automation system to be controlled via 3 types of internal units, IP manager, remote controller and a tablet/pc/smartphone via a web browser. System features:

- Lighting Control
- Climate Control
- Flood Control
- Warden Call Control
- Blind / Window Control
- Door Control
- TV Control

Door Access

Each system and every specified entrance to be supported by a proximity access control system. The system to be installed in accordance with the manufacturer's guidelines. The readers to be located as specified on the standard drawing. The entrance panels to be vandal resistant. The IP video/audio door access control system to be interfaced with the home automation system.

Warden Call System

This specification details the design, for easy installation and operational performance of a communication system specifically designed for installation in accommodation occupied by elderly or infirm residents. The system provides emergency alarm signalling facilities, with Telecare sensor monitoring and enhanced access control. The system to be designed to ensure simple and fail-safe operation from both the manager and the resident's point of view.

The control features can be accessed directly by the residents or (as described above) by a supervising scheme manager. A standard system will consist of five main elements:
1. The central control unit
2. The resident's intercom unit
3. The scheme manager's mobile master unit
4. The vandal resistant door access panel
5. The resident's access control telephone

The Assisted Living Automation system shall be supplied, installed and commissioned by:

Atlas Fire and Security (NI)Ltd Portview House
80 Dargan Road
Belfast

or equal and approved

Based on the tender specification document it does not appear that any comment was made that the home automation system will be used by people with complex physical disabilities. Under the warden call specification, it is noted that the communication system needs to be specifically designed for installation in accommodation occupied by elderly or infirm residents. This on reflection is not an appropriate description for the type of tenant the facility was planned for.

From the interviews completed with Triangle Housing Association, we understand there was one contract procured for the whole construction of the building, which included an electrical engineering services component. Within this electrical engineering service component is a section on commissioning a specialist supplier / installer for an access control system. The document contains the suggestion to the electrical contractor to use 'Atlas Fire and Security (NI) Ltd' or propose an "equal and approved" alternative. None of the tendering firms availed of this option. Atlas Fire and Security sent their quotation to the electrical sub-contractor from each building firm that tendered for the Meadowvale construction.

Tenders were returned to Triangle on 31 January 2014, but Triangle did not enter into a contract until funding for the assistive technology was agreed in July 2014 and NIHE approved the project in November 2014. Building work commenced in January 2015. The main contractor selected for the job was Donaghmore Construction, now called FORRME Constructions. They subcontracted AM Electrical for the electrical components, and AM Electrical subcontracted Atlas Fire and Security for the technology provision.

Atlas Fire and Security installed the Assistive Technology supplied by Comelit. On 9 March 2016 Atlas Fire and Security and Comelit demonstrated the proposed tablet to Cedar Foundation and Triangle Housing Association. It was noted that as specified tenants would be able to control their windows, doors, temperature and TV through the tablet's icon-based system. There was an extended discussion clarifying the complex disability, literacy, numeracy and dexterity issues. Cedar Foundation believed that most tenants could be trained to use the tablet, but that some may not be able to use tablet technology. Cedar Foundation said it would take specialist advice on how those who could not use the tablet as it was set up currently could be supported and were immediately aware that some tenants would not have the dexterity to use the tablet interface. Our understanding is at this point Cedar Foundation only required the system to have adequate capacity for further personalisation and knew the tablet based interface would not meet everyone's needs.

3.3 Technology Currently in Place

The Assistive Technology currently in place is the hardware and software supplied by Comelit and installed by Atlas Fire and Security. The user interface is accessible through both a tablet and wall screen in the apartment hallway, which controls the following:

- Door intercom
- Door control (letting people in from outside of the building and into the apartment)
- Window and blind opening / closing control
- Lighting
- Heating
- Water on / off

Around each apartment there are physical wall switches to open doors, windows, blinds and turn on/off lights.

Diagram 1: Door intercom with the magnetic fob panel from the outside

Diagram 2: Intercom view from the inside

Diagram 3: Magnetic fob panel to open the individual apartment door

Diagram 4: Motor for the door opening / closing

Diagram 5: User interface in the hallway

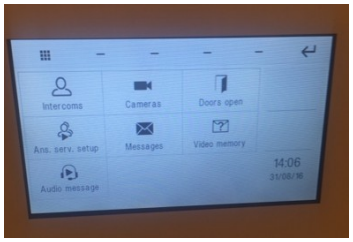


Diagram 6: Types of environmental control

Diagram 7: Lights control

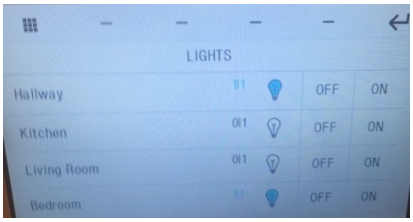
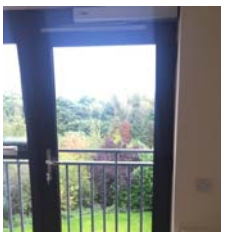


Diagram 8: Kitchen with flood detectors

Diagram 9: Physical door release switch

Diagram 10: Physical wall switch for doors inside the apartment



RFA
RF ASSOCIATES

The table below presents what is controlled in each room.

Table 1: Technology Currently In Situ

Type of Control	Rooms / items controlled
Lighting Control	Hallway 1 x Circuit Living Room/Kitchen 2 x Circuits Bedroom 1 x Circuit Bathroom 1 x Circuit Storage Room 1 x Circuit
Heating System	4 Zones- Living Room/Kitchen, Hallway, Bedroom, Bathroom
Door Motors	Front Door Living Room/Kitchen Bathroom Bedroom Rear Exit Door
Window Motors	Living Room/Kitchen Bedroom
Motorised Blinds	Living Room/Kitchen Bedroom
Nurse Call System	Bathroom x 2 Hallway x 1
TV Socket	Living Room/Kitchen x 1
Wall Switches	Triple Gang Switch x 3 Double Gang Switch x 2 Single Gang Switch x 8
Touchscreen	Comelit Icona Manager Supervisor 4.3" Unit
Headend Unit	Comelit Simple Home Power Supply Unit (20022101) x 1 Comelit Simple Home Multi User Gateway Module (1456b) x 1 Comelit Simple Home Serial Bridge Module (20003101) x 1 Comelit Simple Home 9Input and 8 6A Relay Outputs (20046605) x 3 Comelit Simple Home 9Input and 8 16A Relay Outputs (20046606) x 2
User Interface	Apple iPad Mini

NOTE: Description above is from the Safe Care Technologies report from December 2017.

3.4 Cost of Technology

Core funding for the construction of the building came from the Housing Associations Grant (from Department for Communities) and Triangle Housing. An Assistive Technology grant was made available mainly from Department for Communities, with the rest of the costs being split three ways between Cedar Foundation, SEHSC Trust and Triangle Housing Association. The table below shows how the funding for Meadowvale was divided between organisations. The total anticipated cost of the assistive technology at this stage was £278,154.

Table 2: Total Capital Funding (Provided by Northern Ireland Housing Executive)

Funding stream	Capital cost
Housing Associations Grant	£1,634,259 (including additional grant for assistive technology of £166,894)
Triangle Housing Association	£729,574 (including contribution to A.T costs of £37,087)
South Eastern Health & Social Care Trust	£37,087
Cedar Foundation	£37,087
TOTAL	£2,438,007

As noted earlier in this document the Assistive Technology component was funded by a 60% one-off capital grant contribution from Department for Communities, with the stipulation that there would be a follow up research study.

RF Associates has sought to work with Triangle Housing Association to seek as much information as possible on the Assistive Technology costs, this has not been a straightforward exercise. Table 3 below is the initial breakdown of Assistive Technology costs provided by Triangle Housing Association. Due to very limited information provided and lack of clarity RF Associates sought a more detailed breakdown of the cost. Triangle Housing Association forwarded our request to the contractor, who provided us with the breakdown of costs in Table 4. Please note the total of these costs is £289,227 - approximately £10,000 different from the costs as set out for approval to NIHE.

Table 3: Initial Information Provided On Assistive Technology Costs By Triangle Housing Association

Technology description	Cost
1. SMART / automated technology equipment to doors and windows as 4/3/J and 4/4/M	£95,000
2. Home automation systems as Electrical breakdown item 14	£112,000
3. Variations to windows, doors and ironmongery as CE27 and CE28	£40,477
+ Preliminaries (16.87%) in relation to items 1 and 2	£41,749
TOTAL	£289,227

Table 4: More Detailed Cost Information Provided On Assistive Technology By Triangle Housing Association

TECHNOLOGY COST-Component Parts	Product cost for whole facility (All physical components)	Installation cost for whole facility (Labour)	TOTAL
Video door entry system	£6,732	£3,166	£9,898
Climate control system	£9,976	£4,790	£14,766
Lighting control	£20,639	£11,040	£31,679
Flood control	£3,586	£1,248	£4,834
Warden call system	£3,908	£1,030	£4,938
Window + blind control	£57,695	£20,320	£78,015
Door Control	£71,313	£35,310	£106,623
TV Control	£2,229	£2,538	£4,767
Hard wiring in relation to all technology highlighted above	£17,862	£12,594	£30,456
Tablet computers	£3,250 (£250 each)	NB. The cost of the tablet computers had been spread across the cost of the systems controlling the video door entry, climate, lighting, flood, warden call, windows and blinds, doors and TV.	
Software app	The app that controls the Assistive Technology system is free to download from the Comelit website. It will run on any tablet device or smart phone. The cost of developing the app is spread across the price of the hardware sold by Comelit. (All the physical hardware in the flats was provided by Comelit.) (RFA Note)		
	£197,190	£92,036	
TOTAL	£289,226		
	@£22,000 per dwelling		
Are there any components of the build that would have been adapted to facilitate the technology i.e. are the doors heavier to allow for the door openers / are the blinds specialist etc.?	Doors were made as Door sets – Extra £3,000 (we have assumed that there are about 5 doors per property, so this equates to @£50 per door) (RFA Note) Blinds extra cost £2,500 for automated (we have assumed this is a cost per apartment of @£200) (RFA Note)		

As Table 4 highlights it is evident that the most expensive components of the Assistive Technology relate to the installation of the door controls and the window and blind controls. Given that the user group is physically disabled, these are important and vital components. However, it is important to note that if comparing the costs of the Assistive Technology on this site to another site which is not for those with physical disability, these costs are likely to be lacking in another scheme. This scheme in comparison may therefore seem more expensive to put in place. Based on the Assistive Technology data provided by Triangle Housing Association / Atlas Fire and Security the cost of Assistive Technology per apartment is in the region of £22,000 per dwelling.

Technology Maintenance Cost

From the start there was agreement that Cedar Foundation would be responsible for the maintenance and repair of the Assistive Technology (funded by the Supporting People Programme) and Triangle Housing Association as a landlord would be responsible for the housing maintenance and repair of anything in relation to the building itself.

KCC Architectural / Fusion Heating Ltd were contracted by Cedar Foundation for two visits per year after completion. The Atlas Fire and Security contract does not specify the frequency of their maintenance visits, but Cedar Foundation informed us that they make two visits per year. Table 5 details the cost of the technology maintenance per year.

Table 5: Cost Of Technology Maintenance Per Year Provided By Cedar Foundation

Provider	Maintained equipment	Cost
Atlas Fire and Security	Assisted Living System	£680
Atlas Fire and Security	Disable Refuge	£80
Atlas Fire and Security	Door Entry	£80
	Atlas Fire and Security TOTAL	£840 + VAT
KCC Architectural / Fusion Heating Ltd.	76 EMD-F Single Operators and 13 Geze Automatic Window Actuators	£2,000 + VAT
	KCC Architectural TOTAL	£2,000 + VAT
	OVERALL TOTAL	£2,840 + VAT

KCC Architectural also provide fault callout rates:

- Standard Fault Call from Monday to Friday 8.30am – 5pm - £55 per hour
- Out of hours callout Monday to Saturday 5pm – 12am - £75 per hour
- Out of hours callout Monday to Saturday 12am – 8.30am - £100 per hour
- Out of hours callout Sunday and bank holidays - £100 per hour

For very basic comparison in relation to costs, Cedar Foundation has two other facilities with a similar client group and similar technology. Table 6 below shows the maintenance and repair cost for 22 units altogether over the past 12 years. From 2012 – 2017 Cedar Foundation had to modernise / replace some door motors / windows / blind openers, which is the reason for higher costs. Fusion was able to provide details on installation and replacement for blinds only for 2012 but we cannot access further

detail as materials have now been archived. Over the 12 year period Cedar Foundation has spent nearly £90,000 on on-going repair and maintenance of technology systems (approx. an annual cost of £7,500)

Table 6: Ardkeen & Hillmount Maintenance / Repair Cost (Across 22 units) Provided by Cedar Foundation

Provider	Year	Cost	Detail not available on all spend due to archiving of documents
Odel	2006/07	£4,256	
Odel	2007/08	£146	
Odel	2008/09	£1,687	
	2009/10	\	
	2010/11	\	
	2011/12	\	
Fusion	2012/13	£7,562	Fusion replaced six of the blind motors and rails because of malfunction, and installed five new motors and rails as they were removed (across 7 properties) (@£7,500)
Fusion	2013/14	£9,780	
Fusion	2014/15	£18,574	
Fusion	2015/16	£21,391	Repairs / installation re door technology at 5 properties in Hillmount (@£7,000)
Fusion	2016/17	£20,449	Repair at one bathroom (@£1,100)
Fusion	2017/18	£4,257	
TOTAL		£88,102	

3.5 Training Support

Cedar Foundation is fully aware that training and encouragement to use technology is key for staff, tenants and their family and friends. They cannot overstate the role of staff in encouraging tenants to optimise the use of the technology.

Cedar Foundation have provided us with the following detail on what training and encouragement has been received so far. This will be an area of on-going work and development for Cedar Foundation:

Tenants

- Be Safe, Stay Safe Training – Delivered by Leonard Cheshire. This was the first session of group training that took place in January 2016. Individual training commenced from mid-January 2016.
- 3 x CILNI (Centre for independent Living) Independent Living Workshops for service users in March 2016.
- In July 2016 service users visited Meadowvale prior to moving in and were shown how the technology works, what it is for and how it works.
- Since 2017 Cedar Foundation have been running a weekly class on IPad Training with the tenants, 5 of whom are regular attenders. (We understand that this had not been running every week but is now in place regularly.)

Staff

- In July 2016, Donaghmore (contractors) and Atlas Fire and Security provided a demonstration to staff of all technology.
- Key staff were at this stage identified to further demonstrate technology to tenants as required.
- Atlas Fire and Security provided training for staff on 25th and 26th May 2017 for any staff who required it or who required a refresher
- In May 2017, Atlas Fire and Security was asked to provide a technology protocol and manual to support staff to encourage the use of the technology. The protocol developed has however been seen as too technical, and Atlas Fire and Security have agreed to look at developing an Easy User Guide to meet the needs of the staff, the tenants and their families.

Families

- In 2016 bespoke training was provided for families on request by Atlas Fire and Security. It is not clear how many families took part in this training.
- Staff demonstrate the technology to families on an ongoing basis as requested.

3.6 Costs

Tenants have come to Meadowvale from different living settings:

- Six from residential care
- Two from long-term hospital stay
- Two from their family home
- One from accommodation provided by a housing association

Table 7 below shows approximate costs for the care and housing of people who came from the long term hospital setting (Thompson House) and residential care (at Ballymacoss House). Based on figures produced by SEHSCT and Cedar Foundation we calculated that the cost for those eight people prior to moving to Meadowvale was £440,273.60 per year. We are aware that at Ballymacoss House residents received a small amount of 'pocket money', however we are not aware of how much that was and the details of the source of those monies.

Table 7: Cost of Care & Housing Prior To Meadowvale Move

Accommodation / Support Before	£ Source	Cost per week per person	Cost per year	No. of people	TOTAL COST
Thompson House Hospital	HSCT	£1,939.00	£100,828.00	2	£201,656.00
Ballymacoss House	HSCT	£764.80	£39,769.60	6	£238,617.60
TOTAL PRIOR TO LIVING AT MEADOWVALE				8	£440,273.60

(Please note, the calculations are approximate; there may be other costs that we are not made aware of).

At Meadowvale, the costs of care and housing cost are separated. Each tenant has a specific number of care hours per week. We have taken the hours of care for the same eight people from table 7. Tenants are now receiving housing benefits to cover their rent and contribution from Supporting People to cover other living costs. Total costs are £327,794.40. From these very limited calculations, it would appear there is a difference in an annual positive difference in the cost of £112,479.20.

Table 8: Cost of Care & Housing At Meadowvale

Accommodation / Support Now	£ Source	Cost per week per person	Cost per year	No. of people	TOTAL COST
Domiciliary care and support (Personal hygiene, dressing, bathroom support, help to get up / go to bed)	HSCT	£451.475 `(average)	£23,476.70	8	£187,813.60
Housing Benefits	NIHE	£85.70	£4,456.40	8	£35,651.20
Supporting People	DfC	£242.60	£12,615.20	8	£100,921.60

+ Technology/ maintenance cost	DfC		£3,408.00		£3,408.00
		TOTAL NOW AT MEADOWVALE		8	£327,794.40

(Please note, the calculations are approximate; there may be other costs that we are not made aware of. Also, for the remaining three tenants we do not have cost details for their accommodation prior to Meadowvale so they have not been included in this comparison.

+ in relation to technology and maintenance costs it would not be anticipated that there would be any major outlay for at least 5 years on replacement motors etc. These would be in addition to the costs set out here which covers maintenance contracts with KCC Ltd and Atlas World Ltd.)

4. Care Model

4.1 Housing / Care History of Tenants

Currently, there are 12 tenants living at Meadowvale (one apartment is vacant). As already mentioned, 11 tenants were included in this study, as one tenant moved in at the start of the research project.

- Six of the eleven tenants previously lived in residential care in their own single room with ensuite bathroom facilities. The only Assistive Technology at the residential care facility was a pull cord for a warden call system. Residents had access to a common space where they could socialise and watch television and meals were provided in a central dining room and a clothes laundry services was provided to them.

- Two of the eleven tenants moved from long-term hospital settings. We assume this will have had some sort of buzzer alarm system.

- One tenant moved from accommodation provided by a housing association – we don't know if this had any technology.

- And finally, two tenants moved from their family home where they were cared for by their family members and did not have access to any Assistive Technology.

Table 9: Current Meadowvale Tenants (Provided By Cedar Foundation)

Gender	TRUST	Moved from	Circumstances
Male	South Eastern Physical disability	Ballymacoss House Residential care	Uses wheelchair independently (electric & manual). Brain injury, physical disability. Currently uses mobile phone etc.
Male	South Eastern Physical disability	Thompson House Hospital	Uses electric wheelchair independently. Brain injury, physical disability, poor memory, can use conventional remote control and can push buttons.
Female	Belfast Physical disability	Ballymacoss House Residential	Uses wheelchair. Cannot use wheelchair independently. Cerebral palsy, cannot manually use technology. Unclear speech.
Female	Belfast Physical disability	Ballymacoss House Residential	Uses wheelchair and walking frame. Use of one hand only.
Male	Northern Physical disability	Ballymacoss House	Wheelchair user. Brain injury, physical disability. Can use a PC and uses a 'Light Writer' to support communication.
Male	South Eastern Physical disability	Housing Association accommodation (own home)	Brain injury, physical disability, poor memory, reluctant to accept technology. Cannot fully mobilise independently.
Female	South Eastern Learning/Disability	Family home	Uses wheelchair independently.

			Mild learning disability, physical disability, cannot read but can use pictorial references but difficulty with abstract drawings as per current tablets.
Female	Southern Physical disability	Ballymacoss House Residential	Brain injury. Can operate all doors, lights windows etc. manually. No mobility needs.
Male	South Eastern Physical disability	Thompson House Hospital	Cannot use wheelchair independently. Brain injury, physical disability, poor memory, cannot use hands.
Male	South Eastern Sensory	Family home	Registered blind. Is partially sighted and can use PC & mobile phone etc. No physical disability or mobility needs, can operate all doors, lights windows etc. manually. Enjoys technology.
Male	South Eastern Physical disability	Ballymacoss House Residential	Walks with assistance of walking stick. Brain injury, can operate all doors, lights windows etc. manually.

4.2 Current Model of Care

Meadowvale aims to help clients achieve as independent and socially inclusive a lifestyle as possible.

Each tenant has an allocated care package with a specific number of hours needed to support them to live as independently as possible. The extent of support and care provided is based on an individual assessment of need, subject to annual review. Care packages differ in the amount of support provided and for current tenants range from 10.5 hours to 45.25 hours per week. Personalised support services available include assistance with daily living activities, personal care, leisure and social skills and household management. This means that staff for example will support tenants to pay their bills, go shopping, cook their own food etc – and that tenants look after their homes in the fashion that they wish.

From our interviews with Meadowvale staff members, we understand that the roles of staff in a supported living facility are different from the roles in a residential care facility. Most staff interviewed came from a residential care setting. In a supported living facility tenants' needs are met from a perspective of encouraging and supporting individuals to do as much for themselves as possible. In a residential facility staff, or the organisation, provide services to complete many of these tasks on the behalf of individual residents for example by meals and eating being organised for everyone at the same time, a cleaner/s cleaning the facility at a set time/s each day, laundry services being provided, and clothes put away by staff etc.

5. Stakeholder Findings

The stakeholder findings are presented thematically and refer to the impact that the new facility and technology has had on tenants as well as staff. We categorised stakeholders into the following groups:

- Family/ friends
- HSC Trust care / case managers
- Staff (for staff at Meadowvale)
- Stakeholders (SE HSCT, Cedar Foundation, Triangle)
- Tenants

Views on the impact of the facility were sought across these range of stakeholders to provide as rounded a view as possible, particularly given the range in ability of the tenants themselves to communicate their views on the impact of the facility.

5.1 Impact of Technology on Tenants

We are very aware that as the Meadowvale facility is a supported living facility that it is very different when compared to the tenants' previous accommodation. From the interviews with all stakeholder groups it is clear that this option to live more independently is unsurprisingly having a large impact. In our view tenants are most affected by this different model of care, and the technology plays a role in this model.

Feedback from all stakeholders on the Meadowvale facility has on the whole been positive on how living there supports and enables more independence.

Tenants now have choices in how to live day to day, they are tenants not residents

The tenants we spoke to all enjoy living in Meadowvale and are very happy 'they can do their own thing'. Most of the tenants who participated in our focus groups came from a previous residential care setting and notice a greater difference between that and their new home. One tenant who moved from home felt that it was not very much different but likes needing to do more things for himself.

"For me, is not much different because my parents cared for me before. Now I just need to do more things on my own, which I like." (Tenant)

"Now I can do my own things." (Tenant)

Both family members that we spoke to are very satisfied with the apartment and can see their relative is pleased where he / she is. One family member noted that their son likes his own space, going out to the day centre, doing his own shopping, cleaning his own apartment – none of which they completed previously.

"He is very happy having his own apartment." (Family)

"I think it's much better where he lives now, it makes him more independent." (Family)

The care / case managers consider this type of setting works really well for their clients; one manager mentioned this would have been much more appropriate for a previous client who was sent to a residential care setting because there was nothing like this available at the time.

Staff noted tenants have had to get used to living more independently, doing things for themselves. Staff noted family members who may have been very protective and concerned, have also had to let tenants get used to doing their own things and have been surprised at how much tenants can do. Staff see living in the facility as very beneficial to tenants as it gives them more choices. They emphasised that it is very important to understand that this facility is really 13 different schemes as everyone has different needs and requires different support.

"Family is [now] surprised how much one tenant can do on her own." (Staff)

"There is one lady who gets out of the chair and crawls about the floor hoovering it, she won't let us hoover, she wants to do it herself and we would watch and supervise but it's her home and she can do that." (Staff)

"It is good for the tenants, they enjoy that they have their own space, they can come and go as they please and have whoever they want in and out of their apartment. It's not that communal living anymore." (Staff)

"They now have to become like the 'man in the house' rather than the person in the hospital." (Staff)

"They can now choose what they want to watch on the television, rather than arguing over the TV in the day room … they can socialise when they want to ... they can embrace their own home." (Staff)

The new living setting has affected family and friends in practical ways as well. They are now able to stay over, or spend more time with the tenant, which wasn't possible before at a care home or hospital setting.

"We can now go and see [person's name] more often - at least once a week, and we have more privacy and time to spend together." (Family)

"The first Christmas here, one tenant's family was able to stay, their daughter was able to stay. So that was the first time in ten years that his family with his children was able to stay on Christmas Eve, Christmas Day and have a Christmas dinner together, and you wouldn't have that in a hospital situation." (Staff)

Support is tailored to the individual to help them care for themselves and their own home

Project partners and some stakeholders are aware that this type of living setting is more person-centred compared to hospital or residential care. One stakeholder from the steering group was very positive towards this kind of independent living model of care.

"It is more centred around them. The support is there, they are doing similar things or maybe slightly more things, but it is centred around them as an individual." (Staff)

"The level of support would still be here because obviously if they [the tenant] needed that level of support within residential then that probably wouldn't change if they needed that level of support. It's maybe just slightly different in that say within the unit here it would be more focused entirely on them, the time that they want to get up, whether they're going out to day centres, any of the social interaction that they want, so you'd be supporting them within their own unit and everything is tailored around individual care within that setting." (Staff)

"The person comes first, and the model of care is around them and then we look at the environment and technology as enablers so it's not the technology is the drive, it's the person and keeping the person central." (Stakeholder)

In relation to personal care specifically the personal care component was viewed by tenants and family / friends as being the same.

"His [personal] care needs are the same as before, so this didn't change but now he has to do his own shopping and he cleans." (Family)

Project partners and staff highlight a big change in the way they provide care to what the tenants would have been used to. They describe it as now being very person-centred where staff now need to provide support tailored to each individual. One steering group member mentioned that it was important to understand that staffing roles have changed fundamentally in that staff are no longer there to 'maintain people within the residential context facility' as the ethos of the supported living is much more proactive.

"We (the staff) have to cook for them now (individual), they had a cook before at Ballymacoss. We actually have to go to their apartments to cook for them, help them plan their meals, help them with finances, sometimes we have to go and do shopping for them or take them shopping so that's a whole new thing for us and a whole new thing for them." (Staff)

"If they don't want us there, they can tell us to go away. It's their home, they couldn't do that in a residential facility … we can say maybe do you want to put that laundry away but if they don't want to they don't have to." (Staff)

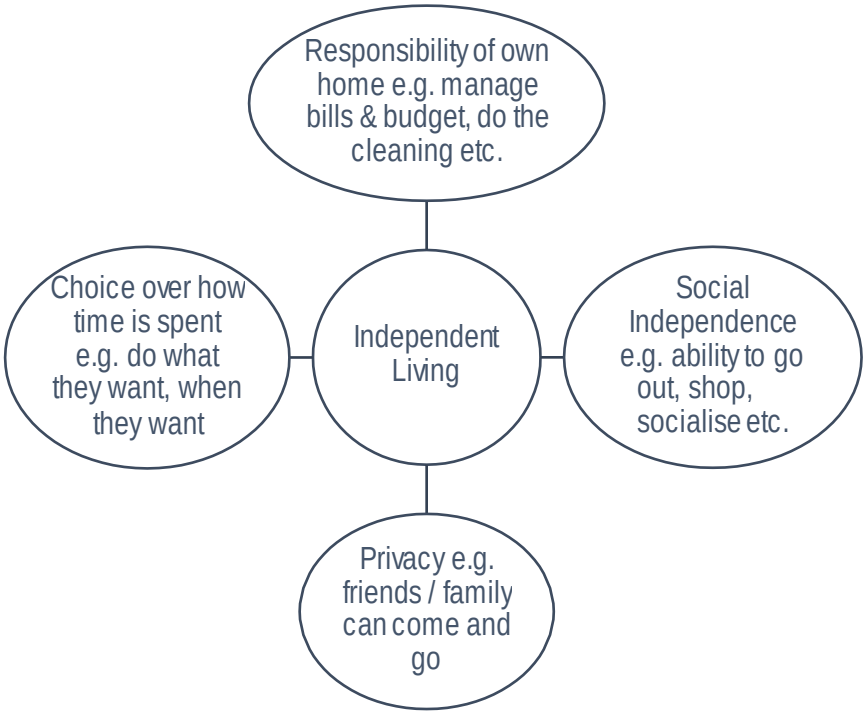
Staff and tenants have had to adjust to the independent living approach

Staff and tenants have had to adjust to the new facility; tenants to a different way of living and staff to a different way of delivering care and support. It was an initial process for staff to learn what tenants could or couldn't do or were not used to doing / did not want to do. Staff had to find ways to support and empower tenants within the ethos of the new scheme. Tenants had to be less reliant on someone always being there to do something for them. There is also a process for family members to get used to this too, as they may have been concerned about what a family member is able to do.

"So, they have an environment now within some sort of decision making, which I think for some of them is quite a challenge because it's something that before they maybe weren't quite used to, and you know now that they're having to make a conscious decision, should I put the heating on, maybe I won't, if I do top up the card (for heating) how much will I put on? Is that too much? So, for us that's a simple thing that we probably wouldn't even really think about or [we] take for granted, they have to maybe actually analyse quite a bit." (Staff)

Diagram 11 below highlights key important themes that appeared in the stakeholder interviews. These themes show how independent living is affecting tenants and their daily tasks.

Diagram 11: Independent living impacts



5.2 General Feedback on Technology

Overall feedback from stakeholders was very positive and the majority welcomed the use of Assistive Technology. The members of the steering group did not make any detailed comment on its impact as they are removed from day-to-day life at the facility, however the majority felt that the facility wouldn't work as well without the technology.

Care / case managers are not so familiar with their clients' daily lives however they were all very welcoming of the technology and felt that Meadowvale was a much better placement for their clients with Assistive Technology as an important component.

"Technology assists the ability [for the tenants] to be independent. It makes life easier and gives them choices how to interact with the environment and that controls their personal preference and also who they give access to." (Stakeholder)

Staff at Meadowvale who have the most contact with tenants were very positive overall in relation to the impact of the technology.

"The technology is an enabler ... it allows people to live in the apartments, without it they couldn't do that." (Staff)

Although staff did express a few practical issues with the technology. They commented that it was initially difficult for everyone to get used to the new building and the new way of working. There were some teething issues with the technology; staff had to learn to use it in order to help tenants, and some staff admit to struggling to use it still or don't feel very confident in using it, particularly the tablet device.

Staff also had to learn what elements of the technology tenants' were able to use and when their disabilities limited its usage. With time, staff and tenants have become more used to the technology. The weekly technology classes provided by Cedar Foundation for tenants seems also to be encouraging more use of the tablet devices.

Staff comment that technology brings an element of independence and empowers tenants. There was some discussion that it can make tenants less physically active as they can control many things without moving from a chair, besides this the technology was considered to be of overriding benefit. Some feel that it brings more dignity to tenants and incidentally they have noticed a reduction in falls. Since Meadowvale opened there have only been two falls recorded.

"I think the technology here ... is more about independence and empowering instead of making [tenants] lazy." (Staff)

"This kind of technology won't mean less staff hours ... because you know technology doesn't lift anyone or bath them or shower them or make a meal. So really it is about dignity and reduction of falls." (Staff)

The two family members interviewed had different views from one another regarding the use of technology – one was positive about it, the other more negative. One family member commented that it didn't have very much impact, but rather that it was more of an annoyance. They knew that the tenant

was happy, could use the wall switches and that the tenant could let themselves in with the key fob. However, the family member thought it was very expensive in terms of its impact on the electricity bill, having everything electronic and that it was more of a waste than a benefit.

"I think that a lot of electronics in there are a waste of money, it only increases the electricity bill." (Family)

The other family member was much more positive about it, commenting that from the start there were some issues and it took time for them and their relation (the tenant) to get used to it. Now, however, since their relation (the tenant) has gone to technology classes, they can use the tablet, which they did not use before, and they see greater independence for him in this setting.

For most tenants who participated in the focus groups, they emphasised their ability to do their own thing, they commented that they like having their own front door and their own space in which they can make their own choices.

"I am very happy here … you can do your own things … You can watch the TV ... You can do everything!" (Tenant)

Six out of seven thought that the technology was good and helped them to do things around their apartment. Most tenants commented that they struggled at the start when trying to use the technology saying that they did not like it. There seem to be on-going issues with the use of the tablet devices with tenants commenting that they found the functions hard to understand. Two tenants commented specifically that the tablet is too complicated and that they find it too small. Everyone commented that they are happy with the physical wall switches. All tenants appreciate that they can go in and out when they want to. Two tenants, who are much more tech savvy, said that they didn't find it hard to use the tablet and they enjoyed using the technology. They both said they could probably live without the technology provided at the facility, but it would make life much harder.

"It is good in terms of safety." (Tenant)

"There is more freedom here ... not as many staff are on your case all the time!... You are left to your own devices but if I need someone I can call them. " (Tenant)

5.3 Usage of Assistive Technology

Usage by tenants

It was difficult to get a sense of actual usage / volume of usage by tenants from tenants themselves due to the tenants finding it difficult to communicate or recall their specific behaviours. No monitoring data is available from the technology provider in relation to usage patterns. Only two of the seven tenants we interviewed could provide a clear estimation of usage and one tenant does not personally make use of any of the technology due to their complex physical disability. The usage comments provided below are mostly based on staff views. It is clear that the technology is used, however due to the different abilities of the tenants, each tenant uses it in their own way. The table below sets out the different components of the technology and their usage levels.

INTERCOM SYSTEM	Everyone (10 tenants) (apart from one tenant with a complex disability) uses the intercom to let visitors into the building and their apartment.
PHYSICAL SWITCHES (to open/close or turn on/off):	Seven use **only** the physical wall switches (not the tablet device). The other three use the physical switches and the tablet device.
TABLET (to control heat, let people in the building etc.):	Three tenants use the physical switches and the tablet to control the environment inside the apartment. The other eight users are not using the tablet device.

"There are variations with tenants, some are more advanced [in their usage] than others." (Staff)

"There is reliance on the switches on the wall because it is easier for tenants to use." (Staff)

"We've got one woman that's very savvy with the money, so everything has to be turned off and she would sit and go through the iPad and make sure all the lights, because if it would be blue if they're on, you know the wee 'on' button would be blue… so then she would just go and tap them off." (Staff)

"One of the tenants, she has a lot of visitors, so she doesn't have to come down you know, nobody has to come down to the front door, just you know look at the screen in the hallway and activate the button." (Staff)

"He lets himself in and out and lets other people in." (Family)

Usage by staff

The technology is used by staff around the building and inside apartments to open doors, this eases their day to day working as the doors are heavy to push. The apartment in the technology is used in conjunction / at the request of the tenant. If requested staff use the screen attached to the wall in the apartment hallway if they need to make an adjustment to heating or require windows or doors to stay open etc.

"We have to use the technology because obviously to gain access in and out of the building you either have a fob, or to open the windows you have to either use a switch or go to the panel on the hall." (Staff)

"I'd say it's a mixture of both, depending on the level of the ability of the individual tenant. So, there would be certain tenants that because of their physical disabilities wouldn't have the manual dexterity, but the staff will be using the technology, but that would be in association with the tenant so as I was saying the likes of [tenants' name] it would be a case of [tenants' name] would you like the window open? Would you like that door open? Which light would you like on? Do you want the kitchen one on or…? So, the technology is being used but it's being used in conjunction with the tenant; because of their physical disability they can't use it." (Staff)

"We would only use it [tablet] if a tenant asks us to adjust heating or something." (Staff)

"I'm never gonna go to the tablet to open up the blinds, I'm just gonna walk over to the blinds and push the button up. We can walk and do it, so I can't see why we would be reliant on it [tablet]." (Staff)

"Sometimes I would use the screen for their doors and for the back door, it is handier for the door to stay open." (Staff)

Usage by family / friends

From the feedback that we received from three family members / friends it appears that they do not make much use of the technology, and as highlighted above there are mixed views on its value. Some family members have their own door fobs to let themselves into the building.

"I have my own fob to go in and out of the building." (Family)

"We would use push buttons in the building and inside the apartment, but I wouldn't use the tablet because it is his apartment and I wouldn't want others to come into my apartment and touch things." (Family)

5.4 Impact of Assistive Technology on Staff, Family & Friends

HSC Trust care / case managers didn't think that the technology changed very much of what staff do. They appreciate that the living setting is different to residential care, however tenants still require personal care and practical help and care to live independently. They were not aware of the impact of the technology on relationships with family and friends and could not comment on it.

Staff at the facility feel that technology makes life physically easier because you can just push the button and the doors open but commented very much that the technology is the enabler of the independence for example allowing tenants to move around their homes, answer their door or open a window if they want to. Without this technology they would require a physical presence to help do these things.

"Trying to hold a door and then get them through, you know it's awkward. I think it enables us more." (Staff)

Tenants did not comment / were unable to comment very much on the impact of the technology on staff or family and friends.

Both family members interviewed also didn't think that technology had changed staff tasks and what they do for tenants. One family member felt that due to technology, staff didn't do as much around the apartment and sometimes left lights turned on even if it wasn't necessary. The other family member felt the staff were present to care for the resident, as before. In terms of their relationship with their relative, they saw everything remaining the same. One family member said that their relation now does grocery shopping every Saturday, which they didn't need to do before, but this is due to a different living setting, and not because of new technology.

"I don't think tech changes what staff do, they are there for care." (Family member)

"Tenants still need practical help and care." (Care / case manager)

5.5 Technology Benefits

Benefits for tenants

As the technology is an implicit part of the Meadowvale facility it is difficult to separate its impact out from the setting. Further, as commented on elsewhere in the report it was difficult to get detailed feedback from tenants themselves. The benefits to tenants of the facility are around their ability to have more choice and control in relation to their day to day living. The technology is an enabler of this. The technology enables them to enter and leave the building themselves, accept or refuse visitors, move around their home and control their own heat and light and entertainment. Technology acts as an enabler and makes it easier for them to live on their own.

"It helps me doing things on my own." (Tenant)

"I can be more independent." (Tenant)

"Tenants can now do more of their own choices." (Stakeholder)

"It is lovely to see how tenants can go out when they want. For example, the other day two tenants went to the cinema to see a movie, they got out of the taxi, let themselves in with their fob, both went to their post boxes to get their post and head to their apartment all on their own." (Stakeholder)

It was discussed that technology in general helps to reduce falls as tenants are less likely to stretch for something and unbalance, for example, to open a window and then fall. However, it was also commented by staff that this type of technology can completely reduce physical activity.

"This kind of technology won't mean less staff hours because technology doesn't lift anyone, bath or shower or make a meal. It really is about dignity and reduction of falls."
(Staff)

One tenant had previously 'run away' a number of times from their prior home. They had not done this since moving to Meadowvale, however this is considered by staff to be due to the freedom provided by the independent living setting rather than the technology per se.

One stakeholder commented that more needs to be done to personalise the technology; staff also commented on this and we are aware that it is an area that Cedar Foundation have been working on this with Atlas Fire and Security / Comelit and Safe Care technologies. It was commented by staff that as the technology is more personalised that this should increase usage levels. At the moment the tablet device is simply not a suitable device for some tenants to use.

"The idea about technology is good in theory but it needs more personalisation. Technology is great if it's tailored to tenants to use it independently." (Stakeholder)

Technology & Falls

One of the staff focus groups discussed that one impact of assistive technology is a likely reduction in falls. We asked Cedar Foundation for data from residential living settings compared to Meadowvale. They provided us with data from 2015 and 2016 for Ballymacoss House, a residential facility that is now closed. The majority of current tenants moved into Meadowvale at the end of August / beginning of September 2016. There were four falls recorded between October and December 2016 but in 2017, and up to March in 2018, there were no falls. At Ballymacoss House a greater number of falls were recorded.

Table 10: Record Of Falls In Ballymacoss House and Meadowvale

Facility	Year	Number of Falls
Ballymacoss House	2015	4
	2016	7
Meadowvale	2016	4
	2017	0
	2018	0

Benefits for staff

The role of staff is more focused on individual personal care and support, than it would be in a residential facility. Staff perceive the main benefits of the technology to be for the tenants, however, it seems that technology can make the job physically easier for staff. The use of door openers reduces some of the difficulty of pushing wheel chairs, and tenants' buzzers are a good support for staff as they don't need to constantly check on tenants, who can call them if they need them.

"[The push buttons on the wall are] handy if you are pushing someone in a wheelchair and trying to hold the door and then get them through, I think it's awkward. I think it [the technology] enables us more." (Staff)

"It sort of simplifies things as you can now just push a button which you couldn't before especially with the doors, it's a lot easier on your body because you are not constantly holding every door, you just push a button." (Staff)

"Likes of the buzzer, telecare system makes life easier for staff. They know who needs them, when they need them, and they can respond, and the technology keeps the building secure." (Case manager)

Benefits for family / friends

Staff commented on a number of family members who are supportive of the technology and encourage its use. Family members themselves struggled to comment on the role of the technology specifically. Two out of the three family members interviewed didn't think that the technology had very much impact at the facility, rather, the supported living scheme is what has made a difference.

One of the tenant's friends thought that the technology had impacted on safety and increased independence, but they certainly didn't see it having any benefits / impact on them as a friend.

Staff members thought that the technology probably decreased anxiety around tenant safety, but this wasn't mentioned by family members themselves.

"The fob is great if you have bags of shopping." (Family)

"Technology is fantastic. It increases their independence and increases their safety; the safety aspect is great." (Friend)

"That provides safety [the intercom with camera] and then you know it probably decreases anxiety from the family's point of view because they are safe and say anybody comes to their front door and they hit the wee panel and they don't recognise them… they know not to let them in." (Staff)

5.6 Super User Case Study – Use and benefits of technology

We spoke to a gentleman who lives in one of the other technology enabled facilities run by Cedar Foundation. He is a huge advocate of the use of technology for people living with physical disabilities and has been living in an apartment at the Cedar Foundation facility for the past 15 years. Staff have three visits scheduled per day – in the morning to help him get up, midday to help him prepare lunch and in the evening to help him get to bed.

It is clear that his apartment is his home and evident that he enjoys living there, as he can have his own time to do his own things but has the reassurance there is someone close by if he needs help. He has an electric wheelchair, which helps him move about on his own.

"I like that I can do things on my own but at the same time if I need anyone, I can always call for help."

He has a lot of hobbies, enjoys watching rugby and likes playing computer games. He also plays sports both alone and competitively; he is very involved and very successful in boccia.

Technology

The apartment where he lives has an Assistive Technology element. He can control his doors, windows, blinds, lights and heating through a heavier box than the panels used in Meadowvale (see diagram 12) or by two large remote controls – one in his bedroom and one in the living room.

Diagram 12: Control for the home environment

He feels that technology gives him greater independence and can't imagine the same level of independence without the use of technology. He really likes the switch on the wall at the front door that he can press when he's leaving the apartment - it closes any windows he has forgotten about and locks the door when he leaves.

Staff only help to charge up the control box, everything else he operates by himself. In addition to the technology in the apartment, he also has a computer and a smart phone, and does his own online shopping and banking. His advises that it is very important to look at each individual's abilities before giving them technology to use.

5.7 Impact of Technology on Quality of Life – ASCOT

In addition to talking with tenants about their experience of living in Meadowvale, Cedar Foundation have been able to provide RF Associates with access to data collected through the Adult Social Care Outcomes Toolkit (ASCOT). This is a survey tool which is designed to capture information about an individual's social care-related quality of life (SCRQoL). ASCOT was developed through a series of studies funded by the Department of Health and HM Treasury, going live in 2010. The toolkit provides a variety of innovative approaches to identifying and addressing the particular challenges of measuring outcomes in social care. The measure itself is preference weighted to reflect the relative importance of different aspects of outcome, and anchored, with final scores anchored to 1 (the ideal state) and 0 (being dead), so it can be related to time. This provides the basis for a social care equivalent of the influential quality adjusted life year (QALY) used in health economics. Measurements are made across 8 domains and these eight domains are recorded for each individual at 4 data- entry levels. The eight domains are highlighted below:

1. Control over daily life: The service user can choose what to do and when to do it, having control over his/her daily life and activities
2. Personal cleanliness and comfort: The service user feels he/she is personally clean and comfortable and looks presentable or, at best, is dressed and groomed in a way that reflects his/her personal preferences
3. Food and drink: The service user feels he/she has a nutritious, varied and culturally appropriate diet with enough food and drink he/she enjoys at regular and timely intervals
4. Personal Safety: The service user feels safe and secure. This means being free from fear of abuse, falling or other physical harm
5. Social participation and involvement: The service user is content with their social situation, where social situation is taken to mean the sustenance of meaningful relationships with friends, family and feeling involved or part of a community should this be important to the service user
6. Occupation: The service user is sufficiently occupied in a range of meaningful activities whether it be formal employment, unpaid work, caring for others or leisure activities
7. Accommodation, cleanliness and comfort: The service user feels their home environment, including all the rooms, is clean and comfortable
8. Dignity: The negative and positive psychological impact of support and care on the service user's personal sense of significance.

The 4 data entry levels are:

- *Ideal state*: The individual's wishes and preferences in this aspect of their life are fully met
- *No needs*: The individuals has no needs, or the type of temporary trivial needs, that would be expected in this area of life of someone with no impairments
- *Some needs*: Some needs are distinguished from no needs by being sufficiently important or frequent to affect an individual's quality of life
- *High needs:* High needs are distinguished from some needs by having mental or physical health implications if they are not met over a period of time. This may be because of severity or number.

Responses from service users are recorded on ASCOT questionnaires (by interview or through self-completion). The ASCOT data entry tools then apply relative importance or 'preference' weights to each level within each domain to obtain the overall current SCRQoL score. This overall score is a number

between zero and one which quantifies a service user's well-being in terms of the degree to which they experience a range of care needs. Spreadsheets are provided in the toolkit, which can then aggregate data.

The SCT4 tool was completed by 13 Meadowvale tenants in January 2017 and responses were entered on the ASCOT data entry tool V2.9 and a SCRQoL report prepared. The questionnaire was then repeated again in January 2018 with 11 tenants.

The Meadowvale SCRQoL results from 2017 were benchmarked with the NHS Survey 2015-16 SCRQoL outputs. Due to some changes in the NHS Survey 2016-17 it wasn't possible to benchmark the 2018 results again with this study. Therefore the 2018 results were benchmarked with the Department of Health Adult Social Care Outcomes Framework 2016/17. For the purposes of this report we have only looked at the comparison of the individual outcomes for Meadowvale for 2017 and 2018.

The overall SCQRoL score for Meadowvale in January 2017 was 0.92 where 1.00 is considered an 'ideal state'. This represents an excellent outcome. This ranges from 97.44% (Personal cleanliness and comfort) to 79.49% (Social participation and involvement). The analysis reflects no areas of high need and 4 domains with a small percentage of "some needs" (food and drink, social participation and involvement, occupation, and control over daily life). Varying degrees of "no need" are reflected across each domain, and significantly high levels of "ideal state."

For 2018 the overall SCQRoL score was 0.87. Scores for 2018 range from 93.94% (Control over daily life, and Food and drink) to 78.79% (Social participation and involvement). Scores from the 2018 questionnaire are lower in most domains apart from 'Control over daily life' and 'Food and drink'.

It is interesting to see that the overall score for the facility has moved downwards slightly from 0.92 to 0.87. It is thought that this is in part due to the study relying on snapshots in respondent's daily lives – and that some of the research may be conducted with service users when they are having a bad day (as well as when they are having a good day). One of the tenants has experienced deteriorating mental health in the last year which may reflect in some of the reduced scores.

When considering this data, we have been interested to look particularly at the data around 'control' as the main discussion around the technology has been as an enabler of independence. Therefore, it is interesting to look at chart 3 and see the increase in the numbers around the number of people in 2017 agreeing that they have 'as much control as I want', with the percentage agreeing with this to being 90.9 from 53.8.

Further given that the technology was commented on in passing as being supporting security, it is interesting that there has been a decrease in the percentage agreeing 'I feel as safe as I want' from 84.6 to 72.7 (see chart 6).

Results 2017 and 2018

Chart 1: Overall Score (Please note the change in scale when considering this chart compared to those that follow)

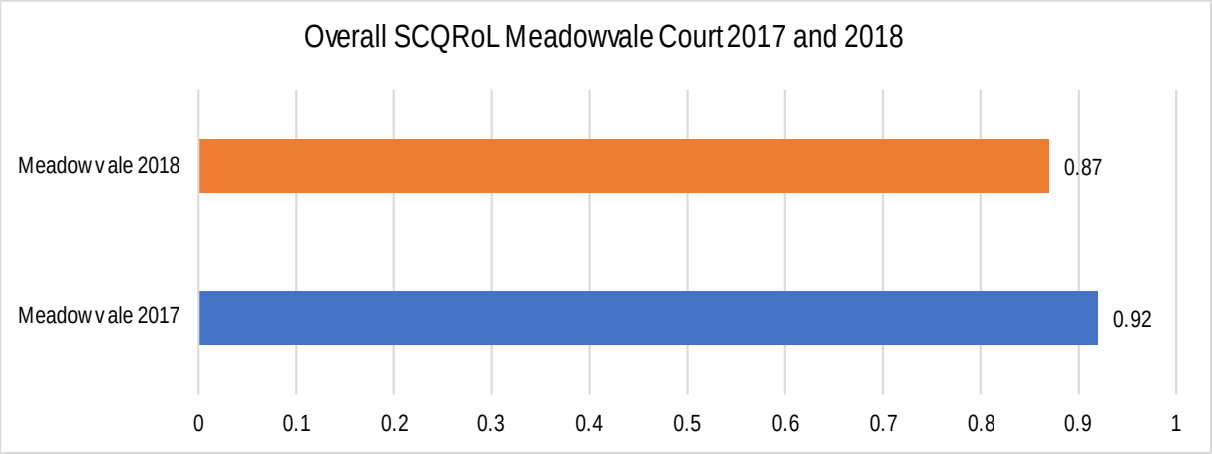


Chart 2: Average Scores For Each Domain

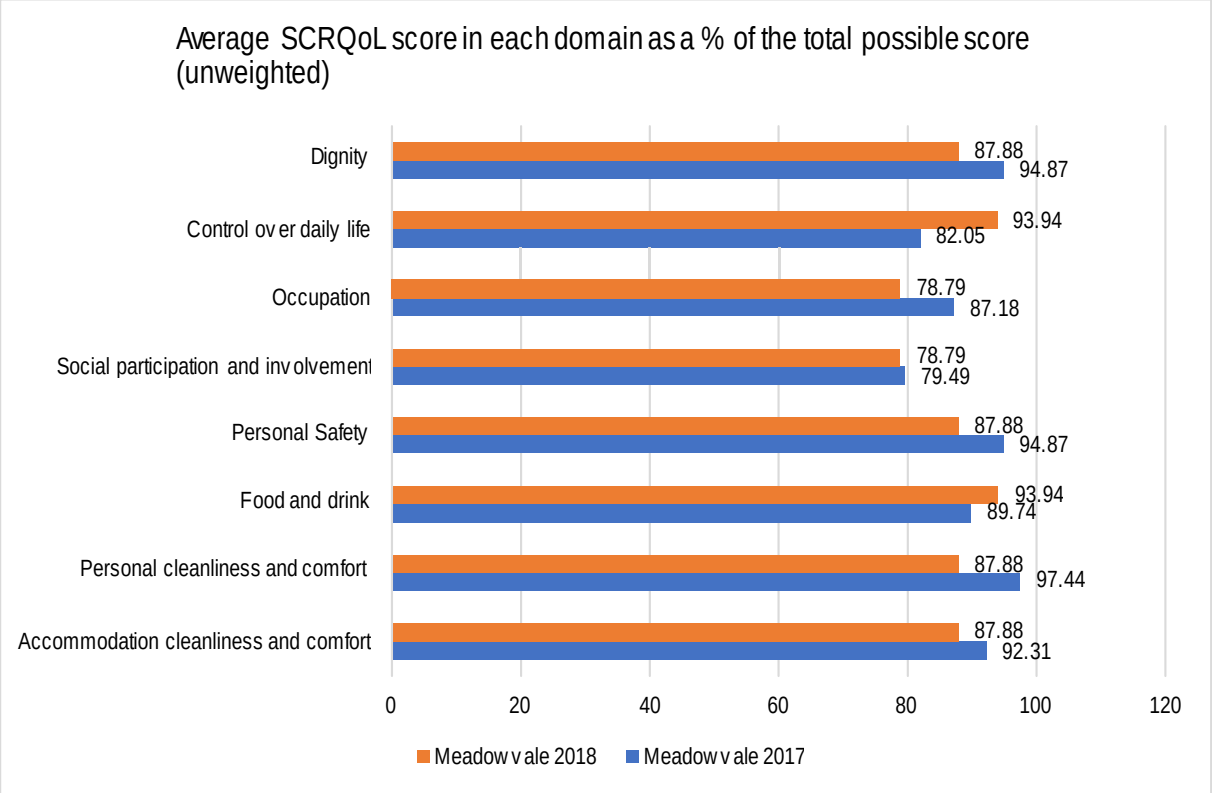
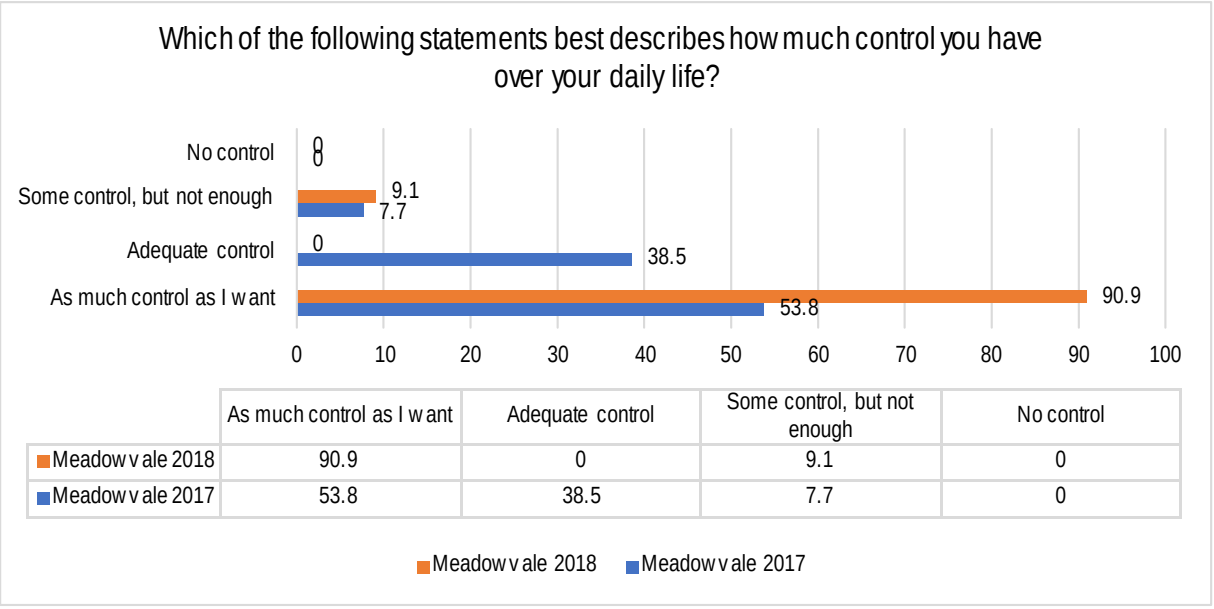
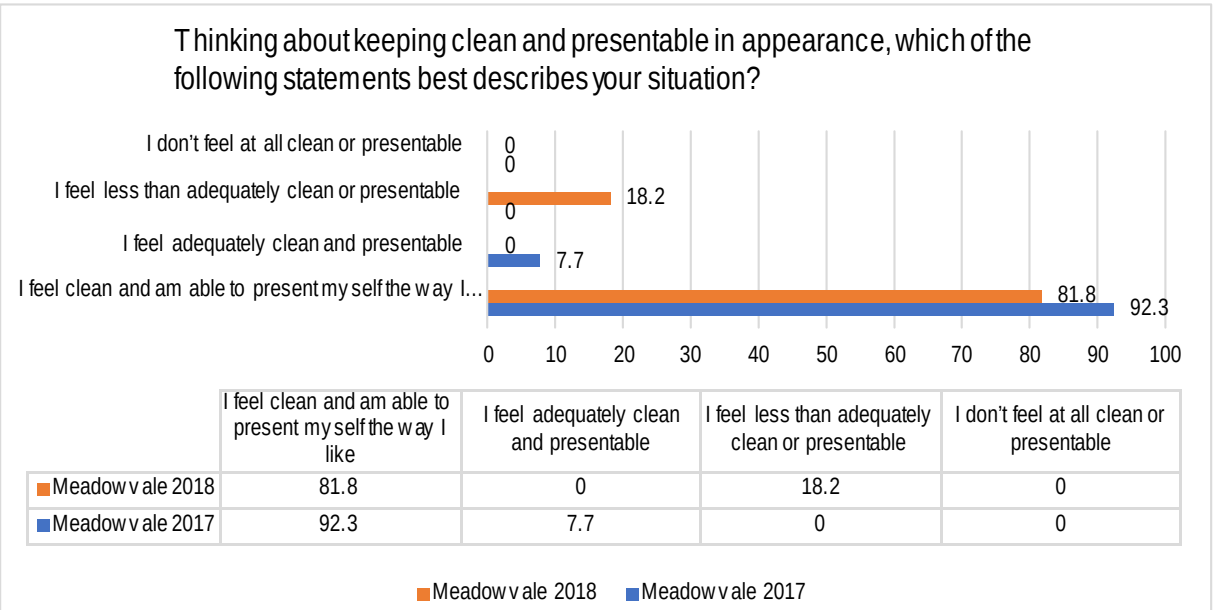


Chart 3: Question 1 – Control over Daily Life



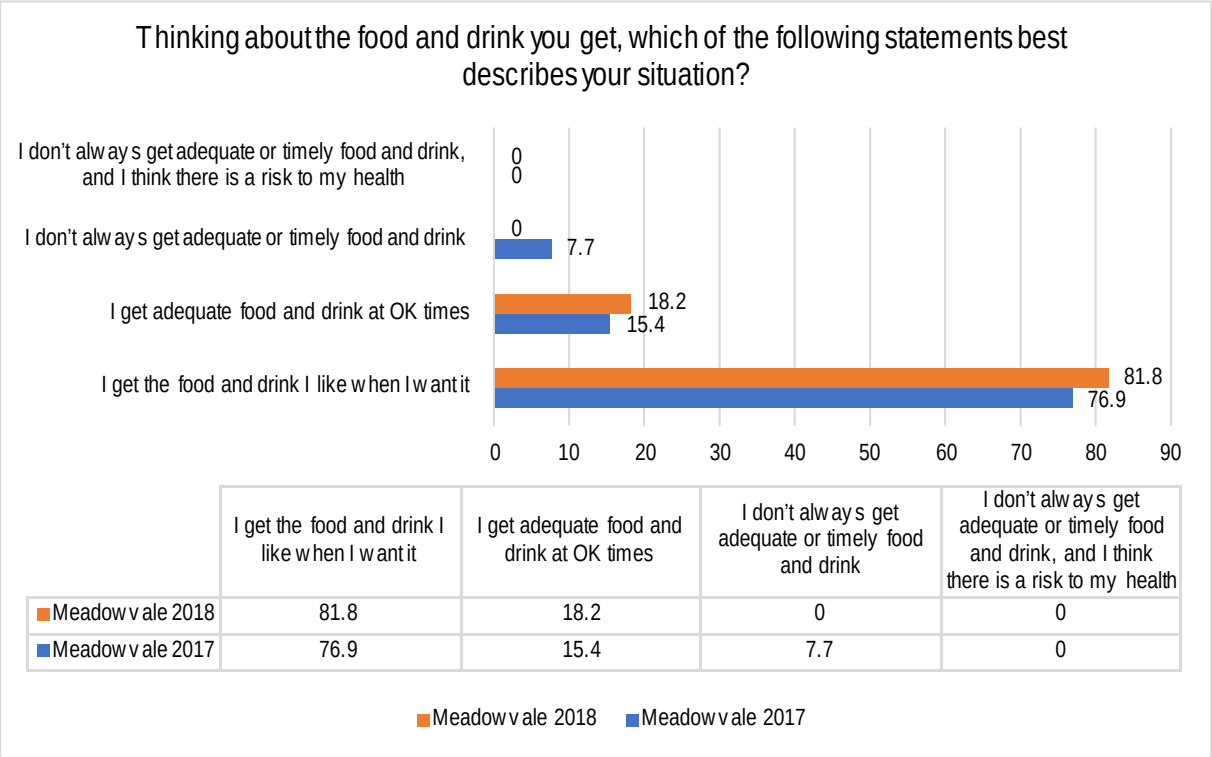
	As much control as I want	Adequate control	Some control, but not enough	No control
Meadowvale 2018	90.9	0	9.1	0
Meadowvale 2017	53.8	38.5	7.7	0

Chart 4: Question 2 – Personal Cleanliness & Comfort



	I feel clean and am able to present myself the way I like	I feel adequately clean and presentable	I feel less than adequately clean or presentable	I don't feel at all clean or presentable
Meadowvale 2018	81.8	0	18.2	0
Meadowvale 2017	92.3	7.7	0	0

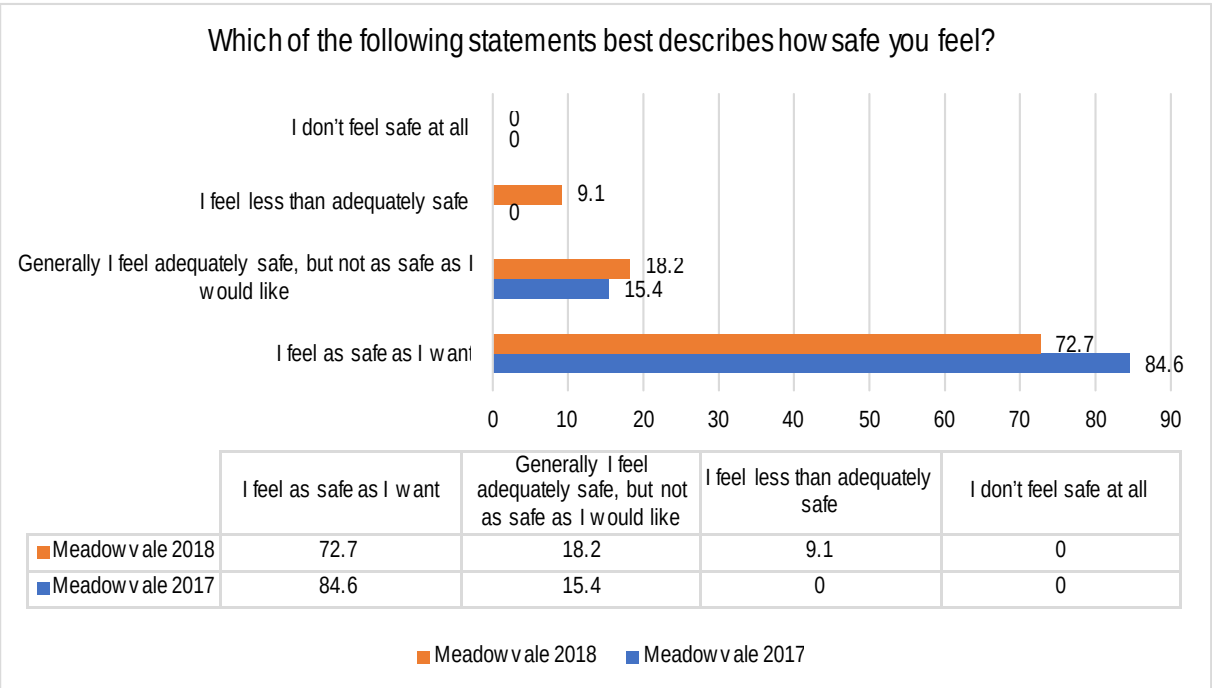
Chart 5: Question 3 – Food & Drink



	I get the food and drink I like when I want it	I get adequate food and drink at OK times	I don't always get adequate or timely food and drink	I don't always get adequate or timely food and drink, and I think there is a risk to my health
Meadowvale 2018	81.8	18.2	0	0
Meadowvale 2017	76.9	15.4	7.7	0

Meadowvale 2018 Meadowvale 2017

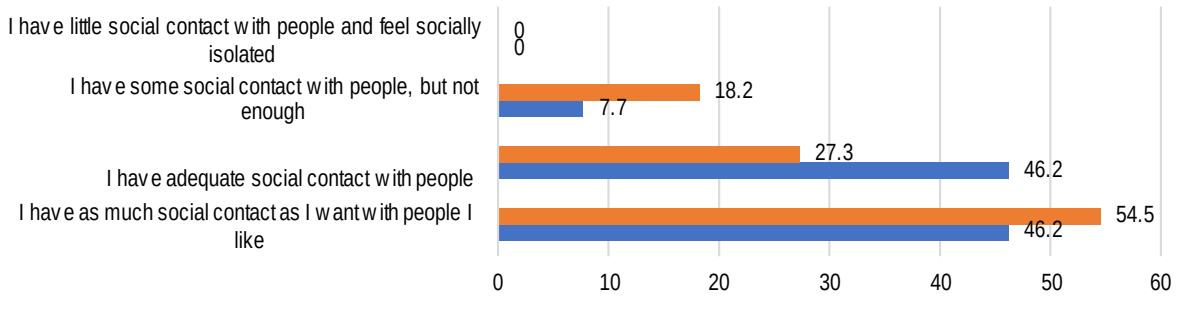
Chart 6: Question 4 – Personal Safety



	I feel as safe as I want	Generally I feel adequately safe, but not as safe as I would like	I feel less than adequately safe	I don't feel safe at all
Meadowvale 2018	72.7	18.2	9.1	0
Meadowvale 2017	84.6	15.4	0	0

Meadowvale 2018 Meadowvale 2017

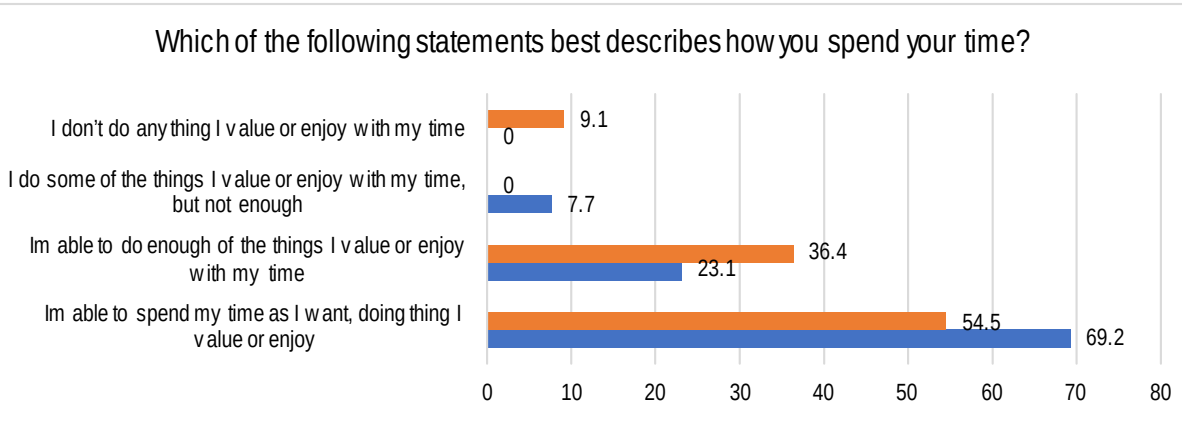
Chart 7: Question 5 – Social Participation & Involvement



	I have as much social contact as I want with people I like	I have adequate social contact with people	I have some social contact with people, but not enough	I have little social contact with people and feel socially isolated
Meadowvale 2018	54.5	27.3	18.2	0
Meadowvale 2017	46.2	46.2	7.7	0

Meadowvale 2018 Meadowvale 2017

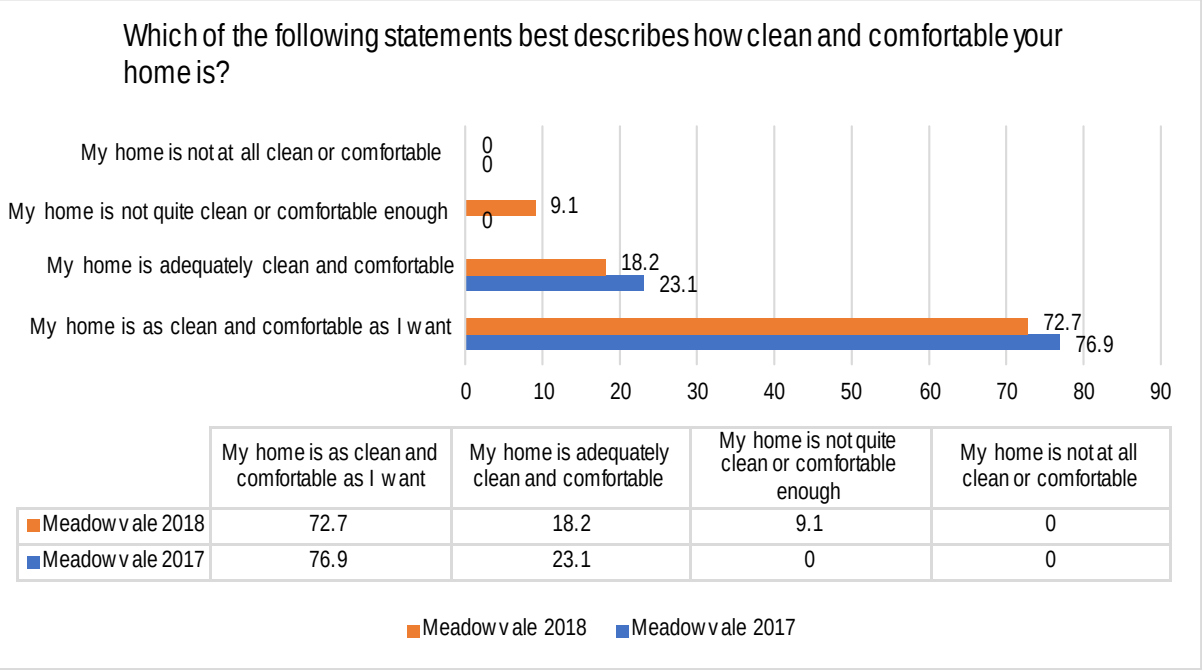
Chart 8: Question 6 – Occupation



	Im able to spend my time as I want, doing thing I value or enjoy	Im able to do enough of the things I value or enjoy with my time	I do some of the things I value or enjoy with my time, but not enough	I don't do anything I value or enjoy with my time
Meadowvale 2018	54.5	36.4	0	9.1
Meadowvale 2017	69.2	23.1	7.7	0

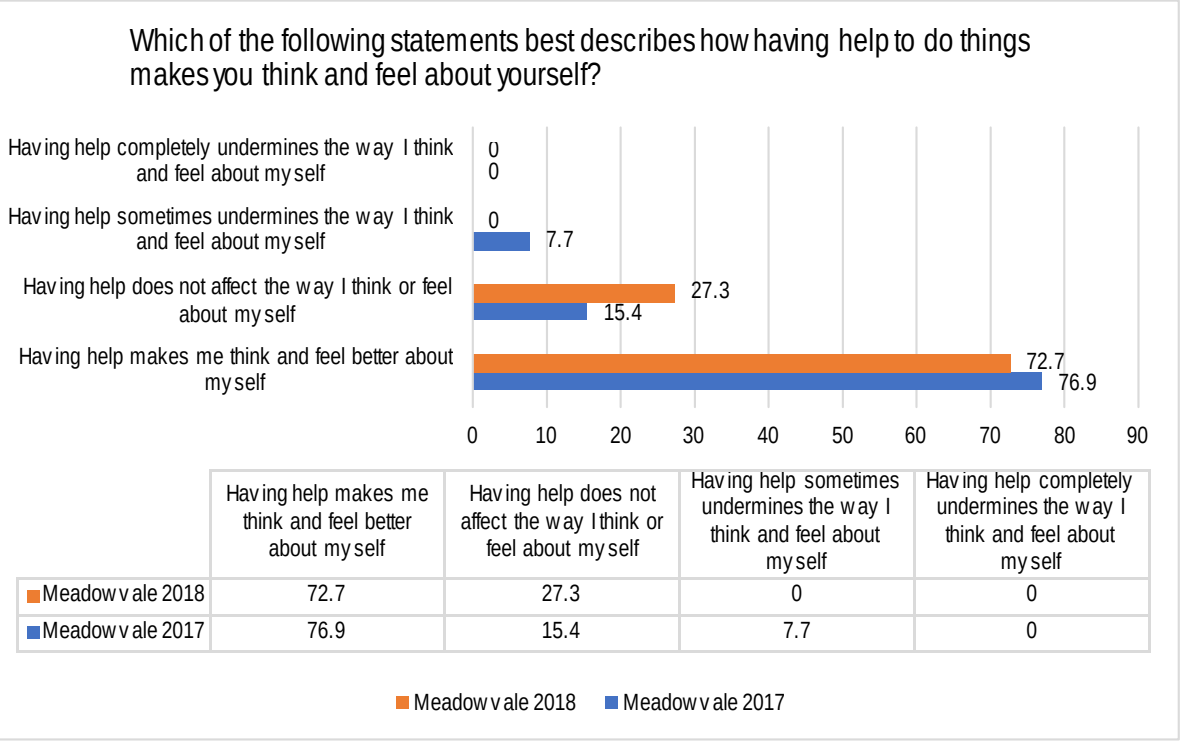
Meadowvale 2018 Meadowvale 2017

Chart 9: Question 7 – Accommodation, cleanliness & comfort



	My home is as clean and comfortable as I want	My home is adequately clean and comfortable	My home is not quite clean or comfortable enough	My home is not at all clean or comfortable
Meadowvale 2018	72.7	18.2	9.1	0
Meadowvale 2017	76.9	23.1	0	0

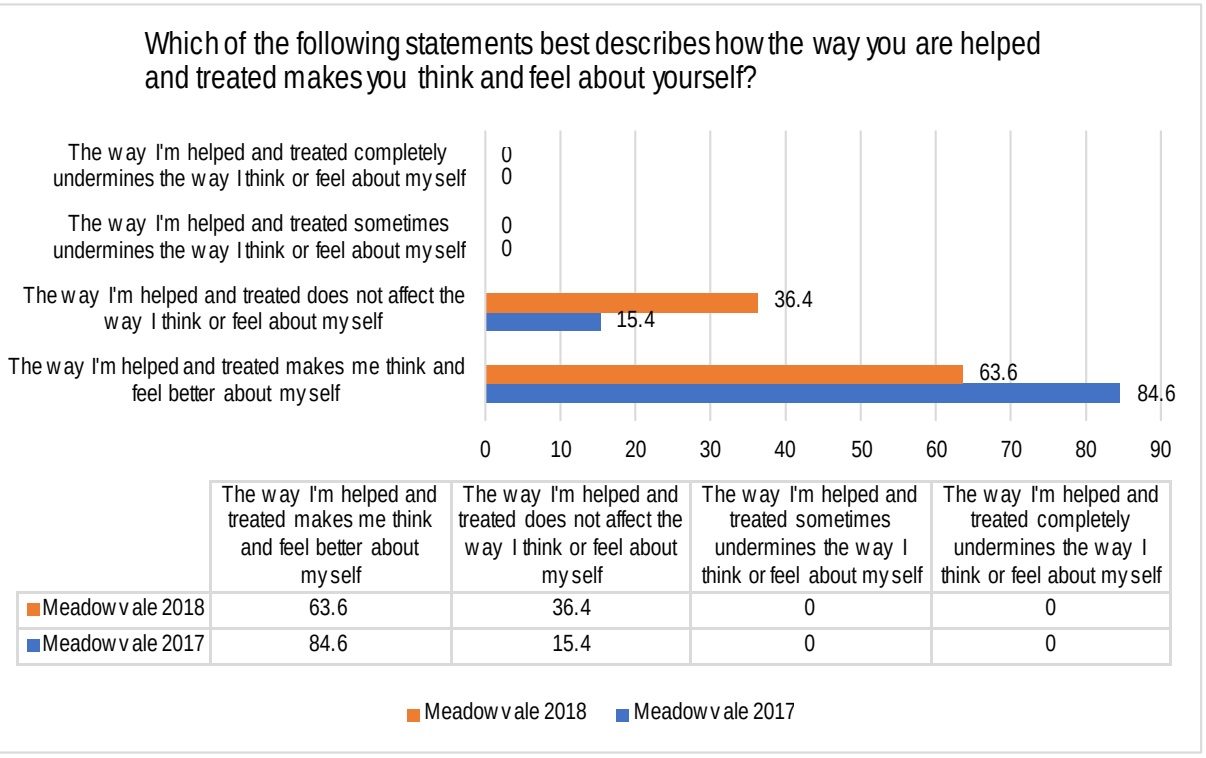
Chart 10: Question 8[1] – Dignity



	Having help makes me think and feel better about myself	Having help does not affect the way I think or feel about myself	Having help sometimes undermines the way I think and feel about myself	Having help completely undermines the way I think and feel about myself
Meadowvale 2018	72.7	27.3	0	0
Meadowvale 2017	76.9	15.4	7.7	0

[1] Question 8 is a filter question designed to allow respondents to express their unhappiness with the fact that they need care and/or support, it is not used in scoring (ASCOT).

Chart 11: Question 9 – Dignity



	The way I'm helped and treated makes me think and feel better about myself	The way I'm helped and treated does not affect the way I think or feel about myself	The way I'm helped and treated sometimes undermines the way I think or feel about myself	The way I'm helped and treated completely undermines the way I think or feel about myself
Meadowvale 2018	63.6	36.4	0	0
Meadowvale 2017	84.6	15.4	0	0

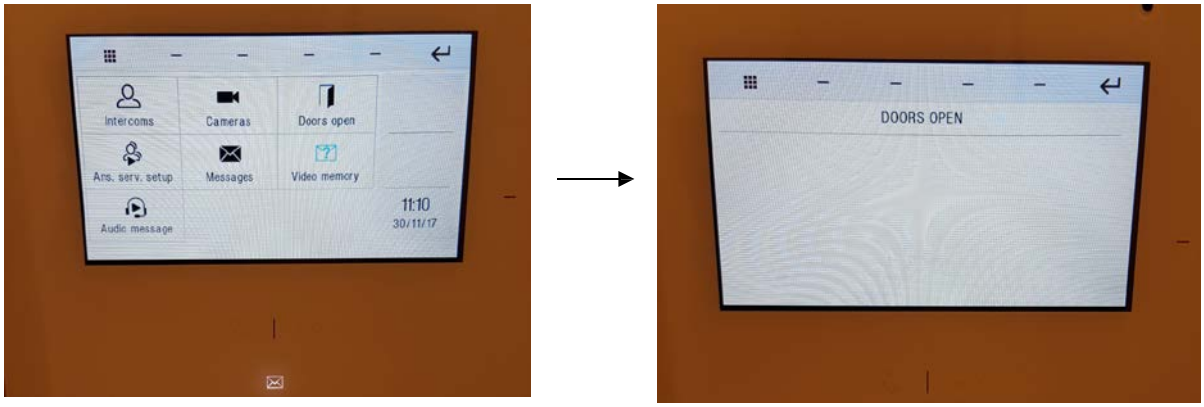
6. Recent Technology Developments at Meadowvale

Our understanding is that Cedar Foundation was aware from the start of the project, when the technology provider was procured and presented the system, that the technology and tablet interface would not be suitable for all of the tenants, given the range and possible complexity of conditions that tenants might have. Cedar Foundation met with the current technology provider (Atlas Fire and Security / Comelit) to review the simplification of the user interface (in terms of both the interface on the software tablet and the wall screen) in April 2017. Comelit at this stage said that simplification was not possible. Cedar Foundation and Professor Suzanne Martin instructed Safe Care Technologies in autumn 2017 to review and evaluate the current technology set up. Safe Care Technologies examined two apartments and common areas. Overall the feedback from Safe Care Technologies was that the level of work carried out by contractor who initially installed the system was of high quality. However, they highlighted difficulties with the software interface and its appropriateness to the user group. In summary the Safe Care Technologies report commented:

"The Comelit system does seem to operate as desired on all wall switches, operating lights and relevant motors. The Icona Touchscreen seems to be operating fine also, but its functionality and user interface are very poor and would not be something recommended for people with disabilities. As a whole the system would be classed more as a home automation system rather than an environmental control system as there is no link for alternative access methods for peoples with disabilities. The users of the facility have little or no interaction with the system as the access methods provided (iPad, Touchscreen, wall switches) … are too difficult to use for them."

The general feedback Safe Care Technologies received was that the interface is not straight forward and easy to use. The Graphic User Interface (GUI) on the touchscreen in each apartment hallway was considered not user friendly and functions not clearly labelled. From the beginning a user may be confused how to navigate the system and find the desired function. There are also many buttons on the GUI that have no purpose and lead to blank pages – see a picture example below (buttons like "Doors Open" might give the impression they were to open doors, but this leads to a blank page):

Diagram 13: Graphic User Interface – Door opening leading to a blank page



A number of functions are labelled under "Other" with no clear indication of what they do until pressed. The buttons are also quite small on the GUI and all text and symbols are in the same font and size with

little clear distinction between the different functions. From what Safe Care Technologies could tell there is no ability to alter access methods on the touchscreen, meaning only people with good direct access can use it.

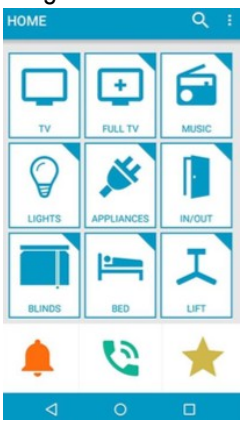
Safe Care Technologies following their review made the following recommendation:
"All Comelit products in the fuse board area to be replaced by the Philips Dynalite relay controllers while the Comelit Icona Touchscreen be replaced with a Philips Dynalite Antumbra Keypad. This keypad is easier to navigate than the Icona Touchscreen and can be used as the master keypad for the apartment as all buttons can be customised for quick functionality. I would, however, foresee this keypad being used more by the carers and staff than the people living in them as it would not be accessible to all."

Diagram 14: Philips Dynalite Antumbra Keypad

They recommended two methods of control:

1. The introduction of the BJ Live app on the iPad. This can be customised and programmed to suit each user. Some users may have full functionality on the app, while functionality and a reduction of the number of buttons can be restricted for some users. The app can also be setup for switch scanning (switch sold separately) if the user does not have the ability for touch access. (This app can also be used with eye gaze technology but would require a change from an iPad to a Windows tablet).

Diagram 15: BJ Live App



2. As well as the BJ Live App on the iPads, Safe Care Technologies also recommended the addition of the Control 6 remote. This six-button remote can be programmed to control any function on the system in the apartment.

Button 1 – Open Front Door
Button 2 – Turn on Lights in Hallway and Living Room
Button 3 – Open Living Room Door
Button 4 – Turn on TV
Button 5 – Bedroom Night Scene on (Open Bedroom Door, Close Blinds and Window)
Button 6 - Bedroom Morning Scene on (Open Bedroom Door, Open Blinds and Window)

The remote is very light and easy to use and will be provided with a lanyard meaning residents can wear it around their neck if required.

Diagram 16: Six-Button Remote Control

Safe Care Technologies started to pilot the new system with one tenant. In this case the Comelit system was replaced with a Philips Dynalite headend unit. The Philips Dynalite system was then paired with the BJ Live Assistive Technology system. For this one trial tenant Safe Care Technologies tried the remote control with six buttons in place of the tablet device. The tenant has tested the device but does not like it. At the time of our interview another option was being reviewed.

Clearly there is some complexity to accessing a system that will work for all tenants, each of whom has differing requirements in relation to personalisation.

7. Search for Comparators

8.1 Brief desk research

From what we can find there is a very limited range of evaluative written material/reports in relation to Assistive Technology and brain injury / neurological conditions and care / housing. our prior work on an introductory scoping study to this project included a literature review element (this is included at Appendix 3) The small number of studies that exist are generally positive about the impact that Assistive Technology can offer to those with a brain injury / neurological condition particularly in relation to independence. We have highlighted below the two studies of most pertinence that relate to the same user group as that at Meadowvale:

I. Evaluation of Hillmount Close Supported Living Scheme (2005) revealed that technology maximised control over tenants' own environments, supporting tenants to feel high levels of independence and autonomy in their everyday lives with the control over these everyday lifestyle decisions.[2]

II. Cedar Foundation also published an Evaluation of the Impact of Assistive Technology at Ardkeen and Hillmount Court (2008). Testimonies of tenants and staff alike provide evidence that tenants perceive themselves to be 'more empowered and independent' in their supported living arrangements. Tenants value their personal space, and the technology that enables them to control the heat, light and ventilation.[3]

The wider literature around other audiences (older people etc.) suggests that there are benefits to the use of Assistive Technology in supported living schemes and that a dominant positive is that tenants gain a high level of independence and control over their everyday lives. Two examples are highlighted below from these other user groups:

III. Barn Halt Cottages in Carrickfergus is a supported living scheme with 26 bungalows for elderly people that opened in 2009. A survey was completed of almost half of the tenants (13 out of 30) where around half of the respondents perceived that their level of independence and autonomy was unchanged since moving to Barn Halt. Any reported decreases were attributed to health deterioration and not the arrangements at Barn Halt. Aids and appliances that promoted independence and mobility were highly valued.[4]

IV. Moorgate Mill in Blackburn is a development containing 20 apartments for people with complex needs including physical and sensory needs, learning disabilities, and some with behaviour that challenges. The technology used enables the least restrictive models of supervision and support to individuals who are at risk of offending, as a result of their

[2] Evaluation of Hillmount Close Supported Living Scheme, 2005, *http://www.cedar-foundation.org/fs/doc/publications/hillmount-close-executive-summary.pdf*

[3] Evaluation of the Impact of Assistive Technology at Ardkeen and Hillmount Court, 2008, *http://www.cedar-foundation.org/fs/doc/publications/final-summary-report-28mar08.pdf*

[4] Research into a future housing and support needs of older people in Northern Ireland, Barn Halt Cottages, Carrickfergus – a study of a supported living scheme, 2010, *https://www.nihe.gov.uk/barn_halt_cottages_carrickfergus_-_a_study_of_a_supported_living_scheme_final_report published_december_2010_.pdf*

previous challenging experiences, and/or illness/disability. Their independence, privacy and dignity are supported, whilst protecting them and their community from a breakdown in their support / wellbeing. [5]

[5] A new approach to supporting people with complex needs using integrated technologies, 2015, *http://www.tunstall.com/media/1140/atel-a-new-approach-to-supporting-people-with-complex-needs-using-integrated-technologies-1.pdf*

8.2 Comparator Facilities

A stipulation of this study was to consider how the Meadowvale facility compares to other similar schemes. We stated at the project initiation meeting that it may be difficult to find 'comparable schemes' being aware of the lack of evaluation studies and specifically studies in relation to facilities focused on those with physical disabilities. It was agreed that we would contact a number of the larger Housing Associations in Northern Ireland to see what information they might be able to provide. We contacted Radius Housing Association and Clanmil Housing Association.

Both organisations tried to be as helpful as possible, but neither were able to provide written studies/evaluations in relation to any of their facilities that include components of assistive technology. In most cases these are dementia related facilities.

Anecdotally, our conversations included the suggestions that assistive technology has an impact in a number of areas:

- That technology in dementia schemes reduces the anxiety of family members around safety, providing reassurance that relatives are safe through assistive technology that provides alarms / tracking re wandering, technology that switches cookers off, sensors re falls etc.
- That there can be a reduction in falls
- Reduction in 'running away'

Clanmil stated that as a landlord there is no significant benefit of technology to them specifically as a housing association. Health and Social Care Trusts take the lead in terms of technology as they are the care provider who know what works and how technology will work with their clients. After discussion with Belfast Health and Social Care Trust by way of follow up, they too could not provide us with any formal report in relation to the use and impact of technology in their schemes.

Clanmil mentioned using for example the DSDC Dementia guidelines when designing housing in relation to dementia but commented that these do not refer to technology. They also commented on the importance of economies of scale around the number of units in schemes, and that small schemes can be tricky to make viable.

Based on this feedback from Radius and Clanmil we think that we need to take great care when making comparisons of Assistive Technologies and schemes for different client groups. Our discussion with Clanmil and Radius referred in the main to dementia schemes, where the technology in place seems to form a more monitoring / risk management role than that in the Meadowvale facility which is more focused on supporting and achieving independent living for those who are physically disabled.

The table below provided some sense of cost comparison:

Table 11: Cases Provided By Radius Housing Association & Clanmil Housing Association

	Case 1: Spelga Mews (Radius)	Case 2: Grovetree (Clanmil)
Description	Supported living scheme for persons with dementia. Comprises a central block of 12 flats with 24/7 staff support and 12 bungalows in the grounds with calls diverted to the 24/7 telecare centre overnight.	Supported living scheme - high quality self-contained apartments that are opening in late spring 2018 for older people living with dementia in a supported living environment. 30 apartments – 27 are one-bedroom, 3 are two-bedroom apartments. Care is provided by Belfast Health and Social Care Trust.
Type of technology	- Speech module (home hub) combined with the door entry - Smoke and carbon monoxide detectors - Fall sensors - Chair sensors - Bed sensors - Epilepsy sensors - Exit / door opening alerts	- Warden Call speech unit at the front door of the apartments to speak to staff plus 4 pull cords across the apartment - Smoke detectors - Heat detectors - Cooker alarm sensors - Flood and water detectors - PIR sensors to control occupancy and movement within the apartment
Approximate capital cost of technology	£1,000 per dwelling = £12,000 (does not include installation)	£180,000 for 30 apartments / £6,000 per dwelling

These cost comparisons are interesting when compared to the Meadowvale facility which per dwelling for the technology component seems to have been more like £22,000. As indicated in that section of this report, a large part of those costs relate to the physical elements and motors required to open the doors and windows – an element that is unique to assistive technology projects for those with physical disabilities.

9. Conclusions and Recommendations

1. The role of technology at Meadowvale

Technology functions as an enabler of supported living in Meadowvale. Tenants could not live in their own homes without elements of the technology such as door openers, fob access, ability to let visitors in and out etc. Technology is focused on empowering and enabling day to day activities in an almost passive role, providing functions that an abled bodied person is likely to take for granted.

2. The impact of technology at Meadowvale

Tenants are afforded a much more independent living environment than previously and all the feedback from them is positive in relation to the facility. Quality of life data is also generally positive. It is difficult to separate out the impact of technology when, for many of the tenants, the supported living element is in itself a completely different experience.

It is difficult to see particular technology impacts for staff (other facilities, for example in the dementia space, may better highlight how staff are supported to manage risk). It is difficult to see how particular technology impacts on friends / family members, but our study had a very poor response to requests for engagement from this group.

3. Usage levels

The specific tablet component of the technology at Meadowvale is not being used very much and further work is required to personalise the technology to increase its usage. Likewise, on-going work is required to support technology adoption. The amount of training and support required for this user group should not be underestimated.

4. Cost of the scheme

There is a complete lack of comparable data around the cost and impact of similar schemes and it is complicated to compare this scheme to others for a number of reasons. This scheme is unique, and the costs of the Assistive Technology are therefore also unique. The costs for the technology for this scheme seem to be more than the other two dementia schemes that we received information on and this seems to be due to the requirement for the physical components such as door openers / window openers. The costs associated with these elements is significant. When these costs are removed the scheme looks less expensive than it might first appear.

5. Learnings from the specification and procurement stages

There is limited expertise around the specific technologies that meet specific user needs. The system procured at Meadowvale was, in the first instance, a home automation system rather than an Environmental Control System tailored for this specific client group. (We use the term home automation system to mean a generic system that might be used in any building to control for example heat, light and temperature. Increasingly 'smart homes' are being developed to include this type of technology. Environmental control technology tends to be the terminology used by the health sector for more tailored systems, systems developed for those with disabilities, with the use of an individual controller with composite adaptations to a specific user group). We think this lack of expertise is, in part, due to the new and evolving nature of these technologies, the relative uniqueness of the use of these technologies and the lack of information available on these technologies and their ongoing monitoring and evaluation.

On reflection it is possible to suggest that the technology specification might have been more robust - it did not for example even mention that the facility would be used by those in wheel chairs with physical disabilities. We appreciate that it is difficult to ascertain the exact user needs of future individual tenants, however as these technologies evolve organisations involved in the development of these types of facilities have a responsibility to act as educated buyers of future technologies.

We also suggest that more suppliers (aside from Atlas Fire and Security) should have been considered and more systems could have been seen in action / tested out. No partner can verify if more systems were considered – when technology of this nature is evolving we would suggest again that only by researching and considering the options can organisations become more educated in what differing technology solutions enable.

It has also been very difficult to access the detail of the financial spend associated with the technology and future procurement processes need to take account of this and enable greater transparency if this area is to be better understood.

6. Other learnings for the future

The evidence base evaluating the use and impact of technologies in situ is completely lacking. Housing associations and health trusts should consider funding some useful evidence gathering work in this space. Not all technology performs the same role nor is it likely to cost the same, for example, the cost and impact of technology in the dementia space is likely to be different than that for physical disability. In particular, understanding the impact of Assistive Technology on carers (informal or formal) requires much more work.

Disclaimer

This report was commissioned by Department for Communities and Northern Ireland Housing Executive and written by RF Associates. Our conclusions are the result of our professional judgment, based upon the material and information provided to us by the client.

About RF Associates

RF Associates is a research and evaluation business focused on delivering high value research driven insight. We were established in May 2015 and are committed to offering great work whilst growing and developing our team. We undertake the whole breadth of research and evaluation methodologies including desk research, both qualitative and quantitative research projects, and make use of a wide range of consultancy methods. We work with clients across the UK in both the private and public sector.

APPENDIX CONTENTS

LITERATURE REVIEW FINDINGS FROM SCOPING STUDY

1. There is a very limited range of evaluative material in relation to assistive technology and brain injury / neurological conditions and care / housing.

The literature on assistive technology including telecare and telehealth is extensive; however, there is a real lack of longitudinal research data / service evaluations that focus on the impact of these technologies.

In particular we have found it difficult to find relevant evaluation material in relation to services for people with acquired brain injuries / neurological conditions. The majority of the evaluations of supported living services and assistive technology are related to older people, people with learning disabilities and people with dementia. We have reviewed 40 documents and only three of those relate specifically to brain injury / neurological conditions. Even wider calls for evidence would suggest that there is a complete lack of literature in this area for example the Association of Directors of Adult Social Services (ADASS) launched a call for evidence in 2014 to allow UK Councils to share best practice and case studies to sustain and accelerate momentum in the use of technology in meeting improved health and wellbeing outcomes. Their call resulted in 28 examples of best practice and implementation from 20 Councils around the UK, however almost all of the material relates to older people, learning disability or dementia.[6]

It should also be noted that there are a wide range of technologies considered under the umbrella of assistive technology – some offering benefits that are not of relevance to this study, and again we have tried to consider articles with most relevance to the specification in place in Meadowvale, which has proved challenging.

The two documents of most relevance relate to evaluations undertaken of schemes already in place with the Cedar Foundation.

2. The small number of studies that exist are in general positive about the impact that assistive technology can offer to those with a brain injury / neurological condition particularly in relation to independence. A full and proper evaluation of the Meadowvale Scheme, collating evaluation data (soft and hard metrics) over a longitudinal period if possible, will provide an extremely valuable contribution to this literature.

In 2005 the Cedar Foundation published an evaluation of Hillmount Close, a purpose built supported living housing scheme for people with complex disabilities that has been designed to incorporate electronic assistive technology (an assisted environment that includes automatic door and window openers, controls for window blind, proximity detectors, flood detectors, CCTV and distributed video) that is very similar to the assistive technology installed in the new North Lisburn (Meadowvale) Supported Living Scheme. The report revealed that tenants were overall satisfied with both the Environmental Assistive Technology and the commissioning system provider, and that there was no evidence of abandoning use of end user devices. One of the projects positive outcomes related to the assistive technology was that tenants 'maximised control over their own environments' feeling high

[6] Association of Directors of Adult Social Services (ADASS). 2015

levels of independence and autonomy in their everyday lives with the control over these everyday lifestyle decisions. The theme of independence emerged from all tenants. There was a perception of "complete independence". One tenant reflected on the independence to plan a trip across town and use public transport, for another tenant it was the freedom to deal independently with activities of daily life.[7]

Cedar Foundation also published an Evaluation of the Impact of Assistive Technology at Ardkeen and Hillmount Court in 2008, where testimonies of tenants and staff alike provided evidence that tenants perceived themselves to be 'more empowered and independent' in their supported living arrangements. Tenants valued their personal space, and the technology enabled them an environmental control (control the heat, light, ventilation). The report considered that for improvements in the functional independence of service users, technology gives choice, and with dignity, increases self-esteem and an ability to carry out the tasks of daily living – opening doors, windows, blinds.

Another paper, 'Using Smart Home Technology in Brain Injury Rehabilitation: The Road towards Service Development' (in Assistive Technology: From Research to Practice: AAATE 2013) reports the process of developing an assistive technology transitional living service for brain injury rehabilitation. The aim of the service is to take advantage of smart home technology to assess, rehabilitate and promote independence in individuals with acquired brain injury who wish to live on their own in the community. The present report comprises the case-studies of two individuals (RK and PK) with acquired brain injury who lived in the BIRT Assistive Technology (BAT) House, before permanently moving from a residential rehabilitation setting into the community. The effectiveness of the technology was evaluated through analysis of a log of all requests for support to staff in the adjacent houses, a record of all pager alerts, and analysis of the occupancy data recorded by the system. Usability was assessed by asking service users and staff about their experience and impressions of interacting with the smart house environment. Neither RK nor PT were considered to be ready to live fully independently at this stage. RK continued to have persistent complex needs with managing finances, social vulnerability, running a home, and coping with unplanned events. PT needed continued assistance with meal preparation and support in monitoring an unrelated chronic health problem (diabetes). However, a period of transitional living in the BAT House was crucial in establishing that both service users would be safe to spend long periods of time within the home without supervision, including overnight.[8]

3. The wider literature around other audiences (older people etc.) suggests that there are benefits to assistive technology in supported living schemes and that a dominant positive is that tenants gain a high level of independence and control over their everyday lives.

- The National Development Team for inclusion reported that there is growing evidence that assistive technology can work well for people with learning disabilities and deliver greater independence, social inclusion, privacy and dignity as part of a wider support package.[9]

- Another report by Advance Housing and Support gives an example of one provider, who by assessing 33 people with learning disabilities in supported housing for AT were able to deliver

[7] Cedar Foundation. 2005
[8] Oddy M., Ramos S., Harris N. in Encarnacdo P., Azevedo L., Gelderbloom G. J., Newell A., Mathiassen N. 2013
[9] National Development Team for inclusion. 2010

greater independence, privacy and dignity by purchasing a range of devices at a cost of £10,000.[10]

4. The literature points to benefits around assistive technology in a wide range of areas:

- The Advance Housing and Support report outlines benefits from assistive technology regarding learning disabilities for clients and staff based on several case studies presented in their report. Service quality for clients/residents – more privacy, increase of dignity, control of environment, enable to do more for self, more reliable in delivering safety, quicker or timelier response when needed, more timely response can result in greater comfort and/or less harm to self, fewer disturbances – in particular sleep at night. For staff - safer working environment, less routine monitoring required, greater satisfaction when enablement occurs, extends skills, creates a wider range of jobs and in some organisations can create a better career structure.

- Care Performance Partners evaluated telecare use across 41 English councils in 2015 and covered 3,303 people who were using telecare during the period 2010-2014. The results suggest that telecare is most effective in helping to prolong independent living and increasing safety when telecare is carefully integrated as part of a wider support package. Telecare is effective in reducing avoidable use of health services. Statistically, the greatest beneficiaries were older people, particularly those who had dementia or who were frail and at risk from falls. It also helped to reduce avoidable admissions to hospitals and supports safe discharge home – especially where telecare can be made available quickly and in deferring or avoiding admissions to care homes.[11]

- While computerised services and devices cannot be used in isolation or always be relied upon as a substitute for traditional human support, Voluntary Organisations Disability Group report reveals a number of benefits to a technology- embracing social care approach. Technology can increase choice, control and independence, support people of different ages and abilities, often through relatively simple methods, help stretch personal, health and social care budgets to provide more support at a time of financial constraint, be employed in a variety of care settings, including community living, residential care and private homes, support the role of carers and staff, encouraging their enabling role and often freeing them to concentrate on other tasks and help commissioners and providers in running cost effective services.[12]

5. It is evident when considering the literature that the role of staff and their activities can change with the introduction of assistive technology. We believe that this will be a particular area of interest in the evaluation of Meadowvale going forward as the whole scheme is different in how care is delivered compared to the clients' previous settings.

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[10] Advance Housing & Support Ltd. 2006

[11] Care Performance Partners. 2015

[12] Voluntary Organisations Disability Group. 2013

Assistive technology clearly does not replace human contact or care giving. However, it is flexible enough to be applied in very different care settings, from residential placements to community living and thus has the potential to change how care is provided / resourced. A number of studies have pointed to the difficulties that staff can have in adopting new practices around the technology.

- The Evaluation of Ardkeen Supported Living Option reported challenges for staff as increased diversity of staff activity for tenants engendered feelings of increased workload. Previously there were staff members who did the cooking and the shopping communally for all residents. Now staff were required to do each of the activities for individual tenants and they are still in the process of adjusting to these being part of their workload. Organising dinners was thought to be stressful at times. However, it was recognised that the new arrangements were still in the process of 'bedding in' and staff and service users alike were affording one another a degree of flexibility during this period. Changed work pattern and the assignment of staff to a small number of particular tenants on each shift differs from the pattern of work staff were used to (i.e. where the staff on duty spread their time across all of the residents). There is a greater need for team working than had been the case in the residential setting; because of the multiplicity of tasks each staff member was now required to carry out.[13]

- A study (Staff perceptions of job satisfaction and life situation before and 6 and 12 months after increased information technology support in dementia care) amongst nurses and support staff of the use of surveillance technology in residential facilities for people with dementia or intellectual disabilities showed that despite the presence of surveillance technology, staff still continued their rounds as before. Alarm fatigue sometimes led staff to turn devices off. Though the technology allowed wandering clients to be tracked more easily, nurses and support staff often preferred keeping clients nearby, and preferably behind locked doors at night. At times staff forgot to remove less visible devices (such as electronic bracelets) when the original reason for use expired. They suggested that care facilities wishing to implement surveillance technology should encourage ongoing dialogue on how staff members view and understand the concepts of autonomy and risk.[14]

6. Material in relation to the cost / benefits of assistive technologies specific to the type of scheme we are considering does not exist, that said, there are some reports in relation to telecare and telehealth that provide some useful context of the sorts of savings that are possible with these technologies in other schemes, and how they come about.

We have managed to review a small number of reports on the cost / benefits of assistive technologies, however the majority of those relate to telecare and telehealth for older people and people with dementia – and again even in these areas the evidence could be vastly improved. A literature review by Dementia Services Development Trust in 2013 of the cost effectiveness of assistive technology in supporting people with dementia reported that the literature shows a real dearth of rigorous costs analysis of assistive technology for people with dementia and their carers.[15] Nevertheless, there are

[13] The Cedar Foundation. 2008
[14] Engstrom M., Ljunggren B., Lindqvist R. and Carlsson M. 2005
[15] Dementia Services Development Trust. 2013

clear indications of cost effectiveness in many respects, albeit from indirect evidence – as the examples below highlight:

- The 'Advanced Housing and Support report' demonstrated that using assistive technology enabled the care provider to replace seven sleeping in staff and change waking to sleeping night cover. This achieved a saving of £122,000 from direct staff salaries. They were able to develop a mobile night response service in the area at a cost of £54,000, thus achieving a net saving of £68,000 that was used by the commissioner to invest in other services. The principal financial benefit flows from needing fewer staff doing very limited tasks. The cost savings lie in eliminating the need for permanent staff, in particular sleep-in staff "just in case", replacing working night staff by sleep in, reducing the overall number of staff and allowing residents to do more tasks themselves or unaccompanied.[16]

- The Department of Health's Care Services Efficiency Delivery (CSED) team assessed the impact of telecare in Blackburn with Darwen between 2008 and 2010 and identified major reductions as assisted living technology had achieved concrete cashable savings through increasing independence at home and reducing demand for domiciliary and residential care. They achieved a net reduction of £2.2 million through reduced costs of care packages, £300,000 above the target set in 2008. Preventative/early intervention approaches, in conjunction with assisted living technology (ALT), then produced a reduction in 2013/14 of £1.2 million (direct budget costs).[17]

7. It was of particular interest to review the existent literature to understand the prevailing trends in measurement around the impact of assistive technology / frameworks that measure independence. There are a wide range of tools in use in the studies reviewed with different purposes and relevant strengths and weaknesses.

[16] Advance Housing & Support Ltd. 2006
[17] Sally McIvor, ADASS. 2015

SMART Technology in Tenant Room

Front Door
Sensors on both sides at top
Motorised door: patio, living room, bedroom
SWAB key on chair that opens main front door and tenants own front door
Hallway
Hall Light on/off switch
Living room light on /off
Bedroom light on / off
Bathroom door
Bedroom door
Room temp thermostat
Kitchen
Hall light on /off – water sensor
Door open (kitchen / Living room)
Living room light on / off
Kitchen light on / off
Heating low / high
Warden call -box
Living Room
Blinds close /open
Blinds tilt left / right
Windows Open / close
Outside light
Patio door open
Heating low / high
Bedroom
Blinds close / open tilt left / right
Window open/ close
Hall light on/ off
Bathroom light on/ off
Bathroom door open / close
Bedro9m light on/ off
Room temp thermostat
Bathroom
Water sensor

TRIANGLE HOUSING ASSOCIATION

PROPOSED SOCIAL HOUSING DEVELOPMENT

AT

OLD ROAD HILLSBOROUGH, LISBURN

SPECIFICATION FOR ELECTRICAL ENGINEERING SERVICES

ELECTRICAL ENGINEERING SERVICES

SPECIFICATION FOR ELECTRICAL ENGINEERING SERVICES

Ref	:	3907 (December 2013)
Project	:	Proposed Social Housing Development at Old Road Hillsborough, Lisburn
Architect	:	JNP Architects 2ND Floor, Alfred House 19-21 Alfred Street, Belfast BT2 8ED
Quantity Surveyor:	:	Andrew G. Crawford & Co., 2nd Floor Chartered Quantity Surveyors 352 Antrim Road Belfast BT15 5AE
Consulting Engineers	:	Cogan & Shackleton 195, York Road Belfast BT15 3HB

SPECIFICATION CONTENTS PAGE

DRAWINGS

The drawings accompanying this Specification are as follows:-

DRAWING NO	DRAWING TITLE
3907 – E1	Lighting Installation – Apartment Type 1
3907 – E2	Power Installation – Apartment Type 1
3907 – E3	Fire and Warden call Installation – Apartment Type 1
3907 – E4	Lighting Installation – Apartment Type 2
3907 – E5	Power Installation – Apartment Type 2
3907 – E6	Fire and Warden call Installation – Apartment Type 2
3907 – E7	Fire, Security and Warden call Installation – Communal area
3907 – E8	Lighting Installation – Communal area
3907 – E9	Power Installation – Communal area
3907 – E10	Lighting Installation – Apartment Type 3
3907 – E11	Power Installation – Apartment Type 3
3907 – E12	Fire and Warden call Installation – Apartment Type 3
3907 – E13	Site Services Installation
3907 – E14	Standard details
3907 – E15	Standard details
3907 – E16	Communal switch gear and Lift Installation
3907 – E17	Solar Systems installation

SECTION A

GENERAL CONDITIONS OF CONTRACT

(Refer to Main Contract Documentation
Not included in this Document)

SECTION B

'PARTICULAR' ELECTRICAL SERVICES SPECIFICATION

SUB-SECTION B1 - CONTRACT REQUIREMENTS

B1.1 GENERAL

The Contractor shall note that the clauses detailed in the Sub-Section of the specification shall be read in conjunction with the Sub-Section C1 of the general electrical services specification.

B1.2 DESCRIPTION OF WORKS

The works comprise the erection and completion of a housing development at Hillsborough old road, Lisburn.

B1.3 NATURE OF SUPPLY AND EARTHING SYSTEM

The electrical contractor shall establish the nature of supply from the utility provider or by measurement prior to commencing works. The installation shall be provided to ensure compliance with bs7671 with respect to the earth fault loop impedance and Prospective fault current ratings.

B1.4 ELECTRICAL SUB-CONTRACT WORKS

The Electrical Services to be provided under this contract shall include for the following:-

1. Supply and installation of all main and sub-switchgear to apartments.

2. Supply and installation of all cabling for mains, sub-mains, sub-circuits complete with all necessary connections using PVC insulated cables, high impact heavy gauge plastic conduit, galvanised trunking, heat resisting flexible cord and cables where required.

3. All lighting points, fittings, lamps, switches, socket outlets, isolators, etc., except where noted otherwise.

4. Supply and installation of all miscellaneous power/heating circuits/mechanical services circuits.

5. Supply and installation of a fire alarm system.

6. Supply and installation of the home automation systems.

7. Supply and installation of the Warden call systems.

6. Supply and installation of telephone conduit and cabling system.

8. Supply and installation of T.V. distribution systems.

8. Supply and installation of a Video Door access system.

9. Supply and installation of all door, window and blind openers and controls as detailed within the standard details and on layout drawings.

10. Supply and installation of a complete emergency lighting system as indicated.

11. Supply and installation of all site and amenity lighting complete with cables etc.

12. Supply of "As Fitted" drawings and operating and maintenance manuals.

13. The complete electrical testing and verification of the electrical installation including the supply of all Test Schedules and Certificates.

The works described shall be complete in all respects and shall be carried out in accordance with the true meaning and intent of this specification and accompanying drawings and shall include everything required for a complete installation whether described in the specification or indicated on the drawings or not.

B1.5 CONSTRUCTION (DESIGN AND MANAGEMENT) REGULATIONS

The Contractor shall take over and develop a health and safety plan, and shall co-ordinate the activities of all Sub-Contractors so that they comply with the C.D.M.

The Contractor shall provide relevant information on health and safety risks created by the Contractor works, and identify how these risks will be controlled. The Contractor shall ensure that all employers and operatives comply with the site rules and regulations as detailed in the Contractors health and safety plan. All Contractor employees shall be given adequate training and information in relation to C.D.M Regulations.

The Contractor shall provide Material Safety Data Sheets for all materials, equipment or plant used in the or for the works.

The Safety Data sheets shall include as relevant the following information:-

* Manufacturer's name and address
* Composition
* Hazard identification
* First Aid measures
* Fire fighting measures
* Accidental release measures
* Handling and storage
* Exposure controls and personal protection
* Physical and chemical properties
* Stability and reactivity
* Toxicological effects
* Ecological information
* Disposal information
* Transport information
* Regulatory information
* Any other information

In addition to the main contract Health and Safety file the Contractor shall provide an individual tenant information pack, including operating and maintenance instructions, for each of the dwellings.

B1.6 PROVISIONAL AND CONTINGENCY SUMS

Provisional sums are located within the main contract documents

SUB-SECTION B2 - SWITCHGEAR INSTALLATION

B2.1 GENERAL

The Contractor shall note that the clauses detailed in this sub-section of the specification shall be read in conjunction with sub-section C2 of the general electrical services specification.

B2.2 MAIN SWITCHGEAR POSITION

The Electrical Contractor shall supply and install free standing cubicle pattern main switchboards at the locations shown.

The switchboards shall comprise of all components indicated on the drawings, and be a Factory Built Assembly - Multi-cubicle type F.B.A. Form 4 and shall comply with BS 5486 Part 1 1977 and IEC 439 1973. Internal barriers shall be fitted to isolate adjacent compartments within and between cubicles.

The panel shall be constructed from 2mm thick Zintec sheet steel, which shall be treated with an epoxy, self etching filler primer undercoat and two finish coats of stove enamelled synthetic paint to an approved RAL colour.

Doors shall be fitted with lift off hinges and flush mounted by separated locks and sealed using neoprene gaskets to give a degree of dust and moisture protection to comply with IEC 144 - IP54. Individual sections of the panel shall be interlocked so that doors cannot be opened until the supply has been isolated.

B2.3 MAIN EARTHING CUBICLE

A main earthing cubicle shall be provided as an integral part of the main switchboard.

The cubicle shall be complete with a suitably sized copper busbar or terminal bar to accommodate the connection of the Supply Authority's earthing conductor and the main equipotential bonding conductors as installed by the Electrical Contractor.

B2.4 C.T. CUBICLE, METERING CUBICLE AND END BOX CUBICLE

A metering cubicle for the landlords supply and each of the apartments, current transformer cubicle and end box cubicle shall be provided as an integral part of the main switchboard. The size and layout of the cubicles shall be approved by the N.I.E.S. prior to manufacture but for tendering purposes the size of the cubicles shall be assumed to be 1.0 m. x 1.0 m. x 0.3 m. deep.

B2.5 HOUSING SERVICE DIST BOARD (APARTMENTS)

This HRC TP&N Dist. board shall form part of the main switchgear. It shall be complete with gland plate suitably modified to take split-concentric cables.

B2.6 INSTRUMENT CUBICLE

An instrument cubicle shall be provided as an integral part of each of the main switchboards.

3 No. Ammeters and 1 No. Voltmeter shall be mounted on the front of the cubicle with a rotary phase selection switch.

The ammeters and voltmeter shall be of the square type 100 mm x 100 mm in size of an approved manufacture. The Ammeters shall have a high and low scale 0-100/0-200 and rotary scale selection switch and shall comply with BS 89 - 1977.

B2.7 BUSBARS

All busbars and busbar connections shall be of the sizes shown on the drawings, be of hard drawn, square edged, high conductivity solid bare, copper complying with BS1432. All busbar and associated connections shall be firmly secured and supported on self extinguishing poly-ester or fibre type mountings. Cupinole Busbars will not be accepted.

B2.8 MANUFACTURE

The main switchboards shall be manufactured by Sperrin Switchgear Ltd, Unit 1, 20 Cahore Road, Draperstown, Magherafelt, BT45 or equal and approved (approved prior to tender submission).

B2.9 DRAWINGS FOR APPROVAL

The Electrical Contractor shall forward detailed drawings showing wiring details and switch-board layouts to the Engineer prior to manufacture.

Approval of such drawings shall not however, exonerate the Electrical Contractor for any mal-function or deficiency in meeting the specification requirements in the switchboards which may become apparent only after it has been brought to site and energised.

B2.10 DISTRIBUTION BOARDS

The Electrical Contractor shall supply distribution boards as detailed on the relevant drawing.

The distribution boards shall be as manufactured by Square 'D' or equal.

Each distribution board shall be supplied complete with the correct numbers and ratings of HRC Fuseways Type 2 M.C.B.'s as detailed in the electrical design schedules in Section D of this specification. Specialist house service distribution board shall be as manufactured by Sperrin Switchgear.

B2.11 CONSUMER UNITS FOR EACH APARTMENT

The Contractor shall supply consumer units as detailed on the relevant drawing.

The consumer units shall be as manufactured by Hager, Square 'D' or equal and approved.

Each consumer unit shall be supplied complete with the correct numbers and ratings of HRC Fuseways, R.C.B.O.'s as detailed on the drawings. All consumer units shall be fitted at a height accessible to residents i.e. maximum height 1000 mm above f.f.l.

B2.12 SWITCHGEAR LAYOUT FOR EACH APARTMENT

The Electrical Contractor shall be responsible for supplying and installing the relevant con-sumer unit, tails, isco's, HRC cut-out complete with 80A HRC fuse for each dwelling.

B2.13 APPLICATION FOR METERS FOR EACH APARTMENT

The Contractor must apply for meters in their own name, and arrange for a meter reading by the NIE at handover. Triangle will arrange for incoming tenants to take over the supply when they move in.

B2.14 DRAWINGS

The Electrical Contractor shall refer to the drawings for details of an arrangement of electrical switchgear.

SUB-SECTION B3 - CONDUIT AND TRUNKING

B3.1 GENERAL REQUIREMENTS

The Contractor shall note that the clauses detailed in this sub-section of the specification shall be read in conjunction with sub-section C3 of the general electrical services specification.

The Electrical Contractor shall note that the clauses detailed in this sub-section of the specification shall be read in conjunction with sub-section C3 of the general electrical services specification.

All (single PVC insulated) cables shall be protected by galvanised steel trunking and a heavy gauge high impact plastic conduit system concealed within the fabric of the building (Refer to Standard Detail sheets).

All conduit and trunking installed generally concealed within the fabric of the building with routes to be agreed on site with the Engineer prior to installation.

All submains cables running from the main switchboard shall be installed in a trunking system not indicated on the drawings.

The following systems have individual 50 mm x 50 mm galvanised trunking runs up through the service ducts with plastic conduit runs to the points of utilization as indicated on the relevant drawings:-

(1))British Telecom Telephone System

(2) Virginmedia System

(2)Vidio,Audio Door Entry System

(3)T.V. Distribution System

In apartments, where feasible, cables shall drop down from accessible roof voids, or be run in ceiling voids. All cable drops must be vertical. All wiring in plastered walls must be in rewirable heavy gauge PVC conduit run continuously to the box/outlet. Cable runs in solid floors must be avoided, where unavoidable cables in solid floors must run in galvanised steel conduits.

SUB-SECTION B4 - CABLES AND INSTALLATION METHODS

B4.1 GENERAL

The Electrical Contractor shall note that the clauses detailed in this Sub-Section of the specification shall be read in conjunction with Sub-Section C4 of the General Electrical Services specification.

B4.2 Wiring throughout the installation shall be carried out utilising the following types for the systems listed:-

1. LSF cable in continuous heavy gauge high impact PVC conduit systems for lighting, power heating circuits and emergency lighting.

2. Steel Wire armored for distribution cables.

3. LSF cable in continuous heavy gauge high impact PVC conduit systems for connection to water heaters.

4. Specialist cable as required by specialist contractor supplying T.V. Distribution System and door entry system.

5. FP200 Gold cable for fire alarm and disabled refuge call systems.

6. All external fixings, screws, etc., for luminaries, etc., shall be stainless steel grade 316L.

7. As Indicated elsewhere.

B4.3 Wiring throughout the site lighting installation shall be carried out utilising the following types:-

1. PVC insulated/PVC sheathed cable.

2. Steel Wire armored

3. XLPE insulated/high impact resistant PVC sheathed cable.

4. As Indicated elsewhere.

SUB-SECTION B5 - EARTHING ARRANGEMENT AND PROTECTIVE CONDUCTORS

B5.1 GENERAL

The Electrical Contractor shall note that the clauses detailed in this Sub-Section of the specification shall be read in conjunction with Sub-Section C5 of the general electrical services specification.

B5.2 MAIN EARTH TERMINAL WITHIN EACH APARTMENT

A main earth terminal or busbar duly designated shall be provided at the switchgear position to facilitate the connection of the circuit protective conductors and the mains equipotential bonding conductors. The main earth terminal shall be fitted in a separate isco which shall form an integral part of the switchgear.

B5.3 MAIN PROTECTIVE BONDING CONDUCTORS

The Electrical Contractor shall supply and install a 16 mm^2 PVC main equipotential bonding conductor from the main earthing terminal within each apartment or busbar to the following points of termination as shown on the drawings and as listed below:-

(1) Water Main (within each apartment).

(2) Gas Main (within each apartment).

(3) Heating Pipework (within each apartment).

(4) Main Structural Steelwork

The main equipotential bonding conductors shall be protected throughout in 20 mm galvanised conduit and shall be fitted with **crimped lugs** at each end for connection to the pipe clamp or metalwork.

Main protective bonding conductors to any gas or water service shall be made as near as practicable to the point of entry of those services into the premises.

SUB-SECTION B6 - LIGHTING INSTALLATION

B6.1 GENERAL

The Contractor shall note that the clauses detailed in this sub-section of the specification shall be read in conjunction with sub-section C6 of the general electrical services specification.

B6.2 LIGHTING SWITCHES WITHIN EACH DWELLING

Local lighting switches throughout the installation shall have inside insulated momentary spring return operated dollies, finished white, switch plates finished white and be click or equal and approved 20 year warrenty

B6.3 LUMINAIRES

The luminaires shall be of the type shown on the Schedule of Luminaires as indicated on the lighting drawings and where no type is shown, plain pendants consisting of ceiling roses flexible cord and lampholders as specified herein shall be erected and connected.

All luminaires indicated on contract drawings as ‘EM’ shall be deemed to be complete with an integral inverter and battery pack to provide a 3 hour emergency lighting function. All emergency luminaires shall be modified by Menvier.

B6.4 EXTERNAL LIGHTING

The site lighting shall be controlled by a number of Sangamo 7 day timeclocks and Thorn QPK photo electric cells mounted as shown on the drawings. Switches shall be provided adjacent the landlords distribution board for the external lighting. Suitably rated contactors shall be provided on the supply to the external lighting circuits for this purpose.

B6.5 PHOTOCELL FOR CONTROL OF EXTERNAL LIGHTING

The contractor shall supply and install a photocell sensor for control of external luminaries, indicated as reference B and C on drawing No. 3369-E8.

Photocell to be two part thermal photocell complete with override switch facility and wall mounting bracket. Photocell to be as manufactured by Zodion Ltd., Ref. FKL3061, or equal and approved.

B6.6 SITE LIGHTING LUMINAIRES

The luminaries shall be of the type shown on Drawing No. 3907-E13 or equal and approved.

B6.7 PHOTOCELL FOR CONTROL OF SITE LIGHTING LUMINAIRES

The photocell shall be as Hy-Lite HL10 and be manufactured to BS5972:1980 and be guaranteed for a period of five years from date of purchase. The 'switch-on' level shall be 70lux (±10%) which must be maintained throughout the life of the cell. The ratio of measured `switch-on' level to the measured `switch-off' level shall be 1:0.5.

Control cable to central cubicle to be 4 core Hi Tuf with fault, overcurrent protection and isolation provided in the control cubicle and a separate photocell neutral supply.

B6.8 STREET LIGHTING UNITS

At the base of each column or bollard a street lighting service unit shall be supplied and installed. The street lighting service units shall be suitable for outdoor use and meet the standard of ESI 12-19 and be provided with red safety shields over the incoming alive supply and be complete with an HRC fuse link.

1 No. suitably treated timber baseboard shall be installed in each column.

Cabling to service units shall be with swa cable with conductors sized 10 mm^2.

The street lighting service units shall be similar to Lucy Lighting, Ref. MC040DN, or equal and approved.

B6.9 PAINTING OF LIGHTING COLUMNS

The Contractor shall include for the painting of all lighting columns.

All columns shall be given one coat of primer, two coats of an oil based undercoat and one coat of gloss paint, the colour of which shall be agreed with the Architect.

B6.10 ERECTION OF SITE LIGHTING COLUMNS

The Main Contractor shall be responsible for the excavation of all trenches, including pipe ducts under roadways, etc., and holes in lighting attendance. The Contractor shall be responsible for handling, setting in position, and supporting columns during the concrete setting period.

B6.11 SPARE LAMPS

The Contractor shall supply 8 No. lamps of each different type used in this contract for spares and shall submit a receipt for the spare lamps to the Engineer prior to issue of the Final Account.

SUB-SECTION B7 - GENERAL POWER INSTALLATION

B7.1 GENERAL

The Contractor shall note that the clauses detailed in this sub-section of the specification shall be read in conjunction with sub-section C7 of the general electrical services specification.

B7.2 ELECTRICAL ACCESSORIES

Electrical accessories throughout this installation i.e. switched socket outlets etc. shall be finished white and be manufactured by click or equal and approved and as described on the drawings.

Switches, isolators, switched fused connections units, etc., for control of cooker, fridge, washing machine, immersion heater, cooker hood, heat recovery unit, focal point fire, timeclock, dishwasher/tumble dryer, etc., and where indicated on drawings are to be suitably engraved for appropriate function.

B7.3 COOKER CONTROLS

Cooker control units of 45 amperes capacity shall be supplied and installed by the Electrical Contractor in each apartment. They shall be suitable for flush mounting in a pressed steel box made for the purpose.

Each unit shall be complete with 45 amp. D.P. isolating switch, engraved "Cooker" in red and indicating pilot lamp. It shall comply with BS. 3676 and supplements thereof and be by Crabtree Ltd.

The unit shall be mounted as agreed onsite.

B7.4 COOKER OUTLETS

In each apartment from the pressed steel box a 25 mm conduit shall be run to a conduit outlet box to the side and below at 600 mm above finished floor level. This outlet shall consist of a flush mounted steel zinc plated conduit box and fitted with a cable outlet unit of 45 amp. rating with cable grip and screw terminals.

The interconnecting cable between the cooker switch and the outlet unit shall be 6 mm sq PVC/PVC with 2.5 mm sq earth continuity conductor.

B7.5 POINT ONLY FOR FOCAL POINT FIRES

The electrical contractor shall supply and install in the living room of each apartment a radial circuit feeding a 20 amp D.P. indicating switch mounted at 600 mm above F.F.L This shall in turn supply a flex outlet plate mounted at 450 mm above F.F.L.

The circuit shall be a 2.5 mm^2 radial circuit.

B7.6 FINAL CONNECTIONS TO EQUIPMENT

The Contractor shall include for the connection of all items of equipment shown on the contract drawings. e.g. washing machine, dishwashers, cookers etc.

B7.7 The Electrical Contractor shall supply and install all necessary equipment and controls for the heating installation as shown on the drawings and specified hereinafter. All heaters shall be of the types and capacities as shown on the drawings and specified in the Schedules of Heaters following this Section.

B7.8 WATER HEATERS

The Electrical Contractor shall supply and install all electric water heaters in common areas as shown on the drawings.

Final connection to water heaters shall be by means of D.P. indicator switches as shown on the drawings and using cable as per the manufactures requirements.

Note:- All general water heaters shall be mounted by the Electrical Contractor and left ready for plumbing connections to be carried out by the Mechanical Contractor.

B7.9 CALL SYSTEMS IN DISABLED TOILETS

(i)General

The Contractor shall supply and install in the toilets as indicated on the Contract drawing a 'help required' call system together with all associated electrical works and connections as necessary.

(ii)Equipment

Each system shall comprise the following components:-

1) Momentary action pull switch c/w reassurance lamp located in each toilet.

2) Reset button located just inside the doorway of each disabled toilet.

3) Semi-recessed luminaire c/w 11 Watt PL lamp and 'HELP' legend located above the door into each toilet.

Generally the equipment shall be as the 'Emergilite' Helplight product (Cat. No. SR11) with the following modification:-

B7.10 DADO TRUNKING

The Contractor shall allow for the supply and installation, where indicated on the drawings, of a dado trunking system consisting of 3 No. independent compartments.

The trunking system shall be constructed from white PVC dado trunking and shall be complete.

The trunking shall be complete with all necessary angle, joint covers, end stop, cable retainers, and outlet boxes.

The dado trunking shall be mounted 1050 mm above f.f.l unless otherwise indicated, and shall be secured at 300 mm intervals using brass screws and raw plugs.

The dado trunking shall be as manufactured by Rehau from their Profila Set. B size 170 mm x 50 mm or equal and approved.

B7.11 HAND DRYERS

The Contractor shall supply and install in the positions shown on the drawings electric hand dryers mounted 1.2 metres above finished floor level. The hand dryers shall be as manufactured by the Warner Howard Group Ltd from their World range List No. A48 or equal and approved.

The dryer must be securely **rawlbolted** to the wall.

The hand dryers shall be energised on a straight circuit from the relevant distribution board terminating in an unswitched fused connection unit mounted 2000 mm above finished floor level. A 20 mm conduit shall drop from the switch to a conduit box mounted behind the unit.

SUB-SECTION B8 - ASSISTED LIVING HOME AUTOMATION SYSTEM AND IP DOOR ENTRY

B8.1 GENERAL

The Electrical Contractor shall allow in his tender for a specialist firm to supply, install and commission a complete door entry system comprising of 1no. flush mounted 13 button audio/video Atlas IP entrance panel which will call through to 1no. flush mounted IP manager monitor and apartment gateway within each apartment. The IP manager monitor will manage the following features within each property, lighting, climate control, flood systems, automated curtain/blinds and colour video door entry and as indicated on the drawings

The Electrical Contractor shall be ultimately responsible for the organising of this Contract with regard to attendance on site, meeting programme, etc., and shall also be responsible for providing a complete trunking/conduit system, outlet boxes etc to facilitate wiring to each flat.

B8.2 ACTION OF THE SYSTEM

The video door entry system will comprise of 1no. 13 button flush mounted Atlas IP entrance panel which will be Black in colour utilising a dedicated Door Entry IP Network. The entrance panel when activated will send a call to an Internal flush mounted white IP manager monitor and a Tablet/Smartphone through an Apartment gateway on each apartments Local Wi-Fi network, utilising the intercall IP App. Upon receiving a call from the entrance panel the IP manager monitor and/or Tablet/Smartphone will activate and emit a ring tone/audible notification and display a colour image of the visitor.
The resident can answer the call by touching the handset symbol on the monitor or On-screen display of Tablet/Smartphone, this will then initiate two way audio/visual communication with the visitor and if the resident wishes to allow entry for the visitor they can touch the key symbol to initiate the lock release facility.
In addition to the IP manager monitors being able to communicate with visitors at the entrance panel they also have the facility to have intercom between the internal stations, therefore allowing audio communication via the monitors in the building.

The home automation system will be controlled via 3 types of internal units, IP Manager, Remote Controller and a Tablet/PC/Smartphone via a web browser.
System Features:

Lighting controls
The lighting control system allows the resident to either manually control the lighting scenario of the property by means of manual switches, IP manager, Tablet/PC/Smartphone and also by automatic scenario's. The lighting control can be set to offer entry and exit scenarios which means that by pressing the exit/entry symbol or by presenting a fob to the IP manager the lights can set to the pre-programmed levels (i.e. on entry all lights in the lounge and kitchen would come in along with the master bedroom or on exit all lights could go off).
Currently based on a standard property of this size we have allowed for 7no.Lights to be controlled. This of course can be adjusted accordingly to suit the property but we will require further clarification on the final quantities.

Climate Control
The automation system allows you to control the heating/cooling per room or per apartment, for this development we have designed the system to offer 4 Zone Heating control per apartment.
The climate control system can also be accessed remotely from a PC/Tablet/Smartphone to allow the resident to control the relevant areas ready for their arrival.
We have allowed for a keystone – RG45 thermostat device as this is an aesthetically pleasing discrete unit.
The automation system will also facilitate a time clock to control heating times.

Flood Control
The flood control system will activate if the device detects water, dependant on the positioning of the detector to be confirmed by the installer, which will automatically cut off the supply of water to the bathroom to prevent flooding.
Currently within our design we have allowed for 2no.relay which will cover the apartments' bathroom.

Warden call control
The assisted living automation system can activate a telecare call via the tablet/remote controller

Curtain/Blind/Window Control
The assisted living automation can automatically close and open curtains or blinds from a preset memory facility to offer the resident an automatic comfort setting. This feature also provides an added illusion of security when the residents are away from the property.
The device can also be accessed remotely to allow the resident via their Smartphone the desired curtain/blinds setting can be activated.

TV control
The home automation remote controller/Tablet will enable the user to control their TV. Changing channels and selecting volume.

The Assisted Living Automation system shall be supplied, installed and commission by:

Atlas Fire and Security (NI)Ltd
Portview House
80 Dargan Road
Belfast
BT3 9JU
Tel:02890 784533
Mob:07918 721159
graeme.white@atlasfs.co.uk

or equal and approved

SUB-SECTION B9 – DOOR ACCESS

B9.1 GENERAL

The electrical Sub-contractor shall allow in his tender for the installation of the Door Access Systems, this will be installed at all points marked on drawings and as indicated on the standard schematic diagrams. This will be a site wide access system, programmable from the local office PC and remotely if required.

Each system and every specified entrance will be supported by a proximity access control system. The system will be installed in accordance with manufactures guidelines. The readers shall be located specified on the standard drawing. The entrance panels and shall be vandal resistant.

Please note the IP video/audio door access control system will be interfaced with the home automation system.

B9.2 MAIN CONTROL UNIT

The main control panel will be installed as per drawing at each door and will have the following features:-

Mother Board with built in circuitry to support 2 readers and slot for one plug-in module
Size: 280 x 260 x 140mm
Up to four access points per controller:
Four simple readers (using 4322 or 4422 module) or
Two simple readers and two readers with PINpads (using 4322 or 4422 with an optional 4922 data adaptor)
Access parameters configurable from software
Built-in dial-up communications functionality for use with Modems (not available in 4010-CDP/SPD)
2500 cardholders per controller. Expansion to 13000 cardholders using 4105 Memory Expansion Module
Configurable Logical Input/Output Control (CLIC) with a 4253 I/O module
Transaction Buffer:
Maximum 8000 Events
Maximum 1600 Events
RS485 / RS232 Port
Connectors for supply to locks etc.
Tamper Switch
Comprehensive Status Indicators
Integral Power Supply
Controller and Modules meet the requirements of European EMC directive 89/336/EEC as amended by 93/68/EEC, Certificate number 10506 Iss2
EEC/PTT type approval to ETS 300 – 330, Certificate number 12226.

B9.3 READER HEAD

The reader head will be of the proximity type and will have a reading range of up to 30cm.

LONG RANGE READER HEAD

The reader head will be of the active type and will have a reading range of up to 1.5m.

The reader will operate when the long range reader is located on the external side of the door and will not operate from within the apartment. Hence not accidental operation of door internally.

B9.4 LOCKING DEVICES

Locks shall be supplied by others

B9.5 EXIT DEVICES

Exit devices (if required) will be marked push to exit and will be accompanied with an emergency break glass coloured green, or as detailed on the drawings

B9.6 ELECTRICAL SERVICES

The Electrical Sub-Contractor shall provide a conduit installation for the complete system.

A suitable 13A unswitched fused connection unit shall be provided by the Electrical Contractor as detailed on the standard detailed drawing

B9.7 LONG RANGE FOBS/HANDS FREE TOKENS

The Contractor shall allow for the provision of 30No. long range fobs/hands free tokens and an additional 30No. as spares to be handed to Triangle

B9.8 LONG RANGE FOBS/HANDS FREE TOKENS

The Contractor shall allow for the provision of a Personal notebook computer to program the door access system. Toshiba satellite or equal and approved.

B9.9 INSTALLATION

Each Door Entry System shall be wired in a galvanised trunking/ PVC Conduit System through the service void to each individual position marked on the drawings.

B9.10 COMMISSIONING

The specialist supplier/installer shall supply, install and commission this system in accordance with this design specification. Upon satisfactory completion and testing of this system, the Specialist Sub-Contractor will provide a handover and Commissioning Certificate.

The Specialist Sub-Contractor will provide a complete set of Commissioning Data in compliance with the design specification.

The Specialist Supplier shall arrange to demonstrate the equipment to staff at an agreed time.

The Specialist will provide 12 months maintenance of this system after handover.

The access control systems shall be supplied, installed and commission by:

Atlas Fire and Security (NI)Ltd
Portview House
80 Dargan Road
Belfast
BT3 9JU
Tel:02890 784533
Mob:07918 721159
graeme.white@atlasfs.co.uk

or equal and approved

SUB-SECTION B10 – WARDEN CALL SYSTEM

B10.1 GENERAL

This specification details the design, installation and operational performance of a communication system specifically designed for installation in accommodation occupied by elderly or infirm residents. The system provides emergency alarm signalling facilities, Telecare sensor monitoring and enhanced access control.

The system shall be designed to ensure simple and fail safe operation from both the manger and the resident's point of view. The system shall also be designed for ease of installation and service.

The alarm signalling and communication features shall be capable of operating in one of three modes;

1. ONSITE MODE. The scheme manager is active on-site and operates the system using a cordless portable master unit that does not require electrical connection to the site wiring.

2. LOCAL OFFSITE MODE. The scheme manager is remote from the site and operates the system using either a standard telephone or a mobile cellular telephone. The physical connection is established using a standard PSTN telephone line connected to the central control equipment.

3. REMOTE OFFSITE MODE. No local Scheme manager is available and all alarms are reported using a PSTN link to a centralised and permanently manned facility (Alarm Receiving Centre ARC)

The access control features can be controlled directly by the residents or as described above by a supervising scheme manager.

A standard system will consist of five main elements:

1. The central control unit
2. The resident's intercom unit
3. The scheme manager's mobile master unit
4. The vandal resistant door access panel
5. The residents access control telephone.

If a telephone link to a remote Central Station Receiver is specified the system shall be fully approved for PSTN connection and shall comply fully with the requirements of BS 7369 for communication data protocol. The system shall be compatible with existing central station equipment manufactured by other leading companies.

The equipment shall be approved to meet European Standard EN55022 for Electromagnetic Compatibility and the Low Voltage Directive (LVD) and shall be certified and marked with the CE mark. A copy of the Technical Construction File (TCF) relating to the standards shall be available for inspection at any time.

The system shall comply with the requirements of BS EN 50134.

Experience has shown that full duplex speech is a minimum requirement for access control equipment used by the elderly and infirm. The system shall employ full duplex speech from the resident's telephone to the active access control door panel. No button operation shall be required to either establish or maintain a speech link from the resident's access control telephone to the access control door panel.

The system shall have a Smart Technology option to perform electronic assistive technology functions. The system shall be capable of logging life-style activity monitoring in real time, storing the data and making it available to service providers.

In addition to the PSTN communication links described above the system shall have an Ethernet port to allow high-speed communication over ADSL broadband networks. The system will use standard browser interface software. The Ethernet communication port shall be used to access system operating data and assistive technology data.

The manufacturer shall undertake to supply training and spare parts to any nominated company of an appropriate technical and commercial standing.

B10.2 INSTALLATION

The system shall be installed in accordance with the 16th Edition IEEE Regulations, British Standards and Codes of Practice as applicable.

The installation company will normally be a member of The National Inspection Council of Electrical Installation Contractors (N.I.C.E.I.C).

Full 'as fitted' drawings detailing all cable routes, cable sizes, joint box locations and cable colour codes will be supplied prior to final commissioning.

B10.3 POWER SUPPLY

The power supply shall be an integral part of the central control unit.

The system shall operate from a 240 Volt 50 Hz mains supply but shall be capable of normal operation within +/- 10% of nominal.

The supply voltage to the system wiring shall not exceed 24 Volts DC.

The system shall be suitable for use on distribution networks protected by Residual Current Devices (Earth Leakage Current Breakers).

The system shall have an integral mains fail battery back-up facility which will run the system under normal load for up to eight hours. Certain installations may require a battery back-up period in excess of eight hours; the system shall be capable of meeting this specification by the addition of an external battery pack.

B10.4 CENTRAL CONTROL UNIT

The central control unit shall be a single control unit housed in a metal enclosure and shall be wall mounted by pre-drilled fixing centres. The enclosure shall have adequate pre-drilled cable entries protected by grommets.

The central control unit shall be available mounted in an IP65 grade lockable cabinet for installations where no suitable internal location is available.

The central control unit shall provide the following facilities;

a) Extra low voltage power supply for the whole system, including standby battery. The power supply circuit shall include a low battery dropout feature to prevent permanent damage to the battery in the event of a prolonged mains failure.

A MAINS FAILURE warning shall be signalled within 5 minutes of a mains supply failure occurring.
A MAINS RESTORED warning shall be signalled when the mains supply is restored.
A LOW BATTERY warning shall be signalled prior to the battery dropout feature activating.
LED indicators shall clearly show that all power supply voltages are healthy.

b) Provision for connection of up to 256 dwellings each of which can have both warden call and access control facilities.

c) Monitoring of individual intercom units for fault conditions. Faults shall be signalled with the relevant intercom identity. Normal system operation shall continue in the event of an intercom

fault or the removal of one or more intercoms from the system. It shall be possible to inspect the system memory and display all faults that exist. It shall be possible to mask faulty or removed intercom units to prevent continual fault signalling.

d) Audio amplifiers shall feature Digital Speech Technology (DSP) and have Automatic Gain Control (AGC) to ensure high quality speech and adequate sensitivity for the detection of speech through one closed door. It shall be possible to set the default volume level of individual intercom units to suit the user's needs.

e) An RS232 output shall be available for connection to a local printer or computer.

f) Memory for the programming of digital intercom identities of up to three digits. Each digital identity shall be supplemented with a message indicating the location. Standard channel messages shall include FLAT, OFFICE, WARDEN, FRONT DOOR, CORRIDOR, COMMON ROOM, GUEST ROOM, BUNGALOW, TOILET, LIFT and SHOWER ROOM. There shall be provision for up to 80 other standard messages that can be allocated to specific channel identity numbers. There shall also be provision for the inclusion of site-specific customised messages.

Programming of all intercom data and system configuration options, including central station telephone numbers and site identification, shall be stored in NVRAM and shall be programmable on-site. without the need for special electronic equipment.

g) Call detection shall differentiate between an alarm call from the intercom unit and that from any other auxiliary trigger devices that may be connected to a particular intercom. The different types of calls shall be clearly signalled to the mobile master unit.

h) Alarm detection of one or more of the following auxiliary alarm devices: CEILING MOUNTED PULLCORD, SMOKE/HEAT DETECTOR, LOW TEMPERATURE DETECTOR, INDIVIDUAL RADIO TRIGGER, INTRUDER DETECTOR shall be possible. The channel from which the alarm was detected shall be signalled to the mobile master unit with a message clearly indicating the type of sensor.

i) Digital communicator to allow the system to communicate via the PSTN. The system shall be capable of signalling alarm calls in one of two modes;

1. If calls are signalled to a standard or mobile telephone a special key press sequence shall be required to confirm the authority of the recipient to answer the call. The identity of the calling channel shall be preceded by the site identity. Control of speech direction shall be automatic and controlled by the call recipient's voice.

2. If calls are signalled to a remote central monitoring station a digital preamble shall identify the site and dwelling. Control of speech direction shall be by control tone from the central station.

The system shall be certified for connection to the PSTN network. The system shall be capable of DTMF dialling.

It shall be possible for the remote scheme manager or central monitoring station to call a resident even if the system is in the ONSITE mode (provided there is no system activity). An automatic warning tone shall be generated before a speech link is established.

The digital communicator shall monitor the telephone line for faults. Any fault detected shall be signalled to the mobile master unit if the system is in the onsite mode. A line fault shall prevent the system being switched to Local or Remote Offsite mode of operation. A BT line fault indicator shall be provided. This will have a strobe light to provide an onsite indication of a BT line fault.

There shall be provision for the storage in memory of at least four telephone numbers.

j) The mode of operation shall be selectable either locally or remotely. Local selection, by the onsite scheme manager, shall be by either a key-switch or using the cordless master unit. Remote selection shall be by a PSTN connection using special DTMF command codes. The

local wall mounted keyswitch shall have LED indication to show the current operating mode of the system. Confirmation of the operating mode selected shall also be available using an enquiry code.

k) Provision shall be available for the connection of auxiliary alarm signalling devices. The outputs shall be programmable to indicate a variety of equipment conditions including BT line fault and alarm call not answered.

l) Programmable output signals shall be available for activation by both the local and remote scheme manager and by the remote central station. The outputs can be used to control external devices such as door locks, key safes, etc.

m) Where more than one scheme manager is on duty it shall be possible for scheme managers to contact each other using their mobile master units. Scheme managers shall also have direct access to external telephone lines to both make and receive normal telephone calls. It shall be possible for two scheme managers to talk to each other whilst a third is making an external call. If a scheme manager is making an external telephone call when an alarm occurs an audible signal shall inform the scheme manager.

n) When the system is operating in the ONSITE mode and an alarm call is not answered within a pre-set time the alarm call shall automatically be routed to either the LOCAL OFFSITE scheme manager or the central monitoring facility depending on the mode selected. The time delay shall be set to 5 minutes but shall be programmable to suit local conditions.

o) The system shall have an integral time clock. The time shall be set using the mobile or fixed master. A facility shall exist to check the current time and date. The time shall auto-adjust for BST/GMT twice per year. The time clock shall have it's own back-up battery.

p) It shall be possible to allocate up to 2000 individual radio alarm devices to the system by individual allocation to specific intercoms. This process shall be carried out using the standard master unit and not a special programming tool.

q) Where individual pendant alarm transmitters are required on a site it shall be possible to connect up to 16 network receivers directly into the central control unit to ensure adequate coverage over the whole site. Individual pendant receivers shall be uniquely coded and shall be continuously polled by the central control unit to ensure system integrity.

r) The system shall facilitate the use of the warden call system and the access control system at the same time i.e. dual speech paths shall be employed.

s) When the system has been switched to a remote scheme manager, local offsite or central control, the access control system shall continue to operate normally for residents.

t) Where an Emergency Services panel is fitted all calls shall be routed in line with the selected system operating mode.

u) The central control shall have an Ethernet port to allow direct connection to a standard broadband communication network. The port shall support standard browser software to allow a variety of system functions to be accessed and to allow system activity data to be accessed.

v) The central controller shall log all system and alarm activity and store the data in a non-volatile memory. It shall be possible to download the stored data using either a local PC or, by using the Ethernet port and an Internet connection, to a remote PC. Access to the data shall be password protect. The system memory shall be capable of storing a minimum of 12 months data assuming a fully loaded system with an average of 8 sensors per intercom. An alarm message shall be generated when the memory is 90 % full.

w) It shall be possible to program Telecare sensors as either alarm sensors or activity sensors. The system shall be capable of sending either emails or text messages to care providers in the event that programmed activity patterns have been recognised. It shall be possible to tag any alarm or activity event to any email address or telephone number stored in the system memory.

x) It shall be possible to program up to three basic activity monitoring time periods into the system such that if no activity is detected from a particular intercom within the time period an alarm will be generated. It shall be possible to individually program each intercom for activity monitoring within the time periods.

y) The system shall have a Test Mode to allow any individual intercom to be tested without placing a full alarm call on the system. It shall be possible to select Test Mode which ever mode of operation the main system is operating in i.e. ONSITE, LOCAL OFFSITE or OFSITE. This mode of testing will ensure that genuine alarm calls from other intercoms are answered efficiently. When in Test Mode a VISUAL and AUDIBLE signal will confirm the successful operation of any of the wired or radio trigger devices allocated to the intercom. Test calls from each trigger device will be printed and stored in the system memory. If an intercom is accidentally left in Test Mode it will automatically revert to Normal Operation within 5 minutes of the last test being activated.

B10.5 WARDEN CALL INTERCOM UNIT

Most installations will require a single intercom unit per flat but it shall be possible to fit a slave intercom where required. The master and slave intercom will have an integral pull cord.

Standard pull cords with LED assurance shall be provided in, bedrooms, kitchen and bathroom.

a) The intercom unit shall be of a modern injection moulded design. The unit shall be a neutral colour so as to blend with typical household decor.

b) The intercom unit shall be constructed in a manner that minimises the possibility of tampering by unauthorised persons i.e. There shall be no visible fixing or assembly screws.

c) The intercom unit shall have an integral alarm switch operated by an orange pull-cord fitted with two orange triangular grips. The cord shall be of sufficient length to reach floor level. One pull of the cord shall instigate an alarm call, No further action shall be required by the resident.

d) The intercom unit shall be fitted with a privacy switch. The privacy status shall be clearly visible from the front of the intercom unit. When privacy is selected the microphone function of the intercom shall be disabled but it shall still be possible to hear both the call tone and speech when the scheme manager calls the intercom. The action of pulling the intercom pullcord or the operation of any external auxiliary alarm device shall override the operation of the privacy switch and full two-way speech shall be possible.

After an alarm call has been signalled from an intercom the privacy switch shall remain overridden for a period of approximately 15 minutes to allow the scheme manager to recall the unit if necessary.

e) The intercom unit and associated auxiliary devices shall be connected to the system wiring by means of a high quality plug-on connector to simplify installation and maintenance.

f) The intercom unit case shall have knockouts to facilitate mounting onto a standard electrical back box. Knockouts shall also be provided for cable entry from surface mounted trunking.

g) The intercom unit shall have an optional audible reassurance feature to confirm alarm detection.

h) The intercom unit shall be capable of accepting a range of Telecare input devices such as inactivity monitors, low temperature monitors, etc.

i) The intercom unit shall have a high brightness red LED to confirm alarm detection. The intercom shall also control the LED's on remote pull-cords.

j) The intercom unit shall have the facility to store a recorded message form either the onsite scheme manager or from an offsite source. An LED shall indicate to the resident that a message has been left. The resident shall access the stored this by pressing the “Play Message” button on their intercom.

k) It shall be possible to remotely upgrade the software in each intercom, to offer additional facilities, without the need to directly access the intercom. Appropriate data checking shall be incorporated in the software upgrade process to ensure system integrity.

B10.6 ACCESS CONTROL TELEPHONE

Experience has shown that a normal two way telephone conversation with a calling visitor (rather than a push to speak intercom conversation) results in the highest level of confidence and security. The telephone may be sited in a different location to that of the intercom unit. It shall be possible to fit TWO telephone handsets if required. Where two telephones are fitted both handsets shall ring simultaneously. Either handset can be answered to commence communication to the front door.

a) The access control telephone shall be of an attractive, modern design.

b) The access control telephone shall feature a telephone cradle switch/hook design that is positive and easy for the elderly and infirm to use.

c) The access control telephone shall have a pleasant easily recognisable ringing tone when called. The tone shall be clearly different to that used by the warden call system.

d) The access control telephone shall have a single push button to control both Privacy and Lock Release and a single tri-colour status LED.

e) The access control telephone shall have a PRIVACY facility that prevents the telephone from ringing when activated. When privacy is selected the status LED shall illuminate RED.

f) The access control telephone shall have a door open switch that requires only a single press to energise the door lock for a pre-set time. The status LED shall illuminate GREEN when the door is open.

B10.7 MOBILE MASTER UNIT

The scheme manager's mobile master unit shall comply with the latest DECT standards for local area mobile communication. The operating frequency shall be in the 1.8GHz range. The maximum output power shall be 10mW. No operating license shall be required.

a) The mobile master unit shall be small, lightweight and of a robust design.

b) The mobile master unit shall not require an electrical connection to the system wiring.

c) The mobile master unit shall have a clear LCD display.

d) The mobile master unit keyboard layout shall be simple to minimise operator error. Keyboard legends shall not degrade with continual use.

e) The mobile master unit shall warn of an alarm call by ringing. The ring tone shall be user selectable.

f) An alarm call shall be answered by pressing a single key. The mobile master unit shall automatically signal the IDENTITY and NATURE of all incoming alarm calls using a clear synthesised voice message.

g) Operation of a single key shall establish a speech link to the calling intercom unit. Speech direction shall be automatically controlled using voice switching techniques with the scheme manager having overriding control. If a second call occurs after a speech link has been established a warning tone will be superimposed on the speech signal.

h) The mobile master unit shall have an alarm call memory facility to check the identity of the last three alarm calls received.

i) The scheme manager shall be able to contact any intercom using the mobile master unit keyboard. A calling tone shall be automatically generated prior to the speech being enabled.

j) It shall not be possible to cancel an alarm call without first accepting the call by establishing a speech link.

k) It shall not be possible to 'lockout' the central control unit by accidental miss-operation of the mobile master unit.

l) The central control unit shall be capable of signalling more than one mobile master unit. When the first mobile master unit accepts the alarm call other mobile master units will reset. Where more than one mobile master unit operates on a site it shall be possible to individually program each one for alarm signalling priority.

m) The mobile master unit shall have a simple to operate volume control.

n) The mobile master unit shall have a noise cancelling microphone.

o) The mobile master unit shall have a SPECIAL FUNCTION key to simplify daily sequential calls.

p) The mobile master unit shall have a last number re-dial function.

q) The mobile master unit shall have a security lock PIN facility.

r) The mobile master unit shall have a rechargeable battery pack. The mobile master unit will charge when at rest in a base station or charger. Battery life will typically be up to 60 hours.

s) The mobile master unit shall indicate LOW BATTERY when the batteries require recharging.

t) The mobile master unit shall be able to instigate the ALL CALL PUBLIC ADDRESS facility.

u) The mobile master unit shall be able to instigate the ALL CALL FIRE ALARM TONE facility.

v) The mobile master unit shall be able to select ONSITE, LOCAL OFFSITE or REMOTE CENTRAL STATION OFFSITE operating mode using command codes. An enquiry code shall be available to check the current status.

w) The mobile master unit shall be able to operate remote control functions such as door lock release, keysafe, intercom output, etc.

x) The mobile master unit shall clearly show that a link to a base station has been established before a call to an intercom unit has been made.

y) The mobile master unit shall have the facility to display the origin of the call (CLI). i.e. Resident name or communal area.

B10.8 FIXED MASTER UNITS/TELEPHONE PBX

a) The central control unit shall be capable of signalling alarm calls to one or more fixed standard telephones. Operation of the telephones shall be identical to that of the mobile master unit. Fixed telephones will typically be installed in the scheme manager's office. It shall be possible to connect up to three fixed master units for simultaneous operation with the mobile master unit. The PBX shall have a UPS to support the system in the event of a mains fail.

b) The fixed master units shall be capable of making and receiving calls from any other fixed master unit and the mobile master units.

c) It shall be possible to fit fixed master unit sockets at any location to allow fixed master units to be moved at will.

d) The fixed master units shall be capable of making and receiving calls from the PSTN network.

e) The main office telephone line shall be integrated with the warden call system via a Telephone PBX.

B10.9 DOOR ACCESS PANEL

a) The door access panel shall be vandal resistant, manufactured from 12 SWG stainless steel and be fixed using tamper proof screws into a purpose designed flush mounting backbox. The buttons and display shall comply with the essential requirements of DDA legislation.

b) It shall be possible to incorporate a minimum of 16 door access panels to a system.

c) The door access panel shall have large, minimum 20mm diameter, buttons individually engraved with characters of 8mm minimum height.

d) The door access panel shall have an intelligent 2 line LCD display with characters no smaller than 8mm high. The panel shall be fitted with a polycarbonate plastic lens to protect the LCD display.

e) The door access panel operating instructions shall be interactive on the 2 line LCD display.

f) The door access panel display shall show system status and errors in plain English text. To assist the hard of hearing the display shall show when the resident's telephone is RINGING, when it has been ANSWERED (so that speech can begin) and when the door lock has been released. If a resident has selected privacy the display shall show telephone as NOT AVAILABLE.

g) The volume of speech at the door access panel shall be adjustable to suit local environmental conditions

h) A CCTV camera shall be fitted adjacent to the door access panel. The picture from the camera shall be capable of transmission via the communal aerial system for selection on a spare channel of the resident's television.

i) An integral PAC reader shall be fitted into the door access panel. Where no access panel is required, a stand-alone reader shall be allowed for. The stand-alone reader shall be stainless steel where fitted externally and mullion black internally.

j) The door open time, maximum call duration time and telephone ring time shall all be programmable to suit local site conditions.

k) A programmable access code shall be available to allow residents or staff direct access.

l) A programmable tradesman's timer shall be available to automatically open doors at predetermined times.

m) It shall be possible to set a timed mode of operation such during the preset time all calls from door panels are routed to the scheme manager. It shall be possible to selectively disable the timed mode of operation for one or more flats. All time mode selection shall be carried out using the standard master unit and not require special programming tools.

B10.10 RADIO DEVICE RECEIVERS

Radio device receivers shall be installed strategically around the complex to provide full radio coverage for radio devices such as personal pendants, flood detectors etc.

Radio devices shall be easily assigned onsite by the Scheme Manager.

B10.11 ALL CALL PA & FIRE TONE FACILITY

The system shall have a public address speech facility to all intercom units. The facility shall be operated from the mobile master unit by keying a special code. The public address amplifier shall be an integral part of the central control unit.

A fire alarm tone generator, to supplement the main building fire alarm system, shall be available. The alarm tone shall be an intermittent pulsating tone which can be activated either manually by keying a special code on the mobile master unit or automatically by connection to the auxiliary output contacts on the main building fire alarm panel.

Where bungalows are provided in addition to the main complex, there shall be no fire alarm tone generated in these properties if a fire alarm is activated in the main complex.

NOTE.

There shall be stand alone mains operated smoke detectors fitted in all bungalows. These will be linked to the warden call system.

B10.12 CALL/ACTIVITY PRINTER OR PC LOGGER

An activity printer shall be installed on the scheme. The printer shall identify and differentiate between incoming alarm calls and outgoing calls from the mobile master unit and remote central control. Each event shall be logged with the time and date. The option to integrate the call history log onto the office PC using the Advent logger utility program shall be possible.

B10.13 PAC EQUIPMENT

A PAC proximity access token reader shall be fitted in the door access panels. PAC controllers shall be installed with the facility to add and delete tokens via a PC. Easikey manager shall be installed onto the office PC with an administration kit for token allocation. The PAC equipment shall make use of two of the PBX extensions; this will allow communication between the scheme managers PC and the PAC controller.

Allow for THREE PAC tokens per flat and five spares per scheme.

B10.14 AUXILIARY INPUT MONITORING

It shall be possible to monitor building functions such as lift failure, boiler failure, emergency light failure etc. using an auxiliary input unit. In the event of a fault occurring a call shall be initiated onto the Warden Call System. These alarms shall be coded in an agreed manner to allow clear communication of faults to the local scheme manager or remote control centre.

All emergency exits shall have an intercom with isolating key-switch fitted. Any unauthorised use of these doors shall initiate a call on the Warden Call System. When the key-switch is in the disable position, it shall be possible to use these doors without initiating an alarm call.

B10.15 EMERGENCY SERVICES ACCESS PANEL AND KEYSAFE

This facility shall allow the remote opening of one or more entrance doors independent of each other. The door lock will release on receiving a signal from either the scheme manager or remote call centre. The door open period shall be programmable. The facility shall allow remote operation of a key safe if fitted. Appropriate security safeguards shall be in place to ensure secure operation.

If a fire alarm occurs the door lock releases shall operate and stay active until the fire alarm panel has been reset.

B10.16 TRAINING

The contractor shall allow for two days training to be provided to the scheme manager and other staff. The first day shall be split into half Warden Call, half Access Control with the second day being six weeks later. The second day will be split as day one.

Specialist contractor – Atlas F&S, Portview House, 80 Dargan Rd, Belfast
Contact – Graeme White,Contact Number 07918 721159, email: graeme.white@atlasfs.co.uk

B10.17 AUTOMATIC DOORS

The main entrance door shall be fitted with an Automatic door opener/closer to allow wheelchair access. The door shall operate from the PAC, Door Entry, Warden Call, Push to Exit and Fire Alarm system.

B10.18 MAINS & TELEPHONE CONNECTION

All mains supply connections shall comply strictly with the 16th Edition of the IEEE Wiring Regulations and shall be certified by a fully qualified electrician.

Where the central control unit is mounted internally the mains power shall ideally be supplied from a separate circuit on the local consumer unit. The consumer unit shall be fitted with a fuse or RCB of an appropriate rating. A local fused spur shall be fitted adjacent to the central control unit.

If site conditions dictate that it is impractical to derive the mains supply directly from a consumer unit then the local ring mains supply can be used. A switched and fused local spur shall be fitted adjacent to the central control unit. Additional filtering may be necessary in extreme circumstances.

Where the central control unit is mounted externally an un-metered mains supply shall be requested from the local electricity supply company. The contractor shall liaise with the local electricity supply company and arrange for a fused termination unit to be fitted in the central control unit housing. The contractor shall ensure that all documentation and testing required by the electricity supply company is completed.

The contractor shall liaise with Telecom Supplier to ensure that the ADSL telephone supply is terminated at a suitable position.

B10.19 SYSTEM CABLING INSTALLATION

All cables and cable containment shall be strictly in accordance with 16th Edition IEEE regulations.

Surface cables shall generally only be allowed in unexposed environments i.e. ceiling voids, attics etc. and should be clipped using the correct size and type of cable clips.

Internal cables not drawn into conduits shall be installed in appropriate size PVC trunking. All trunking shall be installed using the manufacturers recommended accessories and fittings.

Overhead cables between buildings shall not be used unless specifically agreed in advance with the Authority's Agent.

Underground cable ducts between buildings shall be installed using UPVC tubing with a minimum diameter of 50mm. Ducts shall have risers of at least 75mm above finished ground level and shall be protected with galvanised capping. The location of all ducts shall be agreed in advance with the Authority's Agent.

All external cables shall be protected by galvanised conduit to ensure protection against accidental and malicious damage. All external conduit joints and cable entries shall be sealed to IP65.

The contractor shall make good all holes made through the building fabric. Only appropriate materials that are harmonious with external surfaces shall be used. The contractor shall make good all areas damaged during the installation of ducts. All paths, paved areas, gardens, top-soil and turf shall be restored to their original condition. The contractor shall agree to and comply with the Highway Authority's procedures to provide the necessary notifications, carry out the installation and provide the correct level of reinstatement to all areas disturbed by their work.

SUB-SECTION B11 - T.V. DISTRIBUTION SYSTEM

B11.1 GENERAL

The Contractor shall allow in his tender for a specialist firm to supply, install and commission a complete T.V. system as later specified to cover the entire project.

The specialist firms recommended for the sub-contract to carry out the work is:-

Smyths Satellite and Aerials Unit 4B Warden Street Ballymena Co Antrim BT43 7OT	or	Robert Oliver TV Aerials & Satellite Systems 14 A Clonavon Avenue Portadown BT62 3AE	or	Clearview 1 Crescent Park Lisburn Co. Antrim BT28 2GN

The Contractor shall be ultimately responsible for the organising of the specialist firm with regard to attendance on site, meeting programme, etc., and shall also be responsible for providing a complete plastic conduit system, outlet boxes etc. to facilitate wiring of all points.

The Contractor shall note that only recognised members of the Confederation of Aerial Industries Ltd., shall be acceptable for the installation of the television distribution system.

B11.2 ACTION OF THE COMMUNAL SYSTEMS

The system shall be such as to provide a complete transmission from one aerial array to cover all the points as shown on the drawings. Under normal operating conditions it will comply with the 'technical' performance recommendations as laid down by the appropriate Licensing Authorities and be capable of satisfactory distributing BBC1, BBC2, ITV Channel 4, RTE1 and RTE2, terrestrial digital, RSL analogue and digital Satellite Signals.

B11.3 EQUIPMENT

All materials must be new and shall conform to CE marked and national standards, where such standards have been established, and be installed to the relevant Codes of Practice (CAI and Sky).
Television and Radio Aerials

UHF television, FM and DAB radio aerials. Their installation must comply with the relevant abstracts from the CAI Codes of Practice. The aerial support structure must be connected to the building PME, when an LPS is present and connected
The aerial system must be capable of surviving wind speeds up to 62.5 mph (100Kph).

Satellite Dishes

Satellite dishes must be of a design and manufacture able to survive wind speeds up to 62.5 mph (100Kph) and are to be of a sufficient size to produce a carrier to noise ratio of 15dB at the head end for the transponders received. All dish mounts must be connected to the PME, when an LPS is present and connected.
The final position for the aerials and satellite dishes must be agreed with the builder/developer/local authority on site.

Head-end Equipment and Repeater Amplifiers

All equipment should be powered with 230 volts except where line powering of multi switches is required. The equipment is to be installed in accordance with CAI Codes of Practice.

B11.4 INSTALLATION

The complete communal T.V. distribution shall be wired through the communal service void to each apartment. Conduit sizes shall be 20 mm or as advised by the TV specialist.

The installation shall allow for upgrading to a second point (cable and suitable outlet plate), at the same location as the original point, this is to allow for the connection of double input Set Top Boxes, such as Sky Plus in an IRS system.

B11.5 ELECTRICAL ACCESSORIES ASSOCIATED WITH TV INSTALLATION

Electrical accessories with the TV installation throughout this installation shall be finished white and be manufactured by Crabtree or equal and approved.

B11.6 COMMISSIONING

The Electrical Sub-Contractor shall include in his tender for commissioning of the T.V. distribution system to be carried out by the specialist contractor.

Commissioning shall be carried out in the presence of the Engineer, and a certificate of commissioning shall be forwarded to the Engineer.

B11.7 CABLE AND WIRING

Definition of Cables

All cables must conform to BS EN 50117 and BS EN 60966, and have passed the benchmarking approval test as conducted by the Confederation of Aerial Industries Ltd. e.g., those from such manufacturers as Webro or Cables Britain Ltd.

All co-axial cables shall have a nominal characteristic of 75 ohms and will be suitable for the application concerned. The contractor must take into account any requirements for special cable constructions such as LSZH (Low Smoke Zero Halogen). We recommend Webro WF100 for subscriber cabling (head-end to outlet plate) and Webro WF125 for trunk cabling (amplifier to amplifier).

General Cabling Requirements

Wiring should be carried out in accordance with the IEE wiring regulations. All cable runs should be of continuous lengths from their source to termination, and joints should be avoided. Particular care should be taken using only connectors intended for this purpose, and so maintaining impedance to within +/- 3%.
In selecting the cable, due regard should be paid to the 'off air' signal level available from the aerial and the requirements of the receiver. In some instances, a single co-axial cable is used to feed both UHF and VHF signals, and in Satellite IF systems terrestrial and satellite signals, by the inclusion of a suitable network known as a diplexer or triplexer. Care should be taken in selection of the correct unit for the intended application taking into account the attenuation introduced into the system by the use of these and similar units (see clause concerning combining and splitting of signals).
All pipes, ducts, conduits and cables should be identified in accordance with the requirements of BS 1710.

Note: Aerial feeder cables should not be used where the cables ambient temperature is likely to exceed 45degC or fall below –20degC without reference to the cables manufacturers specifications.

B11.8 CABLE CONNECTIONS

Cable connections will be made in such a manner as to prevent any ingress of moisture. External cable should always enter terminal or junction boxes in an upward slope so that any water drains away from the point of entry. Cable joints shall not be made, under any circumstances, except with a recognised type of co-axial connector. Terminations should be made mechanically and electrically sound, and braid clamps should not be over-tightened so as to cause distortion of the cable Copper cables should not be terminated directly to, or by means of, aluminium terminations unless these terminations are plated. Cable connections should not be made in such a way that strain or pressure is exerted on the cable or termination in any manner or form.

B11.9 CABLE FIXING

RF feeder cables with a diameter of 10mm or less should be fixed with spacing between fixings as shown below;

(a) On Masts intervals of fixing no greater than 230mm
(b) On other vertical runs intervals of fixings no greater than 750mm
(c) On horizontal runs intervals of fixings no greater than 230mm

Fixings should be as such that deformation of the cable does not occur. Care must be taken that when using cable straps, not to over tighten. Cable clips of the correct size and shape must be used. Straps should not be used unless the straps are the correct size, and are designed for the purposes as to be incapable of damaging the cable.
Note; Fixings must not be at absolutely regular intervals.

B11.10 INSTALLATION AND ROUTING OF CABLE

The installation of the cable should be carried out in a neat and workmanship like manner. Bending radii should be as large as possible and never less than the manufacturers recommendations. In the event of such recommendations being absent, radius of the bend shall be at least ten times the outside diameter of the cable.

All cable installation routes must follow a 'Star Wired' or 'Tree & Branch' installation format.

Star Wired – An individual cable will route from the wall socket, uninterrupted, to the head-end, which will be located in a central position within the designated building.

Tree & Branch – An individual cable will route from the wall socket, uninterrupted, to a switch position, which may be located from the Head-end.

Cables destined for one dwelling must not be routed through another dwelling. Should this be the only option the contractor must obtain permission from the builder/developer/local authority on site. Cables can only be installed in roof spaces where no other route exists.

All connections of the coaxial cable will be made using 'F' type and IEC connectors only. All 'F' connectors must be crimped and be the correct size for the cable used.

B11.11 CONCEALED CABLES

Cables concealed within the fabric of the building, including cavity walls, shall be enclosed in ducting 20mm internal diameter.

B11.12 UNDERGROUND CABLES

Cables to be installed underground shall be of a type designed specially for that use, provided with an integral water barrier. It is recommended that PVC sheathed cables are not used in any underground situation.

Size of duct: A single cable installed underground shall be enclosed in a separate duct of 20mm minimum internal diameter and whose cross sectional area is not less than three times that of the cable, wall thickness to be not less than 2.5mm. The colour of the duct shall be light orange or green.

Cable Pulling: The pulling load applied to a cable drawn into a duct shall not exceed that specified for the cable.

B11.13 SIGNAL SPLITTING COMBINING AND IMPEDANCE MATCHING

Combining and splitting of signals shall be by the use of a recognised device. e.g. Resistive network, inductive unit, frequency-conscious filter.

Losses or gains involved by splitting or combining should be taken into account. If more than one receiver is used or if an amplifier is fitted, isolation must be provided between receivers and amplifiers.

SUB-SECTION B12 - TELEPHONE SYSTEM

B12.1 BRITISH TELECOM SERVICES

The Electrical Contractor shall allow in his tender for the supply and installation of a multi-core cable 4 pair. The cable shall be installed from an adaptable box at the in Store on Ground Floor rising adjacent to the sub-mains cables to the main BT intake point within each apartment. This cable shall be protected in conduit as necessary. Secondary points there after These cables shall also be protected from the adaptable box detailed below to the points by means of 20 mm plastic conduit which shall terminate in a standard accessory box.

The Main Contractor shall from the end of the pipe duct, be responsible for providing British Telecom pipe duct or British Telecom cable as required by the Post Office Services.

Telephone outlet points shall be finished white and be manufactured by Crabtree or equal and approved and complete with 47 mm deep steel boxes.

The conduit to be used for cable protection where dropping through the floors shall be 20 mm diameter plastic conduit complete with bushes, joints, etc., to give a continuous run and be complete with draw wires.

B12.2 LIAISON WITH BRITISH TELECOM ENGINEERS

The Electrical Contractor shall arrange a meeting with British Telecom to discuss the details of the telephone conduit installation and ensure that the system provided is compatible with all British Telecom requirements and that future provision of telephones to all apartments can be made without disruption to the building or its occupants.

B12.3 VIRGINMEDIA SERVICES

The Electrical Contractor shall allow in his tender for the supply and installation of RG6 cabling. The cabling shall be installed from a lock box at the Main Switchgear in Store on Ground Floor rising adjacent to the sub-mains cables to the main Virginmedia intake point within each apartment. This cable shall be protected in conduit as necessary.

From the above lock box which shall be mounted at 300 mm above floor level a 100 mm pipe duct shall be laid to 3 metres on the outside of the building to accommodate the Virginmedia cable entry.

These cables shall also be protected from the lock box detailed below to the points by means of 20 mm plastic conduit which shall terminate in a standard accessory box.

The Main Contractor shall from the end of the pipe duct, be responsible for providing pipe duct or cabling as required by Virginmedia.

Outlet points shall be finished white and be manufactured by Crabtree or equal and approved and complete with 47 mm deep steel boxes.

The conduit to be used for cable protection where dropping through the floors shall be 20 mm diameter plastic conduit complete with bushes, joints, etc., to give a continuous run and be complete with draw wires.

B12.4 LIAISON WITH VIRGINMEDIA ENGINEERS

The Electrical Contractor shall arrange a meeting with Virginmedia to discuss the details of the conduit installation and ensure that the system provided is compatible with all Virginmedia requirements and that future provision of services to all apartments can be made without disruption to the building or its occupants.

SUB SECTION B13 - FIRE ALARM SYSTEM INSTALLATION

B13.1 GENERAL

The Contractor shall supply and install a fire alarm system incorporating a central control panel and repeater panel complete with all equipment necessary for the complete and proper running of the system as hereinafter specified.

The fire alarm installation shall conform fully to BS.5839 incorporating latest amendments.

B13.2 WIRING

The complete fire alarm system shall be wired utilising 1.5 sq mm FP200 Gold cable with a white low smoke and fume (L.S.F) overall sheath, complying in all respects with BS6387, Categories C, W & Z.

B13.3 DESCRIPTION OF SYSTEM

The system shall consist of a main central control/indicator panel positioned as shown, to be complete with a stove enamelled enclosure. The panel shall be mounted at a height of 1.4 metres from floor to centre and be complete with integral power supply unit capable of maintaining the system for a mains input failure, period of 24 hours (minimum) with a further 30 minutes under full alarm/control conditions.

Alarm warning of fire shall be by means of sounders.

Automatic smoke / heat detectors shall be installed at various locations throughout the building as shown on the drawings.

Manually operated breakglass actuating points shall be installed at various locations throughout the building.

All equipment shall be suitable for operation on a 24V D.C supply.

B13.4 SUPPLY TO SYSTEM

The system in each Block shall be supplied via a 6-amp. SP/N MCCB painted red and labelled "Fire alarm System: DO NOT SWITCH OFF" located on the main switchboard. This must be lockable and provided with an approved lock and key.

B13.5 CONTROL INDICATOR PANEL

All functions of the fire alarm control panel shall comply with the requirements detailed in BS 5839 incorporating all amendments current at date of tender.

B13.6 FIRE ALARM SOUNDER/STORE

Fire Alarm sounders shall be mounted approximately 450 mm below ceiling level to the top of the sounder.

The sounders shall be suitable for surface mounting.

B13.7 FIRE ALARM MANUAL CALL POINTS

Fire alarm manual call points shall be of the constant pressure type moulded in red thermoplastic and shall comply with BS 5839 Part 2. A key test facility complete with key shall be incorporated in each unit. The units shall be suitable for flush mounting in standard conduit accessory boxes as specified previously.

B13.8 HEAT DETECTORS

Fixed temperature heat detectors shall be supplied and installed where shown on the drawing. The heat detectors shall be suitable for 24 volt D.C. operation, shall be preset at 57 degrees centigrade and shall be complete with a common mounting base.

All heat detectors shall incorporate a red L.E.D. indicator to indicate fire activation.

B13.9 SMOKE DETECTORS

All smoke detectors as indicated on the drawing shall be high performance optical/heat type mounted on a common mounting base.

B13.10 MOUNTING HEIGHTS

All pushes and breakglass units shall be mounted at a height of 1000 mm from finished floor level, bells shall be mounted on a centre line between ceiling and finished door height, although a maximum of 600 mm below ceiling level shall be observed (Except within the Sanctuary).

B13.11 WIRING DIAGRAM

A wiring diagram of the fire alarm system shall be obtained from the manufacturer and submitted to the Engineer, by the Contractor for comment prior to installation of the equipment.

B13.12 COMMISSIONING

The Contractor shall include in his tender for the complete commissioning of the fire alarm system in each Block to be carried out by the supplier of the equipment at completion.

Commissioning must be carried out in the presence of the Engineer and a certificate of commissioning shall be forwarded to the Engineer.

B13.13 AREA DESIGNATION DRAWING

The Contractor shall supply and install 1 No. area designation drawing showing plans of the building with all fire alarm equipment clearly indicated and all room names/numbers.

The drawings shall be mounted in an aluminum frame with glass front, and fixed to the wall beside the central control panel.

The dimensions of the drawings shall be approved prior to its completion but should not exceed 600 mm wide x 450 mm deep (unless otherwise approved).

B13.14 NEW FIRE ALARM EQUIPMENT

The fire alarm equipment listed below and shown on the contract drawings shall be supplied and installed, all as required to provide a complete installation to the requirements of BS 5839 (or equal and approved).

1 No 2 loop analogue addressable control panel c/w printer and PSU.
Addressable Callpoint
Analogue Addressable Optical Smoke Detector
Analogue Addressable Heat Detector
Remote Indicator
Addressable Contact Interface
Electronic Sounder
Weatherproof Electronic Sounder
Door Release Unit
Sounder Strobe
Common Base
Combined Smoke Detector/Sounder
Combined Heat Detector/Sounder

All isolators to be located in detection equipment.

B13.15 MAINTENANCE CONTRACT

The Contractor shall include in his tender price for a 1 year maintenance contract for the entire fire alarm system.

The Contractor shall also include in his tender price for a one year maintenance contract from the supplier, Fire Security Ltd., for the completed fire alarm system. The contract shall include for 2 major visits and 2 minor visits during the year, the contract to commence from the date of practical completion of the contract works.

B13.16 SPARE PARTS

The Contractor shall supply to the Employer the following spare components

1.	Breakglass - glasses	50 in number
2.	Smoke detectors c/w addressable facility	2 in number
3.	Heat detector c/w addressable facility	2 in number
4.	Sounders	5 in number
5.	Complete Break glass units c/w addressable facility	2 in number

B13.17 ADDITIONAL REQUIREMENTS

The Contractor shall include in his tender price for the following:-

(i) Allow for a power supply for each power supply unit (door holder or sounder) to be taken from the nearest distribution board wired in 2.5 mm^2 LSF radial circuit protected by a 16 Amp M.C.B. Radial circuit to terminate in an unswitched fused connection unit (fused 3 Amps) located adjacent to the power supply unit.

B13.18 ADDITIONAL FIRE ALARM SOUNDER/STROBES

The Contractor shall include in his tender price for the supply and installation of an additional 6 No. sounder/strobes of a type as specified above, together with 15 m of conduit and cabling for each bell. The final position of these sounders will be confirmed on site. If any of these sounders are not installed, an appropriate amount shall be deducted from the tender sum.

The Contractor shall arrange for a sound level test for each area of the Building before the fire alarm system is commissioned. If additional sounders are required to be installed to achieve statutory sound levels the Contractor shall install additional sounders under the direction of

the Engineer. Only when sound levels have been found to be acceptable will the commissioning of the fire alarm system be carried out.

B13.19 FIRE DETECTION WITHIN APARTMENTS

Within each apartment a conventional smoke, heat and carbon monoxide detector shall be wired from the local consumer unit. The system shall be such that if a fire signal occurs in any one apartment, only the conventional smoke detector and heat detector within that area will sound. In addition 1No. 20mm conduit, complete with cabling, shall be provided from the smoke detector as indicated on the drawings in each apartment to main warden call speech unit in the Hall and 1No. 20mm conduit, complete with cabling, shall be provided from the CO detector as indicated on the drawings in each apartment to main warden call speech unit in the Hall.

The fire detection equipment within the communal area and the heat detector detector within each entrance lobby of each apartment shall be wired from the fire alarm panel. The sounders within the communal area *AND* the apartments shall be from the fire alarm panel alarm so that if a fire occurs in the communal areas the sounders in all areas including the apartments will operate.

B13.20 "DOMESTIC" AICO MAINS POWERED CO DETECTORS

The Contractor shall include in his tender price for a carbon monoxide detector in each dwelling as described below:-

Memory Feature

This feature records if CO has been detected whilst the occupier was away. Activated by pressing the test button; 1 flash of the red LED every 2 seconds indicates 150ppm (parts per million), 2 flashes per second 350ppm (parts per million).

Comprehensive Indicator Lights

- Green Mains on
- Yellow Fault Indicator Light
- Red Alarm on
  Flash rate indicates low/high CO level
  Low (150 parts per million) 1 flash every 2 seconds
  High (350 parts per million) 1 flash every half second

Quick CO Gas Test

If testing with CO gas is required, pressing the test button activates the 'Quick Test' feature which reduces the waiting time for testing with CO to approximately 4 seconds instead of up to 6 minutes. On a large scale testing programme this represents a considerable time and cost saving.

Ei261 Mains powered CO alarm with 10 year rechargeable lithium backup battery and LED

Mains powered Carbon Monoxide alarm with rechargeable lithium cell back-up and replaceable CO sensor.

- To BS EN 50291:2001.
- Self contained 230V 50 HZ mains powered multi-station suitable for linking to alarm maximum of 12 units.
- The detector shall embody mains power 'on' indication and easy to use test/hush button which checks the electronics and horn, also silences nuisance alarms
- Automatic self diagnostics alarm bleeps and amber light flashes if a fault is detected
- Pre-alarm warning LED flashes at 50 parts per million CO

- Alarm indication by red LED indicating once a second and by a horn to at least 85db sound with distinctive alarm sound with modulated output to distinguish from a smoke alarm
- Detector chamber shall be protected from insects or dust by fine mesh screen.
- Lithium battery backup.
- Detector shall be mounted on a surface installed pattress and shall be easily dismounted from the pattress by slide release without the use of tools.
- Final electrical connection shall be by way of multi-plug in connection located on back plate of the smoke detector.
- Smoke detector body case design shall be of minimum projection in white plastic.
- Surface mounting pattress of minimum projection suitable for screw fixing to ceiling, base to be complete with relay, suitable for connecting system to assistance call system, manufactured by AICO Ltd. Ref. Ei 128RBU or equal and approved.
- Pattress made in white colour plastic.
- Pattress to embody a fixed wiring screw terminal connection unit. Suitable for accepting 2 x 1.5 mm cored cables.
- Carbon monoxide detector shall have a 5 year guarantee on the complete unit and sensor module
- Manufactured by AICO Ltd. Ref. Ei 166RC or equal and approved.

Contractor to provide relay base for connection to warden call system.

B13.21 "DOMESTIC" SMOKE DETECTORS WITHIN EACH DWELLING

The Contractor shall include in his tender price for optical smoke detectors in each dwelling as described below:-

- To BS EN 14604:2005.
- Self contained 230V 50 HZ mains powered multi-station suitable for linking to alarm maximum of 12 units.
- The detector shall embody mains power 'on' indication and easy to use test/hush button which checks the electronics and horn, also silences nuisance alarms
- Alarm indication by red LED indicating once a second and by a horn to at least 85db sound.
- Detector chamber shall be protected from insects or dust by fine mesh screen.
- Lithium battery backup.
- Detector shall be mounted on a surface installed pattress and shall be easily dismounted from the pattress by slide release without the use of tools.
- Final electrical connection shall be by way of multi-plug in connection located on back plate of the smoke detector.
- Smoke detector body case design shall be of minimum projection in white plastic.
- Surface mounting pattress of minimum projection suitable for screw fixing to ceiling, base to be complete with relay, suitable for connecting system to assistance call system, manufactured by AICO Ltd. Ref. Ei 128RBU or equal and approved.
- Pattress made in white colour plastic.
- Pattress to embody a fixed wiring screw terminal connection unit. Suitable for accepting 2 x 1.5 mm cored cables.
- Manufactured by AICO Ltd. Ref. Ei 166RC or equal and approved.
- Contractor to provide relay base for connection to warden call system.

B13.22 "DOMESTIC" HEAT DETECTORS WITHIN EACH DWELLIMG

The Contractor shall include in his tender price for a heat detector in each dwelling as described below:-

- To BS 5446 Part 2:2003 Class A1
- Self contained 230V 50 HZ mains powered multi-station suitable for linking to alarm maximum of 12 units.
- The detector shall embody mains power 'on' indication and easy to use test/hush button which checks the electronics and horn, also silences nuisance alarms

- Alarm indication by red LED indicating once a second and by a horn to at least 85db sound.
- Detector chamber shall be protected from insects or dust by fine mesh screen.
- Lithium battery backup.
- Detector shall be mounted on a surface installed pattress and shall be easily dismounted from the pattress by slide or clip release without the use of tools.
- Final electrical connection shall be by way of multi-plug in connection located on back plate of the smoke detector.
- Heat detector body case design shall be of minimum projection in white plastic.
- Surface mounting pattress of minimum projection suitable for screw fixing to ceiling, base to be complete with relay, suitable for connecting system to assistance call system, manufactured by AICO Ltd. Ref. Ei 128RBU or equal and approved.
- Pattress made in white colour plastic.
- Pattress to embody a fixed wiring screw terminal connection unit. Suitable for accepting 2 x 1.5 mm cored cables.
- Manufactured by AICO Ltd. Ref. Ei 164RC or equal and approved.

B13.23 SUPPLY TO "DOMESTIC" SMOKE, HEAT AND CO DETECTORS

The installation shall be supplied from a dedicated circuit on consumer unit at each switchgear location within the dwellings. A warning label shall be fitted to the RCBO, which provides isolation to the circuit, clearly labelled:

"Fire Alarm System - DO NOT SWITCH OFF".

Wiring of the installation shall be in a 3 core 1.5 mm^2 and earth PVC insulated/PVC sheathed cable.

SUB-SECTION B14 - PASSENGER LIFT INSTALLATION

B14.1 GENERAL

The Contractor shall allow in his tender for a specialist firm installation of a new 16 person plantroomless lift.

The Sub-Contractor shall be ultimately responsible for the organising of the specialist firm with regard to attendance on site, meeting programme etc. and shall also be responsible for providing a complete conduit system, outlet boxes etc. to facilitate wiring of all points.

B14.2 EXTENT OF WORK

The tender shall include for the supply, delivery, off-loading, erection, wiring, testing, commissioning and setting to work a complete traction operated lift.

The work is to be carried out in accordance with the true intent of this specification and to the satisfaction of the Engineer. The tender price shall include all items of equipment, whether specifically mentioned or not, necessary to leave the installation complete and in full working order in every respect in compliance with B.S. 5655.

B14.3 STEEL WORK

This sub-contract includes for the supply, delivery, erection, levelling, accurate positioning, drilling and fixing of all steelwork required to maintain the set position of the complete lift equipment including fixing brackets, machinery, door gear etc.

The design of all R.S.J. sections shall comply in all respects with the current editions of British Standard 5655 Part 1 and subsequent revisions. In particular R.S.J.'s spanning the lift shaft shall be designed to the factor of safety and deflection limitation required by this British Standard.

Hoisting beams shall be provided and fixed by the main contractor. The Sub-Contractor shall however be required to provide accurate information as to loading of these items and loading on all other building structures all as detailed in Clause 204 below.

B14.4 NATURE OF ELECTRICITY SUPPLY

The electricity supply shall be 230/400 V. single/three phase and neutral 50 Hertz alternating current. The supply for each lift installation will be made available under this contract and shall terminate in a 60-A. TP/N isolator for the lift equipment and a 20-A 3 Way unit or consumers unit for the separate lighting supply in the shaft.

All wiring and equipment from the isolator to the lift manufacturer's equipment shall be supplied, erected and connected under this sub-contract. All wiring, fuses, switches, etc. for the car lighting shall also be under this sub-contract.

B14.5 DRAWINGS BY SUB-CONTRACTOR

Immediately this sub-contract is placed and before any work is put in hand by the Sub-Contractor, he shall submit for approval detailed drawings to indicate (a), (b) and (c) below. Items (d) to (i) shall be agreed with the Engineer before manufacture or installation as appropriate.

(a) The arrangement of all gear and equipment which will be erected in the shaft. This drawing shall indicate the dead loads to be carried by the building structure and the base area and load distributing arrangement for each item of equipment.
(b) Details of Builder's Work.
(c) Details of lift shaft.

(d) The hydraulic ram system
(e) Control panels and apparatus.
(f) Car frame complete with safety gear.
(g) Jointings and fixing of guides including details of footstep bearings.
(h) The arrangement of the landing and car doors and power operators.
(i) When the works covered by this sub-contract have been completed the Sub-contractor shall supply and erect, a framed diagram of all electrical circuits.

B14.6 CONTRACT DRAWINGS

The following drawings are issued with this Specification and all information contained thereon shall be deemed to be included in the Specification of which they form an integral part:-

Drawing showing typical section of Lift Shaft - Drawing No. 3907-E16.

B14.7 ACCESS FOR ERECTION

Access for the erection of the new lift shall be agreed with the Main Contractor. The Tenderer shall note that the drawing may show restrictions for access and that the lift cars must be sectional for erection in the lift shaft. The sub-contractor shall co-ordinate with the main contractor the size of access openings required for the erection of both the lift car and the lift machinery.

The lift machinery is located in the shaft. The tenderer shall make due allowance for this arrangement when pricing his tender.

B14.8 PARTICULARS FOR 16 PERSON PASSENGER LIFT

GENERAL CHARACTERISTICS

Lift Usage Transportation of passengers in Low, medium and high rise buildings

Type of lift: Passenger Lift
Quantity: 1 Simplex
Load capacity: 16 persons or 1250kg
Control type: Full Collective
Speed: 1.00 m/sec
Model: MWLS/3G2016 MRL TRA
Power supply: 400V 3 phase and neutral 50Hz per phase
Drive control: Gearless Traction unit
VVVF (variable voltage variable frequency)
Fire Fighting Control: EN 81-73: Behaviour of lifts in the event of fire included (Standard)
Full Evacuation Control: Not Required
Fire Alarm Interface: Included (I/O required at the top of the Lift Shaft – By Others)
Disability Discrimination Act: Fully Complaint

Pit ladder: By lift contractor

Lifting beam: By main contractor

SITE CHARACTERISTICS

Floors: 3 Floors (0, 1, 2)

Entrances: Inline Car Arrangement

Travel: 5,850mm (to be checked on site)

Shaft: 2000 mm wide x 2700 mm deep (Internal)

Fire Protection/Stopping: By Main Contractor at each Landing Door entrance

Shaft Scaffolding: Scaffolding require by main contractor

Shaft Lighting: Required by Main contractor

Shaft Ventilation: Required at the top of the lift shaft [By Main Contractor]

Shaft Dust Sealing:Main Contractor on Site

Headroom: 3800 mm (Underside of lifting beam)

Lifting Beam:Supply, Install & Test by Main Contractor

Pit: 1300 mm with Pit Ladder and Pit Stop Button

Control Panel:Located on the Top Floor (No machine room required)

CABIN DETAILS

Car dimensions: 1300mm wide x 2100mm deep x 2100mm high

Car Finish: DDA & Part M compliant passenger lifts
Stainless steel finishes
Satin Stainless Steel Skirting,
Satin Stainless Steel Handrails (Opposite side of COP),
Satin Stainless Steel Ceiling,
Car Operating Panel (COP) with Call Buttons & Displays
Emergency Autodialler System in COP

Floor Finish:Vinyl Floor as per Orona NI C3 Range

Car Operating Panel:Full height COP
Seven Segment display
Car Preference Key Switch
Tactile Buttons for ALL Floors
Alarm Button
Door Open Button
Door Close Button
Door HOLD OPEN Button
Car priority key switch in COP in car

Voice Announcer:Hands free Autodialler to Orona MWLS Call Centre
Telephone Line must be located on the top floor (By Others)
OPEN PROTOCOL “MICOME” UNIT USED

CABIN AND LANDING PUSH BUTTONS:
•Tactile & Braille (Compliant with Regulations)
•Vandal Resistant Category 0 with Braille

CABIN AND LANDING INDICATORS:
•Vandal Resistant Category 0 Seven Segment
•Vandal Resistant Category 0 In Cabin Located In Car Operating Panel
•Vandal Resistant Category 0 On Each Landing, Overhead The Doors Located In Door Frame

LIFT CAR CEILING:

Stainless Steel LED Backed Lighting

Efficient Lighting

Lift Stand-By Mode

Low-Energy Drive

Automatic Car Lighting Turn Off Included

Emergency lighting in Cabin

LANDING DOORS

Door type: Automatic two (2) panel telescopic
Door Drive:VVVF Drive
Door dimensions:1100mm wide x 2000mm high
Door Fire Rating:EN81.58 – 120min
Door Protection:Full Height Multi Beam
Door finishes:Brushed Stainless steel 304
Fire Stopping:Behind the Architraves by Main Contractor/Others
Landing call stations:Located in the Wall between Lift Shafts
Landing Displays:Located in the Door Frame Header
Indicators: Seven Segment Display

ADDITIONAL ITEMS INCLUDED:
•Autodialler is Open Protocol "Micome"
•Dual emergency pit stop buttons included @ 500 & 800mm from pit floor
•Dual Direction Safety Gear included is the safety gear when going down, the machine brake acts as a safety gear when going up.
•Witness testing included for ALL Lifts
•O+M Manuals included
•Hilti Rawl Fixings as standard
•Lifting Beams to be supplied, installed & TESTED by the main contractor on site
•Waste disposal to central skins on site supplied by the Main contractor
•Off Loading by Main contractor but Lift engineers will be responsible and will be on site

MACHINE
Gearless Machine with Synchronous Motors240 starts/hour
Coated small diameter suspension ropereduced diameter pulley (160mm)
Silent and efficient

Passenger Lift Safety & Additional Features	
Full height multi-beam detector	Automatic hands free autodialler
Emergency siren	Manual emergency release system
Emergency safety gear on car	Overspeed governor
Pressure sensitive doors	Pit ladder
Danger notices	Emergency cabin lighting
Load weighting system	Door open/close push buttons
Audiovisual overload indicator	Car priority key switch
Fire alarm interface	Lift homing to designated floor
Certified safety brake to prevent uncontrolled upward movement	
Emergency manual door release with Euro release key	

B14.9 TESTING

The lift on completion, shall be fully tested in the presence of the Engineer, and any defects found shall be corrected before a Certificate of Completion will be granted.

The necessary test weights shall be provided by the Lift Contractor and a technical representative and lift erector of the Sub-Contractor's staff shall attend during the tests.

The following tests shall be performed:-

(1) Current readings for starting and running under "No load", "half load" and "full load" conditions.

(2) Main circuit breaker setting for tripping current and overload tripping time and phase reversal.

(3) Speed tests to confirm that under varying loads the contract speed is achieved for ascending and descending travel.

(4) Test to confirm proper levelling at all floor levels and to confirm silence and smoothness of operation, especially on speed change-over, for varying loads both ascending and descending.

(5) A full load safety gear test under power.

(6) Test of locking gear fitted to car and landing doors.

(7) Check on clearances above and below the car and counterweight, including compression of the buggers.

(8) Tests to confirm that terminal and final limit switches operate sat-isfactorily and that the brake operates in a fully effective manner.

(9) Full electrical tests on all electrical wiring and equipment to con-firm proper earth continuity and good insulation resistance proper-ties.

(10) Tests to confirm that all safety devices are functioning properly.

(11) Car and landing door closing force test.

(12) Tests called for in BS.5655

B14.10 PAINTING

All metalwork, excluding galvanized or cellulose finished paint, shall be thoroughly wire-bushed and cleaned and given one priming coat and two finishing coats of best quality oil paint of colours indicated by the Engineer.

The priming coat shall be given before erection and the finishing coats after erection.

B14.11 OPERATION INSTRUCTIONS

(a) On completion and after commissioning the contractor shall instruct the Authority or their representative on the proper operation and maintenance of all parts of the complete installation.

(b) **The Sub-Contractor shall provide one copy of the installation, operation and maintenance instructions for all the installations included in the sub-contract to the consultant, at the same time as handover of building to the client. If the Engineer decided to handover the building to the client before the two sets of operating and maintenance equipment instructions are provided, the Sub-Contractor will be responsible for all day-to-day maintenance until specific instructions are provided by him or his representative to the satisfactory of the Engineer.**

These two sets shall be adequately bound, to the Engineer's approval into volumes with board covers to withstand continual usage. Each set shall incorporate a detailed description of the operation procedure for each installation and item of equipment together with details of the regular maintenance routines recommended by the manufacturer of each item of equipment. In addition for each item of equipment a list of spare parts shall be given which the manufacturers recommend should be kept in store. Each set shall also contain manufacturer's data and maintenance leaflets for all items of equipment and plant; fully detailed drawings showing the construction of such plant and equipment and full detailed internal and external wiring diagrams for any electrical equipment.

B14.12 MAINTENANCE

The Sub-Contractor shall maintain the new works executed in good order for twelve months after completion, fair, wear and tear expected.

During the maintenance period, the Sub-Contractor shall inspect the plant once in each month and shall adjust, clean and oil the lift machinery, replace any part found defective, weak or unduly worn as a result of faulty erection, design or workmanship. Immediately following each monthly inspection during the maintenance period, the Site Sub-Contractor shall submit an inspection report indicating the condition of the plant and machinery and detailing any repairs carried out on the installations.

TENDERERS MUST INDICATE, AT THE TIME OF TENDERING, WHAT FACILITIES THEY HAVE IN NORTHERN IRELAND FOR CARRYING OUT MAINTENANCE WORK AND FOR ATTENDING TO URGENT CALL-OUTS DURING THE 12 MONTHS MAINTENANCE PERIOD, AND AFTER EXPIRY OF THIS MAINTENANCE PERIOD.
A 24 HOUR (7 DAYS PER WEEK) COVER IS REQUIRED.

The maintenance period shall not be deemed to have expired until the Sub-Contractor has made good all defects or faults which have occurred or have been discovered during the said maintenance period, to the Engineer's satisfaction.

During this period, the Sub-Contractor shall indemnify the Employer and/or Main Contractor against any damage to the Building contents and occupants caused by such defects or faults.

If it becomes necessary for the Sub-Contractor to carry out any remedial work under this clause the Maintenance period may be applied at the Engineer's discretion on the giving of notice to the contractor to the portion of the works so renewed or replaced from the date of completion of the work on renewal or replacement.

The sub-contractor shall include in his tender for the 1st year full maintenance and services schedule during the maintenance defects period.

SUB-SECTION B15 - SOLAR PHOTOVOLTAICS SYSTEM

B15.1 GENERAL

The Main Contract shall include for the supply, delivery and off-loading of the solar photovoltaics equipment.

The specialist firm recommended for the contract to carry out the work associated with the new photovoltaics system is:

Unit 10, Work West,
301 Glen Road, Belfast
BT11 8BU T:
+44 (0)2890 600034 |
E: hello@horizonrenewables.co.uk

Or equal and approved

The Main Contractor shall be ultimately responsible for the organising of the specialist firm with regard to attendance on site, meeting programme, etc. The Electrical Contractor shall be responsible for providing a complete conduit system, outlet boxes, wiring, etc. of all points.

B15.2 EXTENT OF WORK

This tender shall include for the wiring, testing, commissioning and setting to work a complete solar photovoltaic system.

The work is to be carried out in accordance with the true intent of this specification and to the satisfaction of the Engineer.

B15.3 WIRING

The complete system shall be wired utilising MC DC solar cables, 3-core flex, with a white low smoke and fume (L.S.F) overall sheath, complying in all respects with BS6387, and PVC insulated/PVC sheathed cables as detailed in the main contract documentation.

B15.4 DESCRIPTION OF SYSTEM

The system on the apartment block shall consist of roof mounted solar panels 8kwp c/w roof mounting kit.

The system on the bungalow shall consist of in-roof mounted solar panels 1.5kwp c/w roof mounting kit.(flashing kit)

B15.5 INSTALLATION

The Solar Photovoltaic System shall be wired in a trunking/ PVC Conduit System through the service void to the ground floor store. The installation shall be completed to the satisfaction of the specialist firm, Engineer and Northern Ireland Electricity.

B15.6 INSPECTION AND TESTING:

The solar system shall be tested after installation, measurements shall be taken of the no-load voltage of the string, the short circuit current and of the insulation to test performance.

The installation shall, on completion and before being energised, be inspected and tested in accordance with Part 6 of the IEE Regulations Requirements for Electrical Installations (17th edition, BS 7671). The Engineer shall be given not less than 24 hours notice before commencing tests.

After satisfactory completion of tests submit copies of inspection and completion certificates to the Supervising Officer, or Consultant Mechanical and Electrical Engineer.

All test instruments shall be provided by the Electrical Sub-Contractor who shall note the instrument serial numbers on the test certificates.

B15.7 COMMISSIONING

The Electrical Contractor shall include in his tender for commissioning of the systems to be carried out by the specialist firm.

Commissioning shall be carried out in the presence of the Engineer, and a certificate of commissioning shall be forwarded to the Engineer.

B15.8 LIAISON WITH NORTHERN IRELAND ELECTRICITY ENGINEERS

The Electrical Contractor shall arrange a meeting with Northern Ireland Electricity to discuss the details of the photovoltaics installation prior to commencement of works and ensure that the system provided is compatible with all Northern Ireland Electricity requirements.

SUB-SECTION B16 – MECHANICAL SERVICES

B16.1 GENERAL

The Contractor shall wire and electrically connect all pumps, Mechanical Ventilation, smoke vent panels, motorised valves, control stats, sensors. etc., as shown on the drawings necessary for the complete and proper running of the ventilation and heating system.

B16.2 LOCAL ISOLATORS

The Contractor shall supply and install isolators adjacent to all motors, pumps,etc., in connection with Services for Mechanical Engineers (not necessarily shown on drawings).

Isolators shall be rated not less than the rating of the over current protective device protecting the individual item of equipment.

B16.3 SCHEDULES

Schedules of power circuits and control wiring shall be provided by Mechanical Sub-Contractor.

Note:- Earth connections are not included in these schedules but the electrical sub-contractor shall include for all necessary earth connections in his tender amount.

B16.4 CO-ORDINATION

The Contractor shall liaise closely with the mechanical sub-contractor regarding the position of items of mechanical plant. No responsibility will be accepted by the client or engineer for a breakdown in this communication if locations of isolators and plant do not coincide.

B16.5 IDENTIFICATION OF TERMINALS AND CABLES

Terminals and both internal and external cables shall be clearly identified within the control panel by means of a numbering system, each cable to be numbered using PVC or similar marking sleeves and each terminal by means of a numbered label.

SUB-SECTION B17 – PUMPING STATION

B17.1 GENERAL

The Contractor shall allow in his tender for the installation and commisioning of the pumping station electrical controls and equipment. The pumping station shall be a King Span, Hillmaster package pumping station, meeting all the requirements of NIW.

The Sub-Contractor shall be ultimately responsible for liaising with the pumping station specialist to meet the program, determining the full extent of services required and shall also be responsible for providing a complete pumping station solution as intended by NIW as specified within their specification for the construction of a waste water pumping station for adoption by northern Ireland water. This is located within the tender documents.

B17.2 NIE METERING

The contractor shall arrange with NIE the installation of a Code 5, class 1 on-line half hour meter. The meter should come complete with an internal modem with GSM communications or alternatively an internal modem capable for connection to a BT line. This will enable Northern Ireland Water to dial up NIE electricity meters for data acquisition and energy management.
Developer must discuss with NIW prior to meter installation.

SUB-SECTION B18 - FIRE SEALING

B18.1 GENERAL

The Electrical Contractor shall employ the services of a specialist contractor to provide fire seals around all electrical services installed by the electrical contractor.

The specialist contractor shall possess a certificate of competence specifically for work of this nature and shall be:

Firetec Structural Fire Protection
Unit 7, 1 Woodside Road Ind Est
Ballymena
BT42 4QJ

Tel: 028 2563 8522

or equal and approved.

1. This specification covers the supply and installation of seals for ducts and service conduits in any location in the building.

   All services supplied by the Electrical Contractor shall be sealed by the specialist contractor where they pass through fire - compartmentation walls/ceilings/floors.

2. The work shall include the design and manufacture of any supporting structures, making good any defects during the contract or defect liability period and the whole of the labour and materials necessary to form a complete installation.

B18.2 COMPLIANCE WITH STANDARDS

Sealing systems covered by this specification shall comply with:-

a. the appropriate sections of British Standards CP413 : 1973 Ducts for Building Services.

b. the appropriate sections of BS 476 Fire Tests on Building Materials and Structures or ISO R-834.

B18.3 SEALING REQUIREMENTS

The sealing system shall be proof against propagation of or attack from the following:-

a. Flame and smoke
b. Gas
c. Water and steam
d. Vermin
e. Mild acid or alkali

In ducts where cables have been installed loose, particular attention shall be paid to the effective sealing of the interstice between the cables at the sealing position.

B18.4 SEAL SPECIFICATION

Sealing materials for application by spray, brush, trowel, or hand in liquid or mastic form are acceptable.

The Electrical Contractor or his specialist Contractor shall supply full details of the proposed system together with any variations which may be required to suit a particular application.

All fire seals shall have one hour stability and integrity as defined in BS 476 (all relevant parts including latest revisions).

In situations where heat conductance via the services passing through the seal could lead to secondary combustion and a spread of fire to other parts of the building then appropriate measures must be taken to ensure that the insulation effect of the seal is not reduced.

The Seal shall be non-combustible when tested in accordance with BS.476 (Part 4) : 1970.

Where a seal contains a material which on its own would fail the above test the following requirements must be fulfilled:

1. The material does not contribute to the fire.

2. During operation the seal material does not emit excessive smoke and cause obscuration.

3. During operation the seal material does not emit any corrosive or toxic fumes or smoke on the unexpected face of the barrier.

4. All other requirements of this specification can be met.

The seal material shall be suitable for installation in damp and wet conditions, and remain waterproof in situations where water may build up on either side of the seal after the duct sealing operation.

The seal shall be suitable for easy modification to accommodate additional cables, or complete removal, without the use of sharp tools.

The seal shall not support bacterial growth.

Asbestos shall not be used in the construction of any sealing system.

The sealing system design shall be such as to produce minimum loading on the civil structure.

Sealing systems shall be maintenance free once installed. Systems that require painting or refinishing in any way are not acceptable.

The design of a sealing system shall be such that seals are suitable for operation in substation and cable duct environments for 40 years within an ambient temperature range of -25^{o}C to 55^{o}C.

Sealing system shall be capable of withstanding the pressure rise associated with fires without impairing their protective properties.

The cross-sectional area of free space within a duct is large when compared to that occupied by cables in many cases. The sealing system shall be capable of withstanding the rigours of future cable laying operations.

B18.5 CLEANLINESS OF DUCTS

The specialist Contractor shall remove all extraneous matter from the duct and carry out any cleaning/degreasing necessary before application of the sealing materials.

Upon completion the Specialist Contractor shall ensure that the site is left clean and tidy.

B18.6 DUCT CONTENTS AND PROTECTION OF SERVICES

The ducts contain electricity cables operating at voltages up to 415 V.

The specialist Contractor shall examine the drawings to determine the nature of any other services

All services will remain energised if required during the progress of the works. It is essential that adequate precautions are taken to avoid excessive trampling and subsequent damage to the services.

The moving, lifting, or re-arranging of cables will not be permitted.

Intumescent pipe collars shall be fitted on all PVC pipe ducts in the existing building where pipes pass through intermediate floors, walls and ducts. The intumescent pipe collars shall be fitted on both sides of the structural element.

SUB-SECTION B19 – DATA/VOICE COMMS INSTALLATION

B19.1 GENERAL

The Contractor shall include in his tender price for the supply and installation of all conduits, adaptable boxes, outlet points, trunking etc. necessary to facilitate the wiring of the data/voice outlets detailed on the tender drawings.

The specialist contractor shall install a network for the following;
AUDIO VISUAL EQUIPMENT
CCTV
General Local area Network
Other Network point locations required by specialist systems detailed within this specification.

Performance Objectives

The design intent is to provide an extensive and versatile 250Mbit/s structured cabling installation supporting Gigabit Ethernet capable of being easily modified and extended to accommodate future changes with minimal interruption to service and capable of supporting a multi-vendor, multi-product environment.

Design Parameters

The design parameters for Category 6 (Class E) are defined within ISO 11801 (2002); TIA/EIA 568B 2-1, BS EN 50173-1 (2002) and BS7718.

System Description

The computer networking installation works under this Contract shall comprise the system infrastructure i.e. wiring closets, patch panels, cabling, room outlets, etc, and the provision of active equipment. All cable trunking and conduit for the data system is provided by the Electrical Sub-contractor.

The IT infrastructure shall consist of horizontal **KRONE CAT 6** UTP LSZH copper data cabling from distributed patching locations to the desktop or other final outlets as indicated in the system drawings.

Where required multimode OM2/OM3 50/125um fibre optic cable shall extend from the Main Communications cabinet to the intermediate Communications Cabinets.

Where required multipair voice cable shall extend from voice patch panels at the cabinets to a Voice Termination Box located adjacent tot the PABX or Telecomm Incomer Position.

B19.2 COMMUNICATIONS CABINET

All modular distribution equipment, including UTP patch panels, patch lead organisers, active equipment, etc, shall be housed within the communications cabinet.

The wiring closet shall comprise of 1no **24U 800x 800 floor standing 19" rack cabinet**. Each cabinet shall be fitted out as follows: -

Plain steel sides, rear and top panels
Fully glazed lockable door
Adjustable internal frame with a facility cable retention on both sides for cable support
Key lockable handle
Fixed shelves
4 way Fan tray
10 way PDU should be included
Cabinets should have brush plates or other such entry mechanism to ensure cable entries are tidy and sealed to IP21
Cabinets should be provided with full vertical cable management

Cabinets should be suitable for top and bottom cable entry, mounted on plinths with side openings in each of four directions

Each wiring closets shall be sized to provide capacity for 50% expansion minimum.

Following completion of all installation works, each wiring closet shall be thoroughly cleaned inside and outside, to remove all dust, debris, cable off-cuts, etc prior to installation and connection of the active equipment.

All room outlets shall be terminated on to RJ45 patch panels back at the wiring closet.

B19.3 UTP CABLING

The complete **KRONE** UTP LSZH infrastructure; patch panels, cabling, outlets, patch cords etc must comply **as a minimum to Cat 6**, 1000Mbit/s standards and be installed to TIA 568-B-5 and ISO 11801 standard with channel performance specified up to 250Mhz.
The system will be required to support, as a minimum, the following.
Token Ring 4,16,32, and 100 Mbps
Ethernet 10 BaseT
IBM 3270 SNA
IBM S/36,38 AS/400
RS 232
ISDN
TPDDI
100 Base-T Ethernet
1000 Base-T Ethernet
The wiring convention to be used throughout is AT&T 258B.
UTP cables shall be terminated on wall mounted patch panels at the distribution patching locations as described above. Wiring tie bars shall be used to relieve the strain on the connectors.
The distance between the distributed patching panel location and the room outlet must not exceed 90 Meters as measured by a Fluke Cat 6 test instrument with the NVP set to the manufacturer's recommended value.
The maximum distance of the horizontal subsystem channel, end to end including patch cords, must not exceed 100Meters.
The Minimum distance for Cat6 installations is 15m.
Cabling shall be terminated using the manufacturer's recommended method and tools only.
Labelling

Patch panels, cables and outlets shall all be indelibly labelled using proprietary cable marking system of rings or tags. The format of which shall be agreed with the engineer.

B19.4 TESTING AND COMMISSIONING

The UTP system shall be tested using specialist test equipment to prove that: -
There is cable pair continuity
That cable pair polarity has been maintained i.e. that the two cables within the pair are not reversed.
Cable pair shorting, both within a particular pair and between adjacent pairs, does not exist.
The installation will be capable of operating in excess of 1000Mbit/s.
The cable meets the manufacturer's performance characteristics.
All pairs in the cable shall be subjected to the following **CAT 6 PERMANENT LINK** tests which shall perform to at least **250MHz:**
Length**All pair lengths are to be measured in Meters with an agreed NVP.**

Delay
NEXT
Attenuation
ACR
Impedance
Return Loss
PSACR
PSNEXT
Pair Loop Resistance
Capacitance
ELFEXT
PSELFEXT
Each test result shall be identified by a three-digit cable number, padded with leading zeros where appropriate.
The contractor shall also prove that:
The cables are correctly installed with respect to strain relief and bend radius.
All labelling at both ends of each cable has been completed.
Appropriate Test Certificates and Certificates of compliance shall be provided for all the above for each system together with a twenty year full system manufacturer's warranty.

B19.5 ACCESSORIES

The electrical contractor shall supply and install the faceplates complete with suitable cut outs for the installation of the room outlets.

The cut out dimensions shall be agreed with the specialist cabling installer prior to the installation, but in general should comply with the European LJU6C Standard

B19.6 FIBRE OPTIC BACKBONE CABLING

The backbone fibre optic cable will be **8 core OM2/OM3 50/125 multimode** and shall comply to IEEE 802.3z, and ISO 11801 standards.

Fibre must have min bandwidth of 2000/500 MHz.km and be able to support 10 gigabit Ethernet over a distance of 900 mtrs at 850 nm.

The fibre shall be terminated at both ends using the fusion splice method.

The complete fibre optic infrastructure (patch panels, cabling, patch panels etc.) must comply as a minimum to 500Mhz.km @ 850nm standard.

Fibre optic cables will be terminated on patch panels at both the new wall cabinet and at the existing main server cabinet.

B19.7 FIBRE OPTIC TESTING

The contractor must prove that:

The cable meets the manufacturer's performance characteristics.
The installation will be capable of operating in excess of 1000Mbit/s.
Tests to be carried out using a CertiFibre testing instrument or equivalent.

The fibre optic cable shall be subject to the following tests using specialist test equipment.
Length
Propagation
Dual Fibre Loss

The fibre optic system shall also be tested to prove that:

The installation will be capable of an operating bandwidth in excess of 500MHz.km with attenuation ≤2.8dB/km @ 850nm.

B19.8 THE CONTRACTOR SHALL ALSO PROVE THAT:

The cables are correctly installed with respect to strain relief and bend radius.
All labelling at both ends of each cable has been completed.
Appropriate Test Certificates and Certificates of compliance shall be provided for all the above for each system together with a twenty year warranty.

B19.9 VOICE SYSTEM BACKBONE CABLING

The size of each multi-pair cable should be agreed on site with the engineer and telephone specialist. The multi-pair should have a capacity for two pairs for every telephone outlet.

The voice backbone cable for this project shall consist of a 100pair cable from the comms cabinet to the PABX location.

The IT cabling specialist will install and terminate these cables in a voice patch panel in the comms cabinet. These cables will be terminated at the PABX end in a Krone 301 box.

B19.10 PATCH CORDS

Patch leads shall complete the UTP cabling installation and shall be manufactured from the same manufacturer as the UTP cable to ensure end-to-end continuity of the installation.
The patch leads shall be provided for each room outlet and at the patch panel for patching to voice/data panels.
The number of patch cords shall equal the number of outlets and also the number of cables at the patch panel.

B19.11 WIREWAYS

All UTP and fibre optic cabling shall be installed between the distributed patching locations and room outlets in a system of galvanised steel basket and trunking in the ceiling void and extending to the room outlets in conduit.

Cable basket, trunking and conduit shall be installed by the electrical contractor who shall liase with the specialist cabling installer to agree suitable routes and bending radius.

All UTP and fibre optic cabling shall be tie wrapped at 2m intervals to provide a tidy and unstrained presentation.

Cable routes for the UTP cabling should be separated as far as reasonably possible from high electrical loads, power cables, Lift Machine Rooms and Lighting Electronic ballasts which may cause interference.

B19.12 SYSTEM WARRANTY

Upon Practical Completion, the IT Sub-Contractor will be required to warrant the installed system against defects of workmanship or materials for a period of not less than **20 years** from the date of Practical Completion.
The specialist IT Sub-Contractor must provide a **KRONE 20-year SYSTEM warranty** for the installed and must therefore be a System Installer.

B19.13 TRAINING

The contractor shall include for one full day training with the end user to cover in detail all aspects on the IT installation.

B19.14 OPERATING AND MAINTENANCE MANUALS

The contractor shall include for two full sets of operation and maintenance instruction manuals. The documentation, which shall describe in detail all aspects of the IT installation, will be in an agreed word processing package.

The documentation shall include a set of record drawings which shall incorporate all changes and alterations that have occurred subsequent to project commencement. The contractor shall keep on site a complete set of up-to-date prints which a drafts copy will initially be submitted two weeks before completion to the consultant engineer for comment before submission to the client.

B19.15 SPECIALIST INSTALLER

The electrical contractor shall employ the services of a specialist AV contractor to supply, install and commission throughout the project a High performance IPTV system. The system shall be as specified hereafter and as indicated on the drawings. The specialist installer must be a **Krone System Specialist** installer.
The Specialist Sub Contractor shall be required to, supply, install and terminate all cabling associated with the system. Only Krone Cat6 cable will be permitted for this project.
Prior to the commencement of works the specialist contractor shall provide full wiring and layout drawings & schematics for the installation. All equipment as described in this system specification and indicated on the drawings shall be supplied in their entirely.
It is the responsibility of the specialist contractor to provide a complete and satisfactory system installation
The specialist installer must be a ***KRONE*** approved partner and installer The specialist will be as follows:

ClearAV Ltd
1 Crescent Business Pk.
Lisburn
BT28 2GN

Contact: Terry McParland
Tel: 028 92667030
Mob: 079 18906888

OR EQUAL AND APPROVED

SUB-SECTION B20 - PRE-COMMISSIONING AND COMMISSIONING

B20.1 GENERAL

The Contractor shall be responsible for the pre-commissioning and commissioning of all systems as detailed hereinafter and shall include in his tender figure for all costs which may be incurred due to compliance with the requirements of this section.

The terms, pre-commission and commission are defined as follows:-

Pre-commission shall mean the testing, checking and adjustment of each individual component within a system to ensure that its operation is satisfactory, its mechanical and electrical connection are correct and in accordance with the manufacturer and/or suppliers instructions and/or wiring diagrams and installation manuals and to ensure that it is functional and in working order.

Commission shall mean the testing and operation of each **system** to ensure that it is operating as designed and that the function under control (temperature, pressure etc.) is being maintained within design limits and also that the response of the system to changes in the variables being monitored by the system is satisfactory.

Sub-Contractor to allow one full day post-tender to sit down with Triangle for post-project evaluation meeting, including a questionnaire and review process.

Sub-Contractor to allow one full day following practical completion to attend site during tenant viewing day for demonstrations, etc.

B20.2 IMPLEMENTATION

The Contractor shall ensure that all information necessary to comply with the above requirements is made available by the relevant suppliers.

The Contractor shall include for all site visits necessary by the suppliers or their agents to ensure compliance with the above.

The Engineer shall be at liberty to attend all pre-commissioning checks and commissioning checks as he deems necessary.

The final commissioning of the plant and all systems therein shall be carried out in the presence of the Engineer, the Client and any such representatives which the Client may deem necessary.

Should the systems fail to commission for any reason the process must be repeated at a later date after all faults have been corrected.

The Contractor may at his discretion employ the services of the supplier or his representative to carry out commissioning of any or all of the systems. A commissioning certificate must be supplied for each system tested.

Systems which are commissioned in the absence of the Engineer shall not be accepted and the commissioning will require to be repeated in the Engineer's presence.

B20.3 LIAISION WITH OTHER TRADES

The Contractor shall liaise with all other trades through the contract to ensure that all information necessary is obtained from; other trades (motor overload ratings etc.) and that all equipment provided by others is obtained and all equipment to he handed over to others for installation is duly handed over.

It shall also be necessary for the Contractor to ensure that the heating installation is operative to allow commissioning of the various heating systems.

B20.4 INSTRUCTION AND INFORMATION

The Contractor shall instruct the Client or his appointed representative in the operation of all systems supplied and commissioned by him. 4 No. copies of a bound building owner's manual shall be compiled by the Contractor and shall include the following:-

1. Description of all equipment installed, including details of type, manufacturer, catalogue reference number and name, address and contact telephone numbers of the equipment representative in Northern Ireland.

2. operating instructions for all systems.

3. operating and maintenance instructions for all items of equipment supplied by the Contractor.

4. installation and wiring diagrams.

5. 'As installed' drawings in protective vision envelopes.

6. all guarantees,

7. all commissioning certificates

The manual shall also be provided in electronic format on compact disc or digital versatile disc, documents to be in Adobe Acrobat or Microsoft Word formats, and 'As installed' drawings in AutoCAD 2002 format.

A condensed manual shall be provided in a bound A4 size tenant information pack to be handed over on completion of each dwelling.

The Contractor shall provide 1No. completed tenant information pack, prior to handover of first dwelling, to the Client or his appointed representative for approval.

B20.5 SYSTEMS

The Systems referred to above shall be all those installed under the Electrical Sub-Contract Works.

B20.6 INSPECTION AND TESTING:

- The installation shall, on completion and before being energised, be inspected and tested in accordance with Part 6 of the IEE Regulations Requirements for Electrical Installations (17th edition, BS 7671).
- The Engineer shall be given not less than 24 hours notice before commencing tests.
- After satisfactory completion of tests submit copies of inspection and completion certificates to the Supervising Officer, or Consultant Mechanical and Electrical Engineer.
- All test instruments shall be provided by the Electrical Sub-Contractor who shall note the instrument serial numbers on the test certificates.

B20.7 INSPECTION, INITIAL TESTING, COMMISSIONING AND CERTIFICATION OF FIRE ALARM SYSTEM:

- To BS 5839 Part 1 Clause 26.
- Engineer shall ensure that the test of the smoke alarm system in each dwelling is carried out and witnessed within two weeks of occupancy and that the tenant has been instructed in the periodic cleaning and weekly operational proving test.
- Engineer to be given not less than 24 hours notice before commencing tests.

-The engineer will require 1 full electrical inspection to be carried out of a randomly selected apartment after all electrical certificates have been provided and prior to handover.

- After satisfactory completion of tests submit one copy of certificates, one copy to the Client.
- All Certificates to be utilising the NICEIC Certificates.

SECTION C

GENERAL ELECTRICAL SERVICES SPECIFICATION

SECTION C1 - SUMMARY OF REQUIREMENTS

C1.1 SCOPE OF CONTRACT

This Contract includes for the supply, delivery, loading, unloading, setting in position, erecting, testing and finishing in every respect complete and ready for use of all materials and equipment necessary for the satisfactory installation of the works hereinafter described, all in accordance with the Conditions of Contract and the true intent and meaning of the drawings and specification.

C1.2 PROGRAMME OF CONTRACT

As soon as possible after his tender is accepted, the Contractor shall produce, in agreement with the Engineer, a Master Programme of the whole of the works, including the works of Specialists. Two copies shall be forwarded to the Engineer and one copy retained in the Site Office and kept up-to-date by the regular recording of progress. This chart shall be modified or redrafted at the instruction of the Engineer should any circumstances arise affecting the progress of the works.

C1.3 DEFINITION OF TERMS (ADDITIONAL)

1. The term "I.E.E." Regulations shall mean the 17th Edition of the Regulations for the Electrical Installation issued by the Institution of Electrical Engineers (BS 7671: 2008) incorporating the latest issued amendments.

2. The term "To Install" shall mean to erect or secure, wire, connect, test and leave in working order.

C1.4 TESTING

The Contractor shall carry out all tests as required by the Wiring Regulations, Part 6 Inspection and Testing. The Engineer shall provide the Contractor with all the technical design information required to carry out testing.

The tests to be carried out shall be completed in the following order:-

1. Visual Inspection: Clause 611 (including all sub-clauses)*

2. Testing : Clause 612 (including all sub-clauses)*

The following tests shall be carried out in the sequence indicated below:-

- Continuity of protective conductors, including main and supplementary equipotential bonding conductors.
- Continuity of ring final circuit conductors.
- Insulation resistance
- Protection by SELV, PELV or by electrical separation
- Insulation resistance/impedance of floors and walls
- Polarity
- Earth electrode resistance.
- Protection by automatic disconnection of the supply
- Earth fault loop impedance.
- Additional protection
- Prospective fault current
- Check of phase sequence
- Functional testing
- Verification of volt drop

In the event of any test indicating failure to comply, that test and those proceeding, the results of which may have been influenced by the fault indicated, shall be repeated after the fault has been rectified.

Following the initial verification required by Chapter 61 the Contractor shall submit a Completion Certificate and Inspection Certificate in the form set out in Appendix 6 for the completed works or any section thereof as may be agreed. Final payment **cannot be authorised** until such completion and inspection certificates are handed to the Engineer.

The Engineer shall be at liberty to witness these tests and three clear working days' notification of intention to carry out these tests shall be given to the Engineer in writing.

* Refers to Clauses in the Wiring Regulations.

C1.5 POSITIONS OF EQUIPMENT

The positions of the equipment, including light points, sockets, fused connection units shown on the drawing are approximate and are to be used for tendering purposes only.

The exact positions shall be determined on site with the Engineer and Contractor before commencement of work.

C1.6 IDENTIFICATION, NOTICES AND LABELLING

All switches (other than local lighting switches and switch socket outlets) and electrical equipment shall be clearly labelled as to their function or purpose. Such labels shall be of the engraved and colour filled bakelite or Traffolyte type or equal and approved and shall be screwed not stuck in place.

The labels referred to above are to indicate the purpose or function of the switch and are not be confused with the labels specified in Clause 805 which are to be fitted to the conduit box of the relevant switch socket or isolator and shall indicate the distribution board reference and circuit designation.

All circuit labels on the switchgear shall be completed stating the circuit controlled (and in the case of fuses shall state the rating of fuse to be used).

Identification shall be in accordance with Clause 514-1* to 514-14* of the Wiring Regulations.

C1.7 SPECIAL NOTE ON 17TH EDITION OF WIRING REGULATIONS

The Contractor shall ensure that the complete installation shall comply with the 17th Edition.

For Contractor's guidance and without prejudice to the statement in the paragraph above, we give some guidance on this matter.

1. The Engineer will provide design data on all electrical circuits as planned. The Contractor shall advise the Engineer if he has deviated from these design requirements and if so, provide his own calculations to show that the deviation still complies with the Wiring Regulations.

2. The Contractor shall pay particular attention to the requirements of earthing.

3. The Contractor shall ensure that the requirements in connection with switching and isolation are carried out.

4. The Contractor shall carry out tests in accordance with Part 6 of the new Wiring Regulations.

SUB-SECTION C2 - SWITCHGEAR

C2.1 GENERAL

The Electrical Contractor shall supply and install all switchgear necessary for the complete and proper operation and protection of the completed Electrical Engineering System.

All Fuse Switches, Switch Fuses, R.C.B.O.'s, H.R.C. fuses and distribution boards shall be of that size hereinafter described, or as may be shown on the relevant drawings associated with this specification or as may be detailed in the schedules associated with this specification.

The Electrical Contractor shall refer to Section B2 of the particular electrical services specification for details of switchgear specified for this project.

C2.2 BUSBARS

All busbars and busbar connections shall be of the sizes or rating shown on the drawings, be of hard drawn, square edged, high conductivity solid bare, copper complying with BS1432. All busbar and associated connections shall be firmly secured and supported on self extinguishing polyester or fibre type mountings.

C2.3 DRAWINGS FOR APPROVAL

The Electrical Contractor shall forward detailed drawings showing wiring details and switchboard layouts to the Engineer prior to manufacture.

Approval of such drawings shall not however, exonerate the Electrical Contractor for any malfunction or deficiency in meeting the specification requirements in the switchboards which may become apparent only after it has been brought to site and energised.

Only when the Engineer has witnessed the satisfactory operation of the switchboards on site, will full approval of their manufacture be given.

C2.4 LABELS AND CIRCUIT CHARTS

Engraved labels shall be provided indicating the purpose of any switch or control device. The description to be agreed with the Engineer. Labels shall be solid 'Traffolyte' type firmly fixed in Position by brass screws ('Dymotape' or other non-permanent labelling will not be accepted.)

Typed or printed circuit charts shall be provided, perspex covered and fitted to the inside of the distribution board access doors. The chart shall indicate final circuit designation, type of phasing, type of protective device, maximum earth loop impedance, and the test value of the earth fault loop impedance. The chart shall also include the short circuit rating of the equipment or design value and the external loop impedance design value at 20 degrees centigrade.

C2.5 MULTIPHASE CIRCUITS

The Electrical Contractor shall ensure that the Electrical loads are balanced as evenly as possible over the three phases.

Where required, phase barriers and warning labels as detailed in the I.E.E. Regulations shall be supplied and installed.

All Plant or switchgear containing two or three phase circuits at a voltage greater than 250 volts shall be marked with a Red Danger label declaring the nominal voltage.

C2.6 SWITCH FUSES

Switch Fuses shall be of the sizes and capacities indicated on the drawings or detailed in this specification and be:-

1. of 500 volt rating, with self aligning contacts and be air break quick make and break pattern.

2. housed in a heavy gauge sheet steel case with a fully gasketted hinged door which shall have clear indication as to the position of the switch ON or OFF.

3. provided with an interlock to prevent the door being opened when the switch is in the ON position and also to prevent the switch being operated when the door is open.

4. fitted with H.R.C fuses of the sizes indicated on the drawing or detailed in the specification, motor rated type where applicable.

5. certified to meet the requirements of BS 5419 and be A.S.T.A. tested.

6. As manufactured by Bill Switchgear or equal and approved.

C2.7 FUSE SWITCHES

Fuse switches shall be similar in specification to switch fuses with the exception that the fuses shall be secured to the moving carriage.

C2.8 R.C.B.O.'s

The residual circuit breakers, with over current protection, shall:-

1. Have silver faced contacts;

2. have thermal-magnetic RCD device with 30mA sensitivity;

3. have positive contact indication of the phase conductor;

4. have 10kA breaking capacity;

5. have tunnel cable connectors;

6. incorporate a filtering device to limit unwanted tripping due to transient voltages:

7. be manufactured in accordance with BS EN 61009-1 and BS IEC61009-2-2 having a breaking capacity as stated in the Schedules or drawings associated with this specification.

8. be as manufactured by Square 'D' or equal and approved

C2.9 DISTRIBUTION BOARDS

Distribution boards shall be TP/N or SP/N of sizes and capacities specified in the Schedules and be:-

1. fitted with protective devices of the ratings stated in the schedules or drawings associated with this specification.

2. fitted with deep dividing and insulated fillets between phase banks and the neutral bar;

3. provided with an insulated neutral bar with a separate terminal for each circuit;

4. enclosed in an amply proportional heavy gauge (minimum 16 s.w.g.) rustproofed one piece sheet steel case fitted with a solid sheet steel door secured to the case with hinge and cylinder type lock, or similar device;

5. industrial pattern unless incorporated in a cubicle switchboard;P6.fitted with 'Traffolyte' labels, one engraved in black to indicate the purpose of the board and another engraved in red 'DANGER 400 VOLTS' when accommodating more than one phase, screwed to the outside of the door;

7. provided with a circuit duct;

8. when accommodating more than one phase be fitted with the appropriate phase identification colour disc adjacent to each fuse bank;

9. manufactured in accordance with the relevant BSEN 60439;

10. provided with double pole 100 amp switch where of the SP/N consumer unit type.

11. manufactured by Square ‘D’, as detailed in the 'Particular' electrical services specification or equal and approved;

C2.10 CONTACTORS

Contactors shall be:-

1. silent in operation having a D.C. coil supplied by a full wave rectifier;

2. fitted with silver faced, single break type main contacts which close with a wiping action or rolling action;

3. fitted with auxillary contacts and remote control fuse where called for;

4. suitable for 2-wire remote control;

5. mounted in sheet steel enclosure with a lift off or hinged front cover, of corrosion resistant finish, of epoxy resin undercoat oven dried and finished with one coat of melamine stove enamel. Alternatively provide with a thermo plastic constructed case.

6. fitted with integral hand/auto/off switch where called for or having switch mounted adjacent;

7. comply fully with BS. 5424 Part 1.

8. of Crabtree Ltd, E.N. Bray or M.T.E. manufacture K.M. Manufacture of equal and approved;

C2.11 HOUSE SERVICE UNITS

House service units shall be of the sizes and capacities indicated on the drawings or detailed in this specification and be:-

1. of 240 volt 100Amp rating single pole and neutral.

2. of glass reinforced polyester moulding.

3. provided with fuselink, fuse carrier and 80Amp fuse to BS 1361.

3. certified to meet the requirements of BS 7657.

4. as manufactured by W.T. Henley Ltd. or equal and approved.

C2.12 LOCAL ISOLATORS

Local isolators shall be as manufactured by Messrs. Wylex Ltd., type 921E surface metalclad type, for single and three phase circuits up to 20 amp. unless otherwise instructed or for flush installations.

C2.13 TIMESWITCHES

Timeswitches unless otherwise specified shall be quartz controlled, 1 pole, 1 throw rated, at 20-amp. with independant motor connections and be as manufactured by Sangamo Controls Model Q554 Form 3. A rechargeable battery enclosed in the unit shall allow the switch to operate for a period of 100 hours after the interruption of the electricity supply.

C2.13 SEALING GLANDS

Proper sealing glands shall be provided for all M.C.C.B's and isolators accommodating entry of armoured cables.

C2.14 RUBBER MATS

The Electrical Contractor shall supply and install suitable rubber mats complying with BS.921 - 1976 in the main switchroom. The mats shall be 1 metre wide and 2.0 metres in length. Additionally rubber mats to be provided at each subswitchboard and each Mechanical Services control panel.

C2.15 KEYS

Each switchboard or sub-switchboard shall have only 1 type of key to open all locks thereon.

The Electrical Contractor shall supply 2 sets of keys for each sub-switchboard to the Engineer.

C2.16 COMMISSIONING OF PLANT

The Electrical Contractor shall allow in his tender for all switchboards and control panels to be commissioned on site before the project is handed over and for the instruction of the employer's staff in the operation of all switchboards and control panels.

C2.17 SEALING GLANDS

Proper sealing glands shall be provided for all switchfuses and isolators accommodating entry of armoured cables.

SUB-SECTION C3 - CONDUIT AND TRUNKING

C3.1 GENERAL REQUIREMENTS

The Contractor shall refer to Section B3 of the Particular Electrical Services Specification for details of conduit and trunking specified for this project.

C3.2 PVC CONDUIT

PVC conduit shall be manufactured in accordance with BS 4607 Part 2 and shall be:-

1. Heavy gauge high impact round conduit unless otherwise specified.

2. Complete with bends, couplers, joints, glands, etc.

3. Set with bends only using proper springs for sizes up to 25 mm diameter only. 90 degree bends shall be by factory set pieces.

4. Joint into couplers, bends spouted fittings by means of semi-permanent mastic sealing compounds or a permanent solvent where ingress of moisture must be prevented.

5. Clipped on horizontal runs at intervals not greater than 0.9 m and or vertical runs at not more than 1.2 m using saddles of the spacer bar type. [U - clips are not acceptable] Stainless steel screws and fixings are required.

6. Fitted with expansion couplers on straight runs in excess of 4 m length or where conduit is installed in locations where the temperature variations is above normal or average conditions.

7. Installation shall be in accordance with manufactures recommendations.

8. Of MK Egatube, Marshall Tufflex Ltd. or Mita Ltd. manufacture.

9. Where conduits are concealed behind plaster they shall be securely fastened to the walls by galvanised steel crimpets. Care shall be taken to avoid damage or squashing of the conduit.

C3.3 GALVANISED CONDUIT

Galvanised conduit shall be manufactured in accordance with BS 4568 free from rust patches or other defects and not less than 20 mm external diameter for conduits carrying mains voltage circuits and be:-

1. protected from mechanical damage and weather when stored on site;

2. carefully reamed to remove all sharp edges and burrs. Oil and filings to be completely removed before erection and already cut threads cleaned by running dies over them and then wiping clean.

3. fully protected to prevent ingress of plaster etc. into boxes and fittings during building works and swabbed dry before wiring is commenced;

4. coated with red or white lead on cut threads and shall have joints screwed tightly using pipe wrenches and spanners and made watertight and after erection have all exposed threads painted with red or white lead;

5. arrange to butt-in solidly boxes, couplers, accessories etc., using looping-in or standard boxes as required by the S.O.

6. where installed on the surface runs shall be in keeping with the architectural features of the premises, fixed by spacer bar saddles using 32 x No.8 brass screws and rawl plugs at not more than 1200 mm intervals;

7. where concealed, fixed into the solid concrete or brickwork by means of crampets at 1200 mm intervals;

8. in accordance with Appendix 12 of the Wiring Regulations in respect of sizes;

9. fitted with locknuts on all running couplings and only couplings and locknuts having smooth even bearing faces shall be used;

10. set on site to form all bends, using bending machine, all sets shall be neatly made and shall not constrict the bore;

11. held in an efficient vice for screwing; badly marked conduit or poorly cut threads shall not be accepted;

12. coupled to adaptable, looping-in, switch and socket outlet boxes and made watertight by brass hexagon smooth bore brass bushes inside with flanged couplings outside;

13. provided with an inspection box where a run exceeds 8 m. or has more than two right angle bends using only circular or adaptable type boxes. Inspection of solid tees or elbows will not be permitted;

14. not be concealed before inspection and not be dismantled for wiring;

15. not be installed with 150 mm of gas, water, L.P.H.W. or steam pipes or any associated work and where this is not possible, approved insulation spacers shall be used and the pipes concerned shall be bonded using strips and brass bolts and washers.

16. Have 35 mm minimum depth of cover where buried in concrete. Where buried in plaster, conduit shall have at least 5 mm depth of cover over its entire length.

17. Where buried in the carcase of a building, all open ends shall be temporarily plugged to prevent the ingress of foreign matter, moisture or water.

18. Wrapped with waterproof building paper for a distance of 300 mm each side where conduit buried in concrete crosses air expansion joint in the concrete.

C3.4 CONVERSION GLANDS

All continental sized knockouts in isolators, socket outlets or other accessories shall be connected to the conduit system using special conversion glands

C3.5 CONDUIT BOXES (METAL)

Metal Conduit Boxes shall be manufactured in accordance with the appropriate British Standard and shall be:-

1. fitted with cover lids of similar material, secured in position with substantial brass screws;

2. used to facilitate wiring up to 6 mm^2 cross sectional area, (For wiring of cables of greater cross section area, through boxes shall be used;)

3. of weatherproof type and packed with an approved waterproof plastic compound after wiring where erected in positions exposed to the weather and external to buildings.(IP 65)

4. of the multiple adaptable type, where two or more conduits run parallel.

NOTE: Conduit boxes for lighting switches, sockets, etc. shall be manufactured to suit the particular accessories, in steel and zinc electro-plated complete with earthing terminal and adjustable lugs
As manufactured by Crabtree Ltd, BG Electrical Ltd. or MK Electric or equal and approved.

SUB-SECTION C4 - CABLES AND INSTALLATION METHODS

C4.1 GENERAL

The Contractor shall refer to Section B4 of the Particular Electrical Services Specification for details of cables and installation methods specified for this project.

C4.2 LSF INSULATED CABLES

Where LSF insulated cables shall be used for wiring of circuits, the Contractor shall forward the name of the cable manufacturer and technical specification of the cable to the Engineer.

The cables shall be 500 volt grade manufactured by one of the following manufacturers, AEI Cables Ltd, B.I.C.C. Ltd., Delta Crompton Cables, Prysmian Cables & Systems, and approved by the Engineer and be:-

1 delivered on site in unbroken sealed drums each with a label stating the maker's name and particulars of test which must comply with the requirements of the relevant British Standard;

2 finished for single phase circuits in blue for neutrals and on all other including strapping wires in brown and for circuits with two or more phases each shall be finished in the same colour as the circuit to which it is connected;

3 completely enclosed in conduit and/or trunking;

4 neatly bound together in circuits with cable ties and labelled with engraved traffolyte identification tabs at intervals of 3 m. where run in trunking;

5 neatly cabled and bound together in permitted groups with cable ties in distribution boards;

6 terminated where entering a terminal by 'doubling up' the strands sufficiently to fill the terminal holes;

7 not smaller than:-

1.5 mm^2 for lighting with stranded copper cores 7/0.50
2.5 mm^2 for sockets with stranded copper cores 7/067

Single Core Cables in these sizes are not to be installed.

8 connected at distribution boards, fittings or switches (joints will not be permitted);

9 drawn into conduit only after all conduit work, including terminal boxes, is complete and only after all plastering in the particular area has been finished;

10 neither 'kinked' nor trampled on, nor come into contact with conduit cuttings, sharp edges, oil etc.

11 if in any way damaged, cable shall be removed from site;

12 installed so that they are at least 150 mm, from any water or gas pipe. The Contractor shall instruct and co-ordinate all trades in this matter;

13 in accordance with BS.6004, BS.6231 type B and BS.6346.

C4.3 PVC/PVC INSULATED CABLES

PVC/PVC insulated cable shall generally be as specified in Clause C4.2 and shall comply with BS.6004, BS.6231 type B and BS.6346.
Where PVC/PVC cables are run across floor joists, such joists shall be neatly bored at least 50 mm from ceiling or floor and the cable threaded through.

Where run in walls the cables shall be suitably protected by round plastic conduit.

Where run in stud partition the cable shall be suitably protected by means of a rubber grommet or plastic bush when entering an accessory enclosure.

PVC/PVC cables shall be manufactured by one of the manufacturers listed in Clause C4.2.

C4.4 FLEXIBLE CORDS

All flexible cords shall be of the heat resisting 300/500 volt butyl rubber EPR or silicone rubber insulated type in accordance with the relevant BS specification.

Lighting Fittings (Plain Pendants). The connection between the ceiling rose and lampholders shall be by means of a .75 mm^2 twin core silicone rubber insulated and glass braided cable (BS.6500) of approved colour for positions in areas with wood floors. For areas of floor other than wood the cable shall be sheathed in silicone rubber, (i.e. damp area; bathrooms, kitchens and stores).

Immersion Heaters and Other Equipment. The final connection to an immersion or other fixed appliance shall be by means of a 2.5 mm^2 or E.S.P with C.S.P. sheath.

Flexible cords must **NOT** be concealed.

Flexible cords shall be the product of one of the manufacturers listed in Clause C4.2.

C4.5 SPLIT CONCENTRIC CABLES

Where split concentric cables shall be used for wiring of circuits, the Contractor shall forward the name of the cable manufacturer and technical specification of the cable to the Engineer.

The cables shall be 600/1000 volt grade manufactured by BICC Cables or equal and approved and be:-

1 delivered on site in unbroken sealed drums each with a label stating the maker's name and particulars of test which must comply with the requirements of the relevant British Standard;

2 plain annealed copper conductor, PVC insulated, surrounded by a concentric layer of plain annealed copper neutral conductors, PVC insulated, and bare copper conductors, with black PVC oversheath;

3 completely enclosed in conduit and/or trunking;

4 not smaller than:-

16 mm^2 for sub-mains cabling
6 mm^2 for site lighting cabling

5 connected at distribution boards, fittings or switches (joints will not be permitted);

6 drawn into conduit only after all conduit work, including terminal boxes, is complete and only after all plastering in the particular area has been finished;

7 neither 'kinked' nor trampled on, nor come into contact with conduit cuttings, sharp edges, oil etc.

8 if in any way damaged, cable shall be removed from site;

9 installed so that they are at least 150 mm, from any water or gas pipe. The Contractor shall instruct and co-ordinate all trades in this matter;

10 in accordance with BS 7870.

C4.6 XLPE INSULATED CABLES

Where XLPE insulated cables shall be used for wiring of circuits, the Contractor shall forward the name of the cable manufacturer and technical specification of the cable to the Engineer.

The cables shall be 600/1000 volt grade manufactured by Draka UK Ltd. or equal and approved and be:-

1 delivered on site in unbroken sealed drums each with a label stating the maker's name and particulars of test which must comply with the requirements of the relevant British Standard;

2 stranded plain annealed copper conductors, XLPE insulated, PVC inner covering, with black high impact resistant PVC oversheath;

3 not smaller than:-

1.5 mm^2 for site lighting cabling

4 connected at distribution boards, fittings or switches (joints will not be permitted);

5 neither 'kinked' nor trampled on, nor come into contact with conduit cuttings, sharp edges, oil etc.

6 if in any way damaged, cable shall be removed from site;

C4.6 SEGREGATION OF CABLES

Separate conduit systems shall be used for the following groups of cables:-

1. 230/400 volt systems cabling

2. Telephone system cabling

3. Smoke detector system cabling

C4.7 CABLE SIZES

The size of all cables shall be as scheduled or shown in the relevant drawings and schedules associated with this specification.

SUB-SECTION C5 - EARTHING ARRANGEMENT AND PROTECTIVE CONDUCTORS

C5.1 GENERAL

The earthing requirements shall be carried out in accordance with requirements of the Wiring Regulations (Chapter 54).

The Contractor's attention is drawn to the implication of the earthing arrangements required by the 17th Edition of the Wiring Regulations. It is necessary to ensure that his staff are instructed and are conversant with the new requirements.

The provision of an equipotential zone requires supplementary bonding of all exposed extraneous metal components such as steel handrails, metal partitions and benches, heating pipework, extract fan ducting, sinks, showers and many other examples. This requires special conduit or access provision at an early stage of the work.

Main equipotential conductors are required for heating, gas, water and oil pipes, structural steel work and ventilation ductwork.

C5.2 MAIN EARTH TERMINAL

A main earth terminal or busbar duly designated shall be provided at the main switchgear position to facilitate the connection of the circuit protective conductors and the mains equipotential bonding conductors.

C5.3 MAIN EQUIPOTENTIAL BONDING CONDUCTORS

The main equipotential bonding conductors shall be protected throughout in 20 mm galvanised conduit and shall be fitted with **crimped lugs** at each end for connection to the pipe clamp or metalwork.

Main equipotential bonding conductors to any oil, gas or water service pipes shall be made as near as practicable to the point of entry of those services into the premises and shall be 10 mm^2 in size.

Where the earthing system provided by the supply authority is TN-CS (P.M.E.) the Contractor shall consult with the supply authority to determine any special requirements concerning the size of protective conductors.

C5.4 CIRCUIT PROTECTIVE CONDUCTORS

Circuit protective conductors shall be sized in accordance with Regulation 543.1. The minimum size of the Circuit Protective Conductor is stated by the Engineer and is given in the Schedule of Distribution Boards and Sub-Mains for the project in Part 2 of this specification.

The size of the Circuit Protective Conductor is stated as that of a copper conductor in mm^2 Provided that the Circuit Protective Conductor used is equivalent to and has an impedance equal to or less than the copper size stated this will be acceptable. Where a continuous galvanised conduit system is being used, the impedance of the conduit per metre run shall be accepted as being equal to, or less than, that of the Circuit Protective Conductor up to a Circuit Protective Conductor size of 6 mm^2

Where a Circuit Protective Conductor size in excess of 6 mm^2 is called for a separate Circuit Protective Conductor shall be installed in the conduit along with the phase conductors.

Where the Circuit Protective Conductor is formed by conduit, trunking or metal sheath and/or armour of cables the earthing terminal of each socket outlet, light fitting, or switch shall be connected by a separate Protective Conductor to an earthing terminal incorporated in the associated box or other enclosure.

C5.5 SUPPLEMENTARY BONDING CONDUCTORS

The Contractor shall provide supplementary earthing bonding conductors to the points as shown on the drawings.

All supplementary bonding conductors shall be not less than 4.0 mm^2 PVC or equivalent i.e. 20 mm conduit.

Supplementary bonding shall be classified in specific types as described below:-

1. A 4 mm^2 PVC earth cable protected by 20 mm galvanised conduit shall run from the earth terminal in the nearest socket box, switchbox or isolator box to a standard metal conduit box (MK Ref. 866ZIC), positioned where shown on the drawings as a type 1 Bond. From the earthing conduit box the 4 mm^2 PVC cable fitted with a crimped lug at one end shall be fixed to the extraneous conductive part utilising a 10 x 4 mm brass bolt and nut.

2. A 4 mm^2 PVC earth cable protected by 20 mm galvanised conduit shall run from the earth terminal in the nearest socket box, switchbox or isolator box to a standard metal conduit box (MK Ref. 866ZIC) positioned where shown on the drawing as a type 2 bond.

   From the conduit box a 4 mm^2 PVC cable fitted with a crimped lug at one end shall be fixed to an earthing pipe clamp on the domestic water service pipe. The 4 mm^2 cable shall be connected to the extraneous conductive part via a flush mounted telephone cord outlet plate similar to M.K. Electric Ltd. List No.3541 WHI. The earthing pipe clamps shall be interconnected utilising 4 mm^2 PVC cable with a crimped lug shall be looped from one of the pipe clamps to the earth lug on the stainless steel unit, where applicable.

3. A pipe clamp shall be fitted on each of the domestic water service pipes. The clamps to be interconnected utilising 4 mm^2 PVC cable with crimped lugs at each end where applicable.

   The Contractor shall note that the positions and number of supplementary conductors shown on the drawings are for guidance only and are not complete.

   The Contractor shall check the positions of radiators, wash hand basins, heating pipes and any other extraneous conductive parts shown on the drawing prior to installing any conduits for type 1 or type 2 supplementary bonding conductors.

C5.6 EARTHING PIPE CLAMPS

All earthing clamps as described in Clause C5.5 shall be as manufactured by "Elmo", "Tenby" or "Henley" and shall be complete with a separate lug to accommodate the crimped lugs on the supplementary bonding conductors.

Crimping of lugs shall be carried out using a proper crimping tool, pliers or side cutters shall not be used for this purpose.

Perforated copper tape shall not be acceptable as an alternative to proper pipe clamps.

C5.7 LABELS

The Contractor shall supply and install:-

(a) engraved labels designating the circuit reference in all outlet boxes associated with earthing. These labels shall be Traffolyte having the circuit reference engraved thereon in 3 mm high letters i.e. G.P./3-R showing distribution reference and circuit designation.

(b) All earth bonds shall be provided with an appropriate metal label "Safety Electrical Earth, Do not remove".

SUB-SECTION C6 - LIGHTING

C6.1 LIGHTING SWITCHES

Local lighting switches throughout the installation shall be:-

1. of 20 ampere rating silent action, single pole and two way as indicated;

2. have insulated rocker operated dollies;

3. be flush mounted in surface steel boxes; or surface mounted on facing brick.

4. control the live side of the circuit;

5. comply in all respects with BS.3676 - amended December 1981;

6. be complete with indicators where required;

7. fitted with phase barriers and colour coded switch grids, where switch boxes contain more than one phase.

8. ceiling switches shall be 15 - A type A.C. only single pole finished white, mounted on a large galvanised conduit box and shall be of Crabtree manufacture or equal and approved;

9. all multi-gang switches, where shown on the drawings shall be suitably engraved as to their function. The exact wording shall be agreed with the engineer prior to engraving.

C6.2 LUMINAIRES

All luminaires shall be of the type shown on the Schedule of Luminaires as indicated on Drawing Nos. 3085-E1, E4 & E9 and where no type is shown, plain pendants consisting of ceiling roses flexible cords and lampholders as specified herein shall be erected and connected.

All outdoor luminaires are to be erected and connected in such a manner as to prevent the collection or ingress of moisture.

The Legend on each of the Exit Signs shall be agreed on site with the Engineer prior to ordering.

C6.3 CEILING ROSES

Ceiling roses shall be white bakelite moulded with fixed interiors mounted on large galvanised conduit areas as manufactured by Crabtree Ltd., Cat. No. 5860.

C6.4 FINAL CONNECTION TO LUMINAIRES IN SUSPENDED CELIINGS

Final connections to all luminaires in this Contract shall be by means of a conduit box mounted 6 Amp 4 pin terminal plug and socket in ceiling rose to a grommeted cable entry in each luminaire.

The plug in ceiling rose shall be manufactured by Ashley/Rock Ltd from their 'klik' range.

C6.5 FIXING OF LUMINAIRES IN SUSPENDED CEILINGS

All luminaires up to and including 300 mm wide and 1800 mm long shall be secured direct to 2 No threaded steel rods which shall be fixed direct to the building structure. All luminaires over 300 mm wide and up to 600 mm wide and 1800 mm long shall be fixed direct to the building structure using 4 No. threaded steel rods.

C6.6 TYPE OF SUSPENDED CEILING

The Contractor shall check the exact module and grid dimensions of suspended ceilings prior to ordering recessed luminaires to ensure that the dimensions of the luminaires are compatible with grid dimensions.

C6.7 EMERGENCY LUMINAIRES - TEST POSITIONS

At each switchgear position, as indicated on the drawings, the Contractor shall install a keyswitch for testing of the emergency luminaires.

A multigang gridswitch box shall be mounted at the switchgear position labelled "EMERGENCY LIGHTING - TEST POINT".

The gridswitch shall comprise of an indicator and key switch for each circuit containing emergency luminaires. The indicator lamp shall be illuminated when the mains supply is "ON" to the relevant circuit.

Circuit references shall be engraved below each key switch and the grid switch box shall be fitted with phase barriers where required.

C6.8 EMERGENCY LUMINAIRES

The Contractor shall supply and install where indicated on the drawing emergency luminaires.

The emergency lighting system shall comprise of two types of luminaires.

(1) Invertor, battery pack and changeover device incorporated in the normal luminaires to run a designed lamp way at a reduced output.

This modification shall be carried out by the manufacturer of the luminaire. On site modification shall not be acceptable.

(2) Single point self contained luminaires incorporating battery pack monitoring device and changeover device.

All emergency luminaires shall incorporated Nickel cadmum battery packs capable of maintaining the luminaire for 3 hours in the event of failure of the normal lighting supply. All emergency luminaires shall be I.C.E.L. certified. Supply to emergency luminaires shall be taken from the unswitched live side of the relevant lighting circuit. They shall be as detailed in the Schedule of Luminaires, following this section.

C6.9 TEST SOCKETS (NOT SHOWN ON THE DRAWING)

The Contractor shall supply and install, at the end of each lighting circuit, and connected to the last fitting of that circuit, a 3-pin 5-ampere switched socket outlet, wall mounted at high level, for testing purposes. The sockets shall be flush mounted where possible, and where this is not possible, surface mounted sockets shall be installed. The sockets shall be of Crabtree Ltd. manufactured to match the remainder of accessories. Wiring shall be carried out in 1.5 sq. mm. cable. Each socket outlet shall have its switch plate engraved 'TEST POINT (230 VOLTS)' and the relevant 'CIRCUIT REFERENCE'

Locations of Test Sockets shall be agreed with the engineer on site before installation.

SUB-SECTION C7 - GENERAL POWER INSTALLATION

C7.1 SWITCH SOCKET OUTLETS

Switch socket outlets shall be:-

1. installed where shown on the drawing.

2. of capacity 13 ampere unless otherwise stated, 3-pin BS. gauge shuttered pattern, single pole A.C. type switches.

3. mounted in rectangular steel boxes;

4. complete with dolly operated switch and suitable for flush or surface mounting.

5. provided with side finger shield pattern, fused plug tops complete with cartridge fuses;

6. manufactured in accordance with BS. 2814 connected to that switches control the live side of the circuits.

C7.2 MOUNTING HEIGHTS

The height to the underside of socket outlets, switches etc., shall be:-

Above Floors

Socket outlet in corridors, and public areas	-	450 mm
Fire Alarm Break Glass Point	-	1200 mm
Fire Alarm Bell or Siren	-	2100 mm
Fire Alarm Remote Indicator unit	-	2100 mm

Above Worktops

Over worktops and other working surfaces as shall be determined by the Main Contractor. The mounting height shall be 150 mm above the working surface.

Where the wall surface is tiled, the mounting position shall be completely ON or OFF the tiled surface.

Where otherwise indicated on the drawings.

The above items must be placed so that they are not obscured at any time by open doors nor affected by door handles.

C7.3 THERMOSTATS

Thermostats where indicated on the drawing shall be suitable for 220-240 volt operation with a switching capacity of 20A resistive. They shall have a single pole single throw on/off switch and shall incorporate an accelerator heater.

It shall be mounted 1650 mm above f.f.l. and set to maintain a cubicle temperature of 55^{o}F (13^{o}C).

SUB-SECTION C8 - FIRE ALARM SYSTEM INSTALLATION

C8.1 GENERAL

The Electrical Contractor shall supply and install a fire alarm system in each Block (2No. Blocks) incorporating a central control panel complete with all equipment necessary for the complete and proper running of the system as hereinafter specified.

The fire alarm installation shall conform fully to BS5839 incorporating latest amendments.

The Electrical Contractor shall refer to Section B8 for details of the fire alarm equipment specified for this project.

C8.2 WIRING

The complete fire alarm system shall be wired utilising 2.5 sq mm mineral insulated copper sheathed cable with a white low smoke and fume (L.S.P) overall sheath and shall be wired in such a way as to be rewirable i.e - enclosed in conduit when run in walls.

C8.3 DESCRIPTION OF SYSTEM

The system in each Block (2No. Blocks) shall consist of a main central control/indicator panel positioned as shown, to be complete with a stove enamelled enclosure. The panel shall be mounted at a height of 1.4 metres from floor to centre and be complete with integral power supply unit capable of maintaining the system for a mains input failure, period of 24 hours (minimum) with a further 30 minutes under full alarm/control conditions.

Alarm warning of fire shall be by means electronic sounders or bells as specified.

Automatic smoke / heat detectors and combined detector / sounders shall be installed at various locations throughout the building as shown on the drawings.

Manually operated breakglass actuating points shall be installed at various locations throughout the building.

All equipment shall be suitable for operation on a 24V D.C supply.

C8.4 SUPPLY TO SYSTEM

The system in each Block (2No. Blocks) shall be supplied via a 15-amp. SP/N switch fuse painted red and labelled "Fire alarm System: DO NOT SWITCH OFF" located in the main switchboard. This must be lockable and provided with an approved lock and key.

C8.5 CONTROL INDICATOR PANEL

All functions of the fire alarm control panel shall comply with the requirements detailed in BS. 5839 incorporating all amendments current at date of tender.

C8.6 FIRE ALARM SOUNDERS OR BELLS

Fire Alarm Sounders or bells shall mounted approximately 450 mm below ceiling level to the top of the sounder.

The sounders shall be suitable for surface mounting.

C8.7 FIRE ALARM MANUAL CALL POINTS

Fire alarm manual call points shall be of the constant pressure type moulded in red thermoplastic and shall comply with BS 5839 Part 2. A key test facility complete with key shall be incorporated in each unit. The units shall be suitable for flush mounting in standard conduit accessory boxes as specified previously.

C8.8 HEAT DETECTORS

Fixed temperature heat detectors shall be supplied and installed where shown on the drawing. The heat detectors shall be suitable for 24 volt D.C. operation, shall be preset at 57 degrees centigrade and shall be complete with a common mounting base.

All heat detectors shall incorporate a red L.E.D. indicator to indicate fire activation.

C8.9 SMOKE DETECTORS

All smoke detectors as indicated on the drawing shall be the ionisation chamber type or photoelectric type mounted on a common mounting base.

C8.10 DUCT MOUNTED SMOKE DETECTORS

The Electrical Contractor shall supply and install duct-mounted smoke detectors at the positions indicated on the drawing (if shown).

The unit shall comprise a sensor, sensor base and duct mounting unit.

C8.11 MOUNTING HEIGHTS

All pushes and breakglass units shall be mounted at a height of 1400 mm from finished floor level, sounders shall be mounted on a centre line between ceiling and finished door height, although a minimum of 600 mm below ceiling level shall be observed.

C8.12 WIRING DIAGRAM

A wiring diagram of the fire alarm system shall be obtained from the manufacturer and submitted to the Architect, by the Contractor for comment prior to installation of the equipment.

C8.13 COMMISSIONING

The Electrical Contractor shall include in his tender for the complete commissioning of the fire alarm system in each Block (2No. Blocks) to be carried out by the supplier of the equipment.

Commissioning must be carried out in the presence of the Architect and a certificate of commissioning shall be forwarded to the Architect.

C8.14 AREA DESIGNATION DRAWING

The Electrical Contractor shall supply and install 2 area designation drawings for each Block (2No. Blocks) showing plans of the building with all fire alarm equipment clearly indicated and all room names/numbers.

The drawing shall be mounted in an aluminium frame with glass front, and fixed to the wall beside the central control panel.

The dimensions of the drawing shall be approved prior to its completion but should not exceed 600 mm wide x 450 mm deep.

SECTION D

ELECTRICAL DESIGN SCHEDULES/DATA
SYMBOL SHEETS

CONTENTS