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GRENFELL TOWER INQUIRY PHASE 1 REPORT

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60 Minutes

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THE TECHNICAL BULLETIN

FOR RESIDENTIAL SURVEYORS

Welcome to the Technical Bulletin. This Bulletin is designed primarily for residential surveyors who are members of RICS and other professional bodies working across all housing sectors. Other professionals may also find the content useful.

Produced by Sava, you will find technical articles, regulation updates and interpretation and best practice. We hope you find this useful in your day-to-day work and we welcome any feedback you may have and suggestions for future publications.

Who we are

We are a team of building physicists and engineers, statisticians, software developers, residential surveyors, gas engineers and business management specialists.

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GRENFELL TOWER

WHAT WE HAVE LEARNT FROM PHASE 1 OF THE GRENFELL TOWER INQUIRY

HILARY GRAYSON BSC EST MAN (HONS) DIRECTOR OF SURVEYING SERVICES, SAVA

In October 2019 Phase 1 of the Grenfell Tower report was published by the Grenfell Tower Inquiry, convened under the chairmanship of the Rt Hon Sir Martin Moore-Bick. Phase 1 of the inquiry covered the cause of the fire, its subsequent development and the steps taken by the London Fire Brigade and the other emergency services in response to it.

In this article, we review the Phase 1 report to summarise what we currently know about the Grenfell Tower fire – how it started, how it spread and how it caused such a devastating loss of life.

This article focuses on the building, it's construction and management, and the learnings the surveying and property management professions can take from the tragedy at this stage. It draws on the findings of the inquiry. It is not within the scope of this article to comment on the response of the London Fire Brigade or the 'Stay Put' policy whereby many residents waited to be rescued rather than escaping from the burning building.

Introduction

In the early hours of Wednesday, 14 June 2017, a fire broke out in a kitchen in one of the flats of Grenfell Tower. Kitchen fires are not uncommon and in terms of its origin and magnitude there was nothing exceptional about this one. However, as we all know, the fire escaped from the kitchen into the external envelope of the building.

The fire claimed the lives of 71 people who were present in the tower that night, including a child who was stillborn shortly after his mother had escaped and had been admitted to hospital. A total of 227 people in all (residents and visitors) escaped from the tower.

The Phase 1 report extends over 4 volumes, much of it very detailed information from the various expert witnesses and the London Fire Brigade. Chapter 32, however, is simply titled 'Remembering those who died' and respectfully remembers those people who lost their lives. For anyone involved in residential property it is worth reading because, while we tend to focus on the buildings themselves, we must remember that they are homes to real people.

Grenfell Tower – history and location

Grenfell Tower is a high-rise residential building in North Kensington, West London. It was built in 1974, though designed some years earlier in the late 1960s, and was owned by the Royal Borough of Kensington and Chelsea (RBKC) and managed by the Royal Borough of Kensington and Chelsea Tenant Management Organisation (the TMO).

Grenfell Tower is just over 67 metres tall and has 25 storeys consisting of a basement and ground and 23 upper floors.

The tower plan floor area is approximately 22 metres by 22 metres. It was constructed with a central reinforced concrete core, reinforced concrete floors and perimeter reinforced concrete columns at each corner of the building. The exterior surface of the perimeter columns were faced with pre-cast ribbed concrete panels (described as 'biscuits' in the Phase 1 report) secured via metal wires embedded in the concrete of the columns themselves.

At the time of construction, the exterior of the building comprised horizontal structural solid concrete spandrel panels (pre-assembled structural panels used as a separating wall) and sliding single glazed, aluminium-framed windows. The metal window frames were fixed directly to the concrete structure on three sides. There were also non-structural, white window infill panels. The material of these infill panels was unknown at the time of the Phase 1 report but may have contained an asbestos bearing cementitious material. The aluminium window frames were also directly connected to these infill panels.

At the top of the building is a pre-cast architectural "crown" which consists of tapered pilasters at the tops of the columns and a ring of perforated freestanding concrete beams.

Internally, the original window sills, jambs and heads were lined in timber. Above and below the windows were panels of ICI "Purlboard" (a layer of plasterboard with a layer of polyurethane foam bonded to the rear). The strip of Purlboard above the windows extended the full perimeter of the external wall in each flat.

Floors 4 to 23 were designed to accommodate residential flats, with six flats on each floor separated by reinforced concrete cross-walls. Floors ground, 1 and 3 were designed to provide more flexible community spaces, later a nursery, offices and a community health centre. Floor 2 was originally left open as a continuation of the walkway connecting adjacent low-level housing blocks.

Later minor refurbishments

- In 1985 the front doors of the flats were replaced. An application under the Building Regulations for the fitting of new self-closing, fire-resisting flat doors was made in 1985, but no further details are known about that work at this time.
- Between 2005 and 2006 both lifts were refurbished. The work appears to have included the "like for like" replacement of the two lift cars and the renovation of the lift motor room and associated equipment.
- Between 2011 and 2013 the entrance doors to the flats on floors 4 to 23 occupied by RBKC tenants were replaced. The purpose of the work was to replace 106 flat entrance doors with fire doors which complied with relevant fire safety standards. The remaining flats not listed for front door replacement were either tenanted or owner-occupied leasehold.
- Between 2016 and 2017 a new tenant gas supply was installed to serve the south-east corner flats because corrosion within one of the existing gas risers had led to a small leak in September 2016. The faulty riser was isolated and a new riser was installed. The new riser enters the building on the south-east side at the basement level and rises vertically through the central staircase between floors 2 and 23. At certain floors it was necessary to install a new lateral gas pipe which passes out through the stair wall, across the lobby and into the flat. The boxing-in of this pipework in the lobbies had not been completed at the time of the fire on 14 June 2017.

The main refurbishment

The most significant change to the building, and most referred to, was the refurbishment carried out between 2012 and 2016. During that period Grenfell Tower underwent substantial changes affecting both the outside and the inside of the building. As we all know, it incorporated the over-cladding of every storey of the existing building with a new insulation and rainscreen cladding system.

Figure 1

In addition to the over-cladding of the building, there was a full refurbishment internally of the very lowest floors from the ground floor to floor 3, including structural works. This included the creation of nine new flats on these lower floors and the relocation and refurbishment of the existing nursery and boxing club. Soft and hard landscaping works were also carried out in the area immediately surrounding the tower.

Building services works were carried out on every floor and within every flat. These internal building services works included the fitting of a new heating system to all areas, a new boosted cold-water distribution system and the refurbishment and extension of the existing environmental ventilation and smoke control system. There were also some alterations to the lifts and dry riser system.

The windows

New, smaller windows were installed on every floor. During the refurbishment the windows were moved outwards so that they no longer sat flush with the concrete but flush with the new cladding system. As the report notes, by repositioning the windows outside the line of the concrete structure and without providing a non-combustible barrier between the interior of the building and the cavity within the cladding system, the effective compartmentation of the building in the event of a fire was undermined.

The changes to the windows created gaps in what had, as a result, become part of the internal walls. For example, vertical gaps had previously existed between the outer corner of the concrete spandrels and the edges of the columns where the two abutted, but before the refurbishment they had formed part of the exterior wall. One result of repositioning the windows was to incorporate those gaps into the interior behind the new window frames. In some places the gaps were filled with an expanding polyurethane foam, in others they remained open.

Another example of this is that before the refurbishment there had been a sloping lip on the outside of the building beneath the windows. By repositioning the windows beyond the outside line of that lip, a horizontal gap below the windows was created.

The reduction in the size of the windows created a gap between the sides of the windows and the adjacent columns. The gap was covered with a black ethylene propylene diene monomer (EPDM) synthetic rubber weatherproofing membrane of 1mm thickness. EPDM is combustible and is thermally thin, which means it will burn quite rapidly. The EPDM was bonded to the window frame and the face of the concrete column, but in some places it was bonded between the two layers of spandrel insulation. Around the columns the EPDM membrane covered the cavity between the insulation and the rainscreen panels without any additional protection.

Internally new uPVC (unplasticised polyvinyl chloride) window sills, jambs and heads were installed around each of the windows on top of the existing timber window joinery, which was left in place. They had a uniform thickness of 9.5mm and a smooth white finish. The report noted that uPVC is a solid combustible polymer which begins to lose its stiffness at around 60°C and loses it entirely at about 90°C. It has an ignition temperature of between 318°C and 374°C. It chars when exposed to heat and generally displays limited surface spread of flame due to its high chlorine content. The uPVC window surrounds were glued partly to the pre-existing timber window sills, window heads and window jambs, and partly to 25mm insulation boards which were used to close off the opening into the cavity in the cladding caused by the repositioning of the windows. No mechanical fixings appear to have been used.

The 25mm insulation boards underneath the windows were a layer of PIR insulation, either Celotex TB4000 or Kingspan Thermapitch TP. These are both types of PIR insulation but were much thinner products than those used on the spandrels and the columns. (PIR [polyisocyanurate] boards are one of the most efficient insulation materials used in construction. This product is an improvement of previously used PUR boards [polyurethane], typically produced as a foam and used as rigid thermal insulation.) The original white window infill panels were retained behind new infill panels. The new panels were fitted flush with the new wall insulation, in effect creating a cavity between the original and the new panels.

The cladding

The cladding work involved the addition of a ventilated rainscreen insulation and cladding system attached to the original concrete façade, in effect creating a new external wall on the tower.

At floors 4 to 23 this comprised insulation materials, new windows and window infill panels (discussed above) and outer aluminium composite material (ACM) rainscreen panels. At floors 1 to 3 the outer wall was re-clad with glass-reinforced concrete castings on the columns and other types of rainscreen panels. The Phase 1 report does not deal with these floors as they were not involved in the fire.

The outer layer of the new external façade covered the existing concrete spandrel panels and the columns. This façade comprised ventilated rainscreen panels made of aluminium composite material (ACM) pre-fabricated into 'cassettes' which are hung on steel or aluminium supports fixed to the concrete structure.

Figure 2

These systems are designed to protect a building from water, with the exterior surface providing the original protection layer. Some water will inevitably get through the outer layer and will seep through to the inner surface of the cladding where it will drain down via gravity. The cladding material is separated from the rest of the wall assembly by a small gap. It is called a 'ventilated rainscreen system' because it is designed to protect the building from the majority of direct rainfall but has gaps which are designed to permit the ventilation of the cavity behind the panels and ensure that water is collected and drained away.

The cladding panels consisted of a 3mm thick core of polyethylene bonded between two 0.5mm thick sheets of aluminium. The Phase 1 inquiry found that:
"Polyethylene is a combustible synthetic thermoplastic polymer which melts and drips on exposure to heat. It can flow whilst burning and generate burning droplets. It has a high calorific value compared with other common construction materials and will provide a fuel source for a growing and spreading fire. It melts at 130-135°C and ignites at around 377°C."

The aluminium component melts at approximately 660°C and can warp and deform under the influence of heat.

> Polyethylene is produced from ethylene, and although ethylene can be produced from renewable resources, it is mainly obtained from petroleum or natural gas.

On many of the panel edges used for the spandrels the polyethylene was exposed. The panels used on the columns were designed differently. One of the findings of the Phase 1 report was that the system of panels and fixings used for the Grenfell refurbishment appeared to have been uniquely designed for this specific project.

Behind the ACM panels used for both the spandrels and the columns there was a layer of insulation fixed directly to the building. On the spandrels this consisted of two 80mm layers of insulation board (Celotex RS5000 polyisocyanurate (PIR) polymer foam or in very limited quantities Kingspan K15 phenolic polymer foam). On the columns, the insulation consisted of one 100mm layer of Celotex RS5000 PIR with a small number of Kingspan K15 insulation boards. In some varying instances an additional piece of insulation board was located adjacent to the windows, alongside the columns. The insulation was fixed to both the spandrels and the columns by 180mm stakes screwed into the face of the existing concrete.

The 'cavity' between the insulation and the rain screen panels varied from 139mm on the columns to 156mm on the spandrels. In addition to the 'designed' cavities, the ribbed 'biscuit' finish on the columns resulted in additional 'un-designed' cavities.

The inquiry noted that while PIR is sometimes claimed to be fire retardant and is certainly more fire resistant that PUR, PIR and phenolic foam have a comparatively low time to ignition and can support rapid flame spread. They can also accelerate the spread of flame on adjacent materials by insulating the cavity and preventing energy from being lost from the system.

Cavity barriers were installed in the façade system in both the horizontal and vertical positions. These cavity barriers did not block the cavity completely. Rather they incorporated an intumescent strip designed to expand in the event of a fire. It was this act of expanding that would then intend to seal the gap between the barrier and the rear of the cladding.

In the horizontal position they were installed approximately 700mm below the level of the window sills and extended over the columns at that level. On both the columns and the spandrels they were mechanically fixed using metal support brackets which pierced the full depth of the barrier at 400mm centres.

Cavity barriers were not provided for all the columns and no cavity barriers were present at the nose of the columns or at the top of the building. In addition, they were not continuous because the cladding rails supporting the ACM panels broke through them at least every 1100mm and in many cases they were poorly fitted, with gaps between them instead of being tightly abutted.

Other changes
The other changes undertaken during this significant refurbishment included:

- A new heating system created for the whole of the tower. The existing boilers were retained to continue serving the walkways and a new central gas fired boiler to serve the tower was installed in the basement. Six new risers were put in to carry hot water to all floors and a new service cupboard was created in the lobbies on every level from level 4 upwards to accommodate the risers and return piping. In each lobby the pipes left the service cupboard and were concealed above a new plasterboard ceiling. They entered the individual flats via holes drilled through the concrete walls above the front door. Each existing residential flat was served by an individual heat interface unit (HIU), which was electrically operated and enabled the residents to control their heating and hot water. New pipework and radiators were installed in each flat.
- A new boosted cold-water system to distribute cold water from a plant room at roof level. This also involved installing additional pipework in each of the lift lobbies which entered flats via holes drilled through the concrete walls.
- An environmental air control system in the common parts of the tower because the new services installed in the lobbies could cause them to become uncomfortably warm under normal conditions. The existing smoke control system was modified to become a combined environmental and smoke control system.
- At ground floor level a new dry riser inlet was installed to serve the existing dry rising main in the core of the building. This required new pipework on the lower floors of the tower in order to connect with the existing pipework at floors 4 and above with new landing valves and branches.

Occupancy and management
At the time of the fire most of the flats in the tower were occupied by RBKC's social housing tenants. However, there were also 14 leaseholders of flats.

Although the tower was owned by RBKC, it was managed by the Royal Borough of Kensington and Chelsea Tenant Management Organisation (the TMO).

The TMO is a limited company appointed in 1996 by RBKC by way of a Management Agreement to carry out certain housing management functions.

How the fire started

The Phase 1 report concluded the fire was accidental and started by a kitchen appliance as a result of an electrical fault.

The fire started in flat 16 in the north-east corner of floor 4 of the tower. The occupant had been woken by his smoke alarm and saw that there were flames around his fridge/freezer.

This was not an exceptional occurrence. In 2018 Which? reported that faulty household appliances – primarily washing machines and tumble dryers – account for 60 house fires a week in the UK, with the number of fires staying roughly the same each year for five years.

While a household fire was not unusual, 10 minutes after the fire brigade arrived the fire broke out of the flat into the cladding on the outside of the tower and began to climb the building.

How did the fire break out of the flat and into the materials on the outside of the building?

The inquiry demonstrated that the smoke from the fire would have been around 110 – 220°C – not hot enough to ignite anything in the kitchen window or the cladding outside, but it would have been hot enough to impact on the uPVC replacement plastic window surrounds which start to melt and distort in temperatures as low as 70°C (when it becomes very viscose and behaves a bit like a gum). The fact that the uPVC window jambs were held in place by adhesive, with no mechanical fixings, made them all the more vulnerable to deformation in rising temperatures.

The uPVC was, however, covering a range of flammable materials – the EDPM synthetic rubber weatherproofing membrane and beyond that the insulation. The report notes that all the experts agreed that the uPVC near the fridge/freezer in the kitchen probably deformed at an early stage allowing flames access to the cladding system on the outside of the tower. Indeed, two firemen attended the fire inside the flat and put the fire on the appliance out. However, by that time the series of events were put in motion because they were aware of an orange flicker outside the kitchen window – this was the cladding burning.

Why did the fire spread so rapidly?

The fire spread in a straight line directly upwards. 18 minutes after it had escaped the kitchen window of flat 16 it reached the 23rd floor at the top of the tower. This rate of 4 metres a minute is noted in the report as being relatively slow when compared to other cladding fires around the world but must have been truly terrifying to anyone witnessing it.

Why did the fire spread so rapidly outside of the building? All the expert witnesses called by the inquiry analysed the complex collection of materials used on the tower. The report concludes that although many factors played a part, the principal reason was the ACM rain screen panels and the polyethylene they contained. The report also says that it is more likely than not that the insulation behind these panels contributed to the speed of the fire. Sir Martin Moore-Bick writes: *"I am satisfied that, although many different factors played a part, the principal reason why the flames spread so rapidly up the building was the presence of the ACM panels with polyethylene cores, which had high calorific value, melted and acted as a source of fuel for the growing fire. I also think it more likely than not that the presence of PIR and phenolic foam insulation boards behind the ACM panels (and perhaps the EPDM membrane and the Aluglaze window infill panels) contributed to the rate and extent of vertical flame spread".*

There were other issues covered in the discussions at the inquiry about the fire spread. One was whether the cladding design could have contributed to the spread, particularly because of long vertical channels along the columns.

For example, one expert witness, Professor Luke Bisby from the Edinburgh University School of Engineering, stated at the enquiry: *"Having the fire confined in a corner, even if it is not a right-angled corner, does 2 things – it changes the way that fresh air is entrained into the fire which means, essentially, you are going to get less air entrained into the fire at its base because there is restricted access to the fire because of its confinement. That has the effect of elongating the flame as the flame searches for more air in order to continue burning, so you have flame elongation in a confined area which would exacerbate upward vertical fire spread".*

The report noted that it was very possible that vertical channels played a role in exacerbating the fire, but the Chairman, Sir Martin Moore-Bick, was unwilling to reach firm conclusions on this point.

Another issue discussed at the inquiry were the cavity barriers intended to stop the spread of fire on the outside of the building. Although many were found to be missing or incorrectly installed, the report concluded that this was not of great significance. Cavity barriers work because when exposed to heat they expand to block the cavity, in this case between the outer rain screen and the insulation on the side of the tower. Here the fire was actually inside the panels themselves so simply passed over the top of the cavity barriers.

Dr Barbara Lane, a fire engineer from Ove Arup, gave evidence to the inquiry and noted: *"Cavity barriers cannot stop a fire in a cavity if the wall itself is burning. The very founding principle is that the wall is not burning, and the cavity barrier is stopping a flame in the cavity. The cavity barrier cannot stop the whole wall from burning in that position".*

(As an aside, the inquiry cannot possibly know that the cavity barriers would have functioned properly. I have seen videos of cavity barriers in test situations that eventually expanded to block the cavity, but only after the flame had spread over the barrier into the cavity above.)

Once the fire reached the top of the tower it started to move around and down, in effect wrapping around the building. The report concludes that this was a specific unusual feature of the way the fire spread at Grenfell. The report says that there were two main reasons for this:

- the rain screen panels – in particular the way the polyethylene core melted and dripped as it burnt resulting in more fires starting lower down the building which then travelled back up to the top.

- the architectural crown – a purely aesthetic feature at the top of the tower. The crown was made up of a series of U-shaped bent rain screen panels with an exposed edge of polyethylene at each corner.

As well as dripping molten material, the inquiry found that fire also spread downwards along the columns of the building, probably exacerbated by the long vertical cavities behind the rain screen on the columns, though it notes that more work is needed to see if any other routes of fire spread had a particular significance. At 2am, flames were travelling along the north and east sides of the tower. By 2.20am the fire had spread to the south side of the building and at 4.02am the two flame fronts met on the south-west corner meaning that the tower was completely encircled.

The report concludes that the outside of Grenfell Tower failed the functional requirement of the Building Regulations because the materials not only did not adequately resist the spread of fire over them, but instead promoted it.

This is a very significant issue for many affected by the fire ahead of Phase 2 of the inquiry. In arriving at this conclusion, the report effectively rejects submissions from 3 companies involved in the refurbishment of the tower who all stated that there was not enough evidence to reach this conclusion. However, Sir Martin Moore-Bick reported that, despite this finding, he did not consider it appropriate to make recommendations at this point in the inquiry about whether materials of a certain fire safety rating should be banned from high-rise buildings or whether there should be changes to the testing and certification of materials.

> "I intend in Phase 2 of the Inquiry to examine (among other things) the extent to which the regime for testing materials intended for use in external walls (including thermoplastic polymer materials such as polyethylene) and the regulations governing their use were, and are, adequate to identify and control the potential dangers from downward and horizontal as well as vertical flame spread. I shall also examine what was and should have been known, both by those in the construction industry and by those in central government responsible for setting fire safety standards, about the particular dangers posed by thermoplastic polymers."

The report does recommend that the owners and managers of high-rise buildings should be required by law to tell the local fire and rescue services about the materials put on the outside walls. However, on the issue of whether panels containing polyethylene should be removed from other buildings around the country Sir Martin said it was unnecessary for him to make this into a recommendation because this has already been accepted.

What happened inside the building?

The fire on the outside of the building was dramatic, but was it inevitable that it would enter the flats from the outside? We know from the inquiry that the fire did indeed enter many flats and smoke spread rapidly through the interior of the building.

We know that some residents had left their windows open because it was a hot summer night but, even if that was not the case, Sir Martin accepted the argument that even if windows were closed, the glass in the windows could not withstand the high heat from the fire in the cladding. In addition, extractor fan units in the kitchen windows buckled and failed when subjected to the heat providing a point of entry for the fire even if the glass had not failed. As a result, the inquiry concluded that effective compartmentation was lost at an early stage.

The first flats to be affected by the fire when it spread in a straight line up the building were those ending in the number 6 – all residents of those flats quickly left.

In addition, a number of other key fire protection measures inside the tower failed. Although some fire doors held back the smoke, the inquiry concluded that others did not. The inquiry identified that on 5 floors the doors to these number 6 flats (those first affected by the fire rising on the outside of the building) did not close behind people because their self-closing mechanisms did not work. Therefore, smoke spread from these flats into the communal lobbies.

Doors on 2 additional floors were also left open for less clear reasons.

The report took so many witness accounts that it was able to track the movement of the fire around the building. Approximately 26 minutes after the first 999 call the communal lobbies on several floors had started to fill with smoke. The situation varied slightly from floor to floor, but less than half an hour after the first 999 call the smoke on the 10th floor, where the door to flat 76 was open, was so thick it trapped 3 people. Sadly, they did not survive. By 2am, just over an hour after the fire was reported, a significant number had become smoke logged.

It seems that the lobbies filled more quickly than the stairs. The report identified that until around 1.50am there was less smoke in the stairs and by that time 168 people had been able to escape the fire. However, after that time the stairs also started to fill with smoke, particularly at the lower levels. Though it was not consistent in the stairs, smoke was thick and the heat considerable. By 2.20am the inquiry found that the smoke in the stairs did pose a risk to life, although the stairs were not completely impenetrable to all even after that time since people did successfully continue to use the stairs until 8.00am. That said, the report did also identify that between floors 13 and 16 the heat was so intense that light fittings were later found to have melted.

The inquiry concluded that some of the fire doors failed. Whether the fire doors at Grenfell complied with Building Regulations will be a question for Phase 2. As this is such an important issue the report made the following recommendation:

> "That the owner and manager of every residential building containing separate dwellings carry out an urgent inspection of fire doors to make sure they comply with current standards and that the law changes to compel all owners and managers of these buildings, whether or not they are high-rise, to carry out checks on fire door self-closing mechanisms every 3 months."

Phase 1 recommendations

Recommendations from Phase 1 of the inquiry are covered in chapter 33 of the report. Those reported below are not all the recommendations or observations, rather they are a selection of those pertinent to housing managers and residential practitioners.

Regarding compartmentation, the report notes:

> "Effective compartmentation is likely to remain at the heart of fire safety strategy and will probably continue to provide a safe basis for responding to the vast majority of fires in high-rise buildings. However, in the case of some high-rise buildings it will be necessary for building owners and fire and rescue services to provide a greater range of responses, including full or partial evacuation. Appropriate steps must therefore be taken to enable alternative evacuation strategies to be implemented effectively."

Turning to the cladding, the report noted that surveys undertaken since the Grenfell tragedy have identified that external wall materials similar to those used on Grenfell Tower have been used on over 400 other high-rise residential buildings around the country. The report does not recommend removal since "… it is accepted that that must be done.". However, in the meantime it does make the following observation:

> "From the evidence put before me in Phase 1, two very important matters have come to light: first, that in its origin the fire at Grenfell Tower was no more than a typical kitchen fire; second, that the fire was able to spread into the cladding as a result of the proximity of combustible materials to the kitchen windows. It is not possible to say whether the same or a similar combination of design and materials is to be found on any other buildings, but it would be sensible for those responsible for high-rise buildings with similar cladding systems, if they have not already done so, to check whether the same or a similar combination exists."

Additional recommendations relating to testing of materials etc. were considered not appropriate at this stage.

Regarding the fire services, the formal recommendation pertinent to building owners and managers is as follows:

> "…that the owner and manager of every high-rise residential building be required by law to provide their local fire and rescue service with information about the design of its external walls together with details of the materials of which they are constructed and to inform the fire and rescue service of any material changes made to them."

> "…to provide their local fire and rescue services with up-to-date plans in both paper and electronic form of every floor of the building identifying the location of key fire safety systems."

> "…to provide their local fire and rescue services with up-to-date plans in both paper and electronic form of every floor of the building identifying the location of key fire safety systems."

> "…to ensure that the building contains a premises information box, the contents of which must include a copy of the up-to-date floor plans and information about the nature of any lift intended for use by the fire and rescue services."

Regarding lifts in buildings, the recommendations are as follows:

> *"…that the owner and manager of every high-rise residential building be required by law to carry out regular inspections of any lifts that are designed to be used by firefighters in an emergency and to report the results of such inspections to their local fire and rescue service at monthly intervals."*

Regarding evacuation, the recommendations are as follows:

> "…that the owner and manager of every high-rise residential building be required by law to carry out regular inspections of any lifts that are designed to be used by firefighters in an emergency and to report the results of such inspections to their local fire and rescue service at monthly intervals."

> "…that the owner and manager of every high-rise residential building be required by law to draw up and keep under regular review evacuation plans, copies of which are to be provided in electronic and paper form to their local fire and rescue service and placed in an information box on the premises."

> "…that all high-rise residential buildings (both those already in existence and those built in the future) be equipped with facilities for use by the fire and rescue services enabling them to send an evacuation signal to the whole or a selected part of the building by means of sounders or similar devices."

> "…that the owner and manager of every high-rise residential building be required by law to prepare personal emergency evacuation plans (PEEPs) for all residents whose ability to self-evacuate may be compromised (such as persons with reduced mobility or cognition)."

> "…that the owner and manager of every high-rise residential building be required by law to include up-to-date information about persons with reduced mobility and their associated PEEPs in the premises information box."

Relating to internal signage, the following recommendations were made:

"...that in all high-rise buildings floor numbers be clearly marked on each landing within the stairways and in a prominent place in all lobbies in such a way as to be visible both in normal conditions and in low lighting or smoky conditions."

For fire doors the recommendations are as follows:

"...that the owner and manager of every residential building containing separate dwellings (whether or not it is a high-rise building) be required by law to provide fire safety instructions (including instructions for evacuation) in a form that the occupants of the building can reasonably be expected to understand, taking into account the nature of the building and their knowledge of the occupants."

"...that the owner and manager of every residential building containing separate dwellings (whether or not they are high-rise buildings) carry out an urgent inspection of all fire doors to ensure that they comply with applicable legislative standards."

"...that the owner and manager of every residential building containing separate dwellings (whether or not they are high-rise buildings) be required by law to carry out checks at not less than three-monthly intervals to ensure that all fire doors are fitted with effective self-closing devices in working order."

"...that all those who have responsibility in whatever capacity for the condition of the entrance doors to individual flats in high-rise residential buildings, whose external walls incorporate unsafe cladding, be required by law to ensure that such doors comply with current standards."

And what of Phase 2?

Phase 2 of the report will consider further the building itself and, in particular, the decisions which led to the installation of a highly combustible cladding system on a high-rise residential building and the wider background against which those decisions were taken.

In addition, Phase 2 will consider whether the current regime for testing materials used in high rise construction is as rigorous as it should be and if it is enforced properly. Sir Martin writes: It will also consider further the detailing around the windows.

"These concerns extend to the adequacy of the regulations themselves, the quality of the official statutory and non-statutory guidance currently available, the effectiveness of the tests currently in use, arrangements for certifying the compliance of materials with combustibility criteria and the manner in which materials are marketed. They are questions that will lie at the heart of the Inquiry's investigations in Phase 2."

Regarding the fire doors, Phase 2 will look at how so many of them failed to be working properly (how they failed to close after residents had left) and how they were allowed to remain in this condition.

Phase 2 will not look at the staircase or the electricity but will consider the gas supply to the building, and in particular if it was compliant with the regulations in force at the time.

Conclusions

At this stage it is difficult to know quite how things will move forward. Following close on the heels of the Hackett Report (Published in May 2018) where Dame Judith Hackett concluded that *"the regulatory system covering high-rise and complex buildings was not fit for purpose"* and needed a *"radical rethink of the whole system and how it works... not just a question of the specification of cladding systems, but of an industry that has not reflected and learned for itself, nor looked to other sectors"*, it is difficult to see how there can be any regulatory changes until Phase 2 of the Grenfell report is published and the full picture is known.

That said, there have been some changes since the Grenfell tragedy. Notably, the Government acted quickly to introduce policy banning combustible material on some newly built property with effect from 21 Dec 2018 and has directed that in certain circumstances aluminium composite material (ACM) external wall systems are to be removed from residential tall buildings. They have also introduced comprehensive guidance via 22 separate guidance notes, most notable for residential surveyors being MHCLG Advice Note 14 for circumstances where there are other potentially combustible materials on existing tall buildings. These include but are not limited to: metal composite materials (MCM) faced with other metals such as zinc, copper and stainless steel; high pressure laminates (HPL); and rendered insulation systems.

Surveyors involved with the valuation, ownership and management of buildings containing multiple individual flats or maisonettes must maintain up-to-date knowledge of government advice, but until the outcomes of Grenfell are formally recognised and acted upon it is possible that Sir Martin Moore-Bick's recommendations reported above will be taken as 'best practice'. Consequently, residential property professionals should, at the very least, be familiar with them.

Hilary Grayson, Director of Surveying Services

Hilary is focused on developing new qualifications, as well as Sava's activities within residential surveying. Hilary has a wealth of experience within the built environment, including commercial property, local government and working at RICS. As well as her work at Sava, she is a Trustee at Westbury Arts Centre, a listed farmhouse dating from the Jacobean period, and has inadvertently become a custodian of a colony of bats.

EXTERNAL WALL FIRE REVIEW

AN UPDATE FROM RICS

JOHN BAGULEY BSC (HONS) MRICS TANGIBLE ASSESTS VALUATION DIRECTOR, RICS

In December 2019, RICS introduced a new industry-wide initiative with the aim of helping people living in high-rise property who had been left in limbo as a result of the fall-out from the Grenfell Tower tragedy. The intention of the new certificate is to help buyers, sellers and re-mortgagers of homes in buildings above 18 metres (six storeys), where there has been uncertainty about the cladding, and get the market moving again.

In this article we look at the development of the new certificate and how it will work in practice.

The problem

Since Grenfell, the Government has published a number of advice notes on the building safety website https://www.gov.uk/guidance/building-safety-programme#advice-notes. These guidance documents, intended to "...make sure that residents of high-rise buildings are safe – and feel safe – now, and in the future", bring together the results of materials testing and industry enquiry on existing properties. They cover everything from combustible insulation, remediation of metal composite and aluminium composite material (ACM), urgent life safety interventions and smoke ventilation.

Specifically, the Government has banned the use of combustible material on some newly built property with effect from 21 December 2018. It has also directed that aluminium composite material (ACM) external wall systems, in certain circumstances, are to be removed from tall, residential buildings. They introduced guidance (MHCLG Advice Note 14) covering circumstances where there are other potentially combustible materials on existing tall buildings, including but not limited to; metal composite materials (MCM) faced with other metals such as zinc, copper, and stainless steel; high pressure laminates (HPL); and rendered insulation systems.

The problem was that, following the introduction of this guidance, in the instances where valuers did not know if the cladding on high-rise buildings met the new guidance, they were returning £0 valuations. This left leaseholders 'trapped' in properties they were unable to sell or re-mortgage.

The solution

Fire safety is one of the key considerations a valuer must take into account, and their valuation must meet the requirements of the RICS Valuation Standards. The External Wall Fire Review process, introduced by RICS, is a new standardised process to be used by valuers, lenders, building owners and fire safety experts in the valuation of high-rise properties, with actual or potential combustible materials used in the external wall systems and balconies.

This new process has been endorsed by RICS, UK Finance, the Building Societies Association, IRPM (Institute of Residential Property Management) and ARMA (Association of Residential Managing Agents). It is also supported by the Ministry of Housing, Communities and Local Government (MHCLG). The process requires a fire safety assessment to be conducted by a suitably qualified and competent professional. One assessment will be needed for each building and this will be valid for five years.

This applies to tall, residential buildings over 18m, which is consistent with MHCLG advice. RICS members must still consider each property individually and reflect in value and report accordingly if fire safety issues exist in buildings below 18m.

A new EWS form has been created to be completed by a fire expert, on behalf of the building owner, which will advise whether works are required. A valuer should obtain the EWS form where the building components appear to or do comprise combustible materials to the external wall system or balcony. If an EWS form is not available, the valuer should refer to lender guidance and consider withholding the valuation figure or condition advice until one is made available.

It is likely lenders will provide standard paragraphs for valuers to use when they either request or have sight of an EWS form. However, RICS has produced some wording for use where such wording is not provided:

> "In arriving at the valuation for mortgage purposes, your mortgage lender and the mortgage lender's appointed valuer (where applicable) we have relied on the EWS1 form in good faith by a professionally qualified third party. There is, however, no liability to the lender, the valuer or to you, the borrower for any losses or potential losses arising directly and solely from the valuation being provided in reliance upon the EWS1 form. If you require further information, then please seek independent advice prior to legal commitment to purchase."

It is important that a disclaimer is used in all reports, that the valuer always checks that the person who has completed the form has completed the information set out in Notes 2 and 3, and that the information in the EWS1 form is complete and makes sense.

There is more information on this on the RICS website.

Bringing the EWS form and process to the market has truly been a collaborative approach. RICS started developing a solution in early 2019; during this time MHCLG's advice continued to evolve, including an additional Advice Note about balconies. This led to further work to the initially agreed solution. Simultaneously, however, Fiona Haggett from Barclays had developed her own pro-forma and the genesis of having a standard form started there. Industry came together to drive the concept forward, culminating in implementation of EWS on December 16th 2019. It was particularly pleasing to lead a group of 50+ people and a working group to deliver something so important to so many in the housing chain.

John Baguley BSc (Hons) MRICS is Tangible Assets Valuation Director at RICS. He is a Chartered Surveyor, Accredited Mediator and qualified Ombudsman. He was previously a Senior Surveying Quality Manager with Esurv.

LOCAL AUTHORITY LANDLORDS

WHEN CAN LEASEHOLDERS BE CHARGED FOR FIRE SAFETY REMEDIATION?

SUSAN BRIGHT, PROFESSOR OF LAND LAW, MCGREGOR FELLOW, UNIVERSITY OF OXFORD

This article looks at whether the costs of fixing and making safe local authority blocks can be recovered from leaseholders. The things that need fixing can include replacement cladding; fire breaks; replacing fire doors etc. but there may also be additional services, such as the provision of a waking watch. Sometimes the landlord may need to enter flats to look at what needs doing and may wish to make alterations inside individual flats; this raises other questions, not discussed here, including, firstly, whether the landlord has a right to go into the flat, and secondly, whether the landlord has the power to make alterations.

The situation for leaseholders in local authority blocks differs from the private sector because the leases will have been sold under the 'Right to Buy'. The terms of these leases are shaped by statutory provisions in Schedule 6 of the Housing Act 1985 (amended by the Housing and Planning Act 1986, that came into force in January 1987). For leases entered between 3 October 1980 and 1 April 1986, the operative Act was the Housing Act 1980 (and the wording of RTB leases entered during that period may differ somewhat).

Whether the costs can be passed on will depend on the lease wording, but some general propositions for RTB leases follow (para references are to Schedule 6).

1. The lease may include reasonable covenants and conditions (para 5).
2. The landlord is under an implied covenant to keep in repair the structure and exterior of the dwelling-house and of the building in which it is situated and to make good any defect affecting that structure (para 14(2)(a)). Usually there will be an express covenant in the lease to this effect.
3. The landlord **may** (depending on the lease wording):
   - require the tenant to pay a reasonable part of the costs of repairs and services (para 16A(1)(a)).
   - require the tenant to pay a reasonable part of the costs of making good structural defects, except that during the first 5 years of the lease the amount is limited to the estimate contained in the s125 notice (para 16A(1)(a); 16(B)). This is the notice given to the person buying the RTB lease and includes the estimated service charges for the next five years.
   - require the tenant to pay improvement contributions,

except that during the first 5 years of the lease the amount is limited to the estimate in the s125 notice (para 16A(1)(a); 16(C)). Not all RTB leases allow recovery for improvements, which may be important when it comes to recovery of fire safety costs.

4. Costs can only be recovered if they are reasonable. By s19 of the Landlord and Tenant Act 1985, costs are recoverable only to the extent that they are 'reasonably incurred' and for works/services of a 'reasonable standard'. This applies to all of the items covered by the service charges and, although the section talks of 'reasonably incurred', it is not only about whether it was reasonable to spend money at all but also whether the amount itself is reasonable. These provisions, together with consultation provisions in s20 of the Landlord and Tenant Act 1985, are designed to ensure that leaseholders "are not required...to pay more than they should for services which are necessary and are provided to an acceptable standard." (Daejan Investments Limited).

In sum, these provisions meant that, always subject to the wording of the particular lease, the landlord may be able to recover the reasonable costs of repair, making good structural defects and (less standardly) improvements.

This leads on to the question of what the distinction is between repair, improvements and making good structural defects. This is seldom straightforward. Applying the broad principles to particular buildings will always be fact-sensitive.

Repair: repair is to do with fixing something if it goes wrong; there is an idea that at some time in the past the premises were in a better state of repair and that they have since deteriorated: "It will only be in a state of disrepair if one can point to a previous time at which the [subject matter of the covenant]... was in a better condition so that one can say there has been deterioration." (Janet Reger International Ltd v Tiree Ltd [61])

Structural defects: there is a lot of case law discussing a distinction between 'repair' and 'inherent defects' (not 'structural defects'). Inherent defects are to do with 'defective design' (Quick v Taff Ely BC). A recent Upper Tribunal case, City of London v Various Leaseholders of Great Arthur House (discussed by NearlyLegal) discusses the distinction between repair, inherent defect and structural defect, noting that there is no "bright line that can be drawn as a matter of principle". A structural defect is not confined to a 'so-called inherent defect' but "must be something that arises from the design or construction (or possibly modification) of the structure of the Building. It is to be contrasted with damage or deterioration that has occurred over time, or as a result of some supervening event, where what is being remedied is the damage or deterioration. That is repair." [para 40]

Improvements: an obvious improvement would involve putting something in that was not there before. For example, retrofitting sprinklers where there were none previously. Tricky issues arise when something that was 'tired' or needed some fixing is remedied by providing a newer, more modern version of that thing. So, for example, Minja Properties Ltd v Cussins Property Group plc (1998) involved a commercial lease in which the landlord had responsibility to "maintain and keep in good and tenantable repair, inter alia, the window frames". The steel window frames suffered from corrosion and the landlord wanted to replace them with double-glazed aluminium frames. Two tenants objected as their leases were running out fairly soon and, as they had no intention of staying, they did not want to pay for this. Harman J accepted that repair could involve more than 'patching up' and, in this particular case, as the additional cost caused by the double glazing was "a very small percentage of the total cost", a "comparatively trivial amount", it was held to come within the covenant to repair and not amount to renewal.

What does this mean for paying for fire safety measures?

There will be lots of fuzzy boundaries that depend on the particular facts and the wording of leases.

Leases are likely to include various generally worded provisions that may cover waking watch costs and some fire safety measures. For example, clauses to enable the landlord to charge for any services or facilities provided by the council; or to recover the costs of complying with any notices served by competent authorities (such as the Fire and Rescue Service); and also, as it may be a condition of insurance that a waking watch is provided, the waking watch costs could form part of the cost of procuring insurance. The costs of the waking watch is, therefore, likely to be recoverable if 'reasonable'.

Most fire safety 'works' are unlikely to involve 'repair', as it is unlikely that the item has been damaged or deteriorated.

Some measures will clearly involve improvements, that is, introducing new measures, such as fire alarms or sprinklers, that were not previously there. Others may be 'structural defects'. So, for example, cladding that is not safe is surely a 'defect' that arises from the design or construction or – most likely – modification of the building. Some of these cladding costs, where they involve replacement of ACM cladding, are likely to be recovered by the landlord from the Government's remediation fund, and leases should be interpreted so that double-recovery is not possible (Sheffield CC v Oliver). What about a missing fire break? Is that a structural defect or is it corrected by making an improvement? The distinction will matter if the lease permits recovery of costs for structural defects but not for improvements (in other research I found that only 1/3 of social housing providers – housing associations as well as local authority landlords – said that all of their leases allowed them to reclaim the costs of building improvements). But, for both, for the first 5 years of a lease, recovery for structural defects and improvements is capped by the s125 estimate (which is unlikely to include these items given the unanticipated need for most fire safety measures).

What if the landlord is pursuing a claim against a third party e.g. an insurance company or developer? It may be that the landlord would be required to give credit for the anticipated income (Avon Ground Rents v Cowley).

None of this is straightforward. There can be some fine distinctions drawn, but certainly for RTB leases that have been owned for more than 5 years many of the fire safety costs are, in principle, likely to be recoverable. But, as lawyers always say, it does depend on the lease wording.

For more information, please visit the 'Housing after Grenfell' blog here: https://www.law.ox.ac.uk/housing-after-grenfell/blog

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AN INTRODUCTION TO LISTED BUILDINGS

WHAT YOU SHOULD KNOW

IAN BULLOCK, BSC (HONS) MRICS MEWI, CARPENTER SURVEYORS

When carrying out pre purchase surveys and valuations, the law of averages suggests you are likely to encounter historic buildings at some stage, some of which may well be listed. It's important to consider what to look out for and what considerations are important when advising your client.

What is a listed building?
'Listing' is the term given to the practice of listing buildings, scheduling monuments, registering parks, gardens and battlefields, and protecting wreck sites. Listing allows us to highlight what is significant about a building or site and helps to make sure that any future changes to it do not result in the loss of its significance.

A listing is not a preservation order preventing change. It does not freeze a building in time, it simply means that listed building consent must be applied for in order to make any changes to that building which might affect its special interest.

Why are buildings listed?
Buildings are listed to help protect the physical evidence of our past, including buildings which are valued and protected as a central part of our cultural heritage and our sense of identity. Historic buildings also add to the quality of our lives, being an important aspect of the character and appearance of our towns, villages and countryside.

Tower Hill House is a Grade II* listed building built in 1630. An account from Dr J. Wells, who bought the property in 1920, describes how it was covered with a layer of 'greyish stucco' when he bought it and one winter it began to deteriorate and uncover two beams. Dr Wells then employed a bricklayer to strip the stucco revealing the black beams and plastered oak laths we see today. Renovations were required to restore some of the beams though, which had become rotten underneath the stucco.[1]

Is it listed?
To confirm if a building is listed, the first point of reference for any homeowner, legal advisor, agent or surveyor will be 'The National Heritage List' which is compiled and managed by English Heritage, a public body set up to help care for, enjoy and manage England's historic environment.

1 https://bromyardhistorysociety.org.uk/newsletter-one

It's the only official, up-to-date register of all nationally protected historic buildings and sites in England, including listed buildings, scheduled monuments, protected wrecks, registered parks and gardens, and even battlefields.

It's believed there are over 500,000 listed buildings, monuments and sites around the UK, accounting for approximately 2% of the UK's building stock.

Figure 1 and 2 – Tower Hill House, Bromyard and Winslow, Herefordshire

Types of listing

Listed buildings will typically be split into three categories listed according to their historic significance and interest. Some people often believe that the grading system is the key to understanding how much of the building is listed but this is a common misunderstanding. A Grade II Listed property is no less significant or less protected than a Grade I!

Grade I – Buildings are of exceptional interest, sometimes considered to be
internationally important; only 2.5% of listed buildings are Grade 1.

Grade II* – Buildings are particularly important buildings of more than special interest; 5.5% of listed buildings are Grade II*
Grade II –Buildings are nationally important and of special interest; 92% of all listed buildings are in this class and it is the most common grade of listing for a homeowner.

What's the criteria for making a building listed?
The Department of Culture Media and Sport (DCMS) uses the following criteria to decide which buildings to include on the list of protected buildings:

- architectural interest: buildings of importance because of their design, decoration and craftsmanship
- historic interest: buildings which illustrate an aspect of the nation's social, economic, cultural or military history
- historic association: buildings that demonstrate close historical association with nationally important people or events
- group value: buildings that form part of an architectural ensemble, such as squares, terraces or model villages

In broad terms, buildings that are eligible for listed status are as follows:

- all buildings built before 1700 that survive in anything like their original condition
- most buildings of 1700-1840, although selection is necessary
- between 1840 and 1914 only buildings of definite quality and character; the selection is designed to include the major works of principal architects
- between 1914 and 1939 selected buildings of high quality or historic interest
- a limited number of outstanding buildings after 1939, but at least ten years old, and usually more than 30 years old

Figure 3 and 4 – 3 Waterloo Road, Wolverhampton

Born in the 19th Century, the Macdonald Sisters were four sisters notable for their marriages to well-known men including painter Edward Burne-Jones, who worked with William Morris. Louisa's son was UK prime minister Stanley Baldwin and Alice's son was Rudyard Kipling, who wrote The Jungle Book. The house is part of a terrace of three, all of which are Grade 2 listed and were built c1850.

Locally listed buildings

Many councils, for example, Birmingham City Council, maintain a list of locally listed buildings as separate to the statutory list (and in addition to it). There is no statutory protection of a building or object on the local list, but many receive a degree of protection from loss through being in a conservation area or through planning policy. Councils hope that owners will recognise the merits of their properties and keep them unaltered if possible.

These grades are used by Birmingham:

- **Grade A:** This is of statutory list quality. To be the subject of notification to Historic England or the serving of a Building Preservation Notice if imminently threatened.
- **Grade B:** Important in the citywide architectural or local street scene context, warranting positive efforts to ensure retention.
- **Grade C:** Of significance in the local historical/ vernacular context, including industrial archaeological features, and worthy of retention.

Works undertaken without listed building consent

One of the main challenges for surveyors when dealing and advising on listed buildings can be identifying past works that might contravene the building's listing status.

It is a well-publicised fact that carrying out unauthorised works to a listed building is considered a criminal offence and it's not unusual to have seen individuals being prosecuted in the past.

A planning authority has the power to insist that all works undertaken without consent are reversed, although sometimes the damage seen has been irreversible, sadly.

The owner of a listed building without the proper consents in place may well have difficulties in selling a property which has not been granted Listed Building Consent for past works undertaken.

I've spotted some illegal works on a property I'm surveying – what now?

Where illegal alteration and/or works have been identified as part of the survey inspection, the current owner will usually end up having to indemnify the purchaser against any potential infringements if insufficient evidence can be produced of compliance.

At the risk of scaring everyone into never proceeding with the purchase of a historic listed building, it is worth pointing out that even though a prison term can be imposed on the property owner, this is for extreme cases only and has never been given to a person taking on the building (i.e. a potential client looking to purchase the property).

In this regard, it is always worth advising your client to engage with the Local Conservation Officer at their earliest opportunity. I will always encourage clients to try and arrange a mutual pre-application site visit if they are planning any significant changes to the building and grounds so as to identify and agree principal works at the outset to avoid later disappointment.

To provide a bit of practical guidance and context of what can and can't be done with Listed Building Consent, let's take a common building element such as windows as an example.

Permission might not necessarily be required for a 'like-for-like' **repair** to the windows BUT different materials or a different finish to the joinery (i.e. change of paint colour) will require consent.

Further, a window **replacement** will need consent, even if the new window is to be of the exact same design, material and finish! It's also worth noting that a Conservation Officer may be willing to consider double glazing to some areas of the property as a strong case can be made that it will not detract from the character of the building.

Also, if an emergency repair was required because of storm damage or a stray football through the window, for example, consent may not be necessary provided the repair is like-for-like. Again, it's advisable to notify the Conservation Officer as soon as possible to ensure they are aware of works.

There are many examples and considerations that will play a part for the ongoing repair and upkeep of a listed building, but if in doubt consult with the Conservation Officer

Although not residential, we couldn't resist including the Feathers Hotel in Ludlow which dates back to 1619 and was converted to an inn in 1670. Named 'The Most Handsome Inn in the World' by the New York Times, this charming Grade 1 listed building still boasts the original plank front door and bays that are moulded with curved mullions and transoms, as well as cast diamond glazing.[2]

2 https://www.feathersatludlow.co.uk/history/

Figure 4 and 5 – Feathers Hotel, Ludlow

Top tips when surveying listed buildings

Take a wholistic approach – As a surveyor surveying or valuing the property, I will always treat and consider ALL of the building as being listed (including the internal elements, external elements and external grounds – including any outbuildings and boundary walls).

Do your research – Preliminary desktop research prior to the inspection is essential and I will always carry out as much internet research as possible. This will include reviewing the property listing on the English Heritage list, taking note of the listing description details and downloading a copy of the free OS map for reference on site.

Maps – Reviewing old OS maps to build up a historical overview of the property and immediate surrounding areas can be a great means of not only dating buildings but also to consider and date extensions.

Planning portals – Reviewing the local planning authority website for past applications can often be an invaluable resource in terms of historical records and reports attached to past planning applications. These could include archaeological surveys, bat surveys, feasibility studies, historic recording reports etc., all of which may provide additional context for the building and surrounding local environment.

Vendor interview – Wherever possible, I always like to meet the homeowner on site in order to discuss their time of ownership. Often, owners of listed buildings are rather proud of their stewardship of a part of British history and will often spend hours discussing all the research they have carried out. There is no better resource than the knowledge of the property owner at times!

Alterations to the building – Always look to identify and consider what changes have been made to the original fabric of the building (irrespective of the current owners' comments). It is always worth noting the historic changes, whether they be extensions, re-roofing works or repairs, replacement windows and doors, internal layout changes etc. Once identified and considered you can flag these matters to your client and their legal advisor for further clarification. It is also worth pointing out to the client that it is the current owner that can be held liable and accountable for any infringements of previous owners. The liability remains with the homeowner, whether they've only just moved in or owned the property for many years!

Listed Building Consent – Notwithstanding the note above, it is possible to carry out alterations and changes to the building fabric BUT only with Listed Building Consent being sought and granted.

Listing information – It is also worth noting that the description of the property as shown on the Heritage Register is NOT a list of what is listed, rather, it is a general description of the property following a review as part of consideration of the listing status.

Ongoing maintenance & skilled trades – I cannot stress this one enough! Nowadays there are some fantastic skilled trades around and steering a client in the right direction is key to ensuring they are well placed to carry out any ongoing repair and maintenance works. Using traditional lime-based plasters and mortars, for instance, are essential to maintaining the eco systems within a historic building. All too often we still come across inappropriate use of modern materials such as cement and non-breathable paints. Referring the client to the right trades and professions is key.

Further information

English Heritage
https://historicengland.org.uk/

Society for the Protection of Ancient Buildings
https://www.spab.org.uk/

Institute of Historic Building Conservation
https://www.ihbc.org.uk/

National Trust
https://www.nationaltrust.org.uk/building-conservation

About Ian Bullock Bsc (Hons) MRICS MEWI, Carpenter Surveyors
Ian Bullock is Managing Director of Carpenter Surveyors, a Midlands based Chartered Surveying practice established for over 30 years, specialising in the provision of Residential Survey and Valuation services to both private individuals and financial institutions.

RADON GAS

HOW TO TEST AND MITIGATE

ROBERT OWEN, PROPERTECO

In this article, Robert Owen from propertECO explains how radon testing is carried out and how high levels of radon can be mitigated. This information may be useful for clients if a property is found to be in an area where radon levels may be higher than average.

What is radon and what is the risk?

Radon is a very ‘short lived’ element produced by the radioactive decay of radium-226, which is found in uranium ores associated with phosphate rock, shales, igneous and metamorphic rocks such as granite. It is also associated with rocks such as limestone.

Radon is a radioactive gas that you cannot see, smell or taste. Although more normally associated with areas built on rock, such as Cornwall, radon is present at low levels in the soil and probably accounts for the most common background radiation we are exposed to. It can accumulate in buildings and, when it builds up, it can be a serious risk to long-term health.

When we inhale radon, the radioactive elements continue to emit radiation inside our lungs which our lung tissue absorbs, causing localised damage. This damage can progress and result in lung cancer.

> Whilst we are all aware that smoking is the leading cause of lung cancer – did you know that according to the National Cancer Institute, Radon is the second leading cause of lung cancer in worldwide”[1]

Given the risk, Public Health England have provided an online, interactive map which shows where high radon levels are more likely to occur across the UK, but as levels can vary from one building to the next, the most reliable way to find out if a property has high radon levels is to carry out tests.

Radon detectors or radon monitors can take accurate measurements of radon in an individual home, which is a reliable test for identifying high levels of this unwanted natural gas. This means action can be taken to reduce the levels, and therefore reduce the health risk associated with it.

Types of radon testing

Testing for radon can be carried out by using passive tests – where no electrical power is required – or tests using digital devices which monitor radon levels over a longer period.

Passive radon detectors are the more common choice and

1 https://www.ukradon.org/information/riskst

options include a 10-day screening test or a 3-month test.
10-day screening tests are ideal for those who are looking to sell or purchase a property and require quick results to determine the levels of radon in a property. However, 3-month tests consider fluctuations in indoor radon concentrations and therefore provide more accurate results.

It is recommended that at least two radon detectors are used when testing as this allows for readings to be taken in more than one main living area, such as the living room and bedroom. The detectors are then sent to a laboratory where they are analysed, and the results are sent back to the customer.

Digital radon detectors are another form of testing which provide on-site readings of radon levels in the property. These are predominantly used for constant monitoring of radon levels in a property and this method is generally a more expensive, but thorough way of measuring radon levels.

What is considered a high level?

Radon is present everywhere, but exposure to higher levels results in a higher health risk. Radon levels are measured in Becquerels per cubic metre of air (Bq/m^3). If the radon levels are below 100 Bq/m^3 then it is not considered necessary to conduct any mitigation. However, if the levels are in excess of 100 Bq/m^3 then mitigation work will be required to reduce levels of radon.

Properties with basements or cellars are particularly susceptible to higher levels of radon gas as they are underground and therefore closer to the source of radon.

Types of radon mitigation

After the testing period is complete, if the results found a high level of radon, mitigation can be carried out to reduce the radon levels in the property. The two main types of mitigation techniques that can be used are:

- a radon sump
- positive pressure systems

The most preferred method for remediation is using a radon sump. This is where a void is created beneath the property, which then becomes the lowest point of pressure. Any radon present in the soil will be drawn towards the void by suction, created by an electric fan. The gas can then be safely vented away with the assistance of a powered fan, through an exhaust pipe. The exhaust pipe will then vent the harmful radon gas away from the property. It's important that the exhaust pipe is not located near any doors or windows to ensure that the radon gas is not vented back into the building.

Figure 1 - radon sump installation

Figure 2 – example of exhaust pipe

The second form of radon mitigation is installing a positive pressure system. This involves installing fans inside of the property, either in the loft, attic or, if the roof void is not present, the fan can be installed on the internal side of the external wall. This form of positive pressure system works by drawing air from outside of the building and then pushing clean filtered air back into the building. This has the effect of pushing 'stale' air out of the property.

Figure 3 – example of a positive pressure system

New-build properties may already have some measures installed but they may be considered basic levels of protection, such as a modified damp-proof membrane which acts as a radon barrier across the ground floor of the building. A radon sump or ventilation system is a more advanced measure. Whilst a newly built property may have a sump system in place, it may need to be activated by the addition of a fan. To check if a property has preventative measures installed, the homeowner can speak to the builder or check the plans. It is advisable to have tests carried out to check the effectiveness of any measure and ensure radon levels are acceptable.

Before any mitigation is carried out, it is always recommended that a radon specialist surveys the building to understand the layout, size and provide an analysis of the results found from the radon detector.

Once the survey has been conducted, a report and specification will be compiled by the radon specialist. They will also recommend which mitigation system would be best for the property and provide a quotation for the installation of the mitigation system.

Want to find out more?
If you are looking for further information about radon, how it can be treated and the methods of mitigation, you can read more on our website https://www.properteco.co.uk/

BATTERY STORAGE AND PV DIVERTERS

DR LISA BLAKE, TECHNICAL MANAGER, SAVA

Following on from our previous articles about the changes expected in SAP 10, in this article we cover the addition of diverters and battery storage for PV systems in the next version of SAP.

PV in SAP 2012

In SAP 2012, PV is modelled using the power of the system and physical factors such as over shading, orientation and tilt, which then calculated the energy output. It assumed that 50% of the energy generated by PV was used in the home at 13.19 p/kWh and 50% was exported to the grid, at 6.61 p/kWh. There is no recognition of electricity storage or the ability to change the proportion of solar power used in the home.

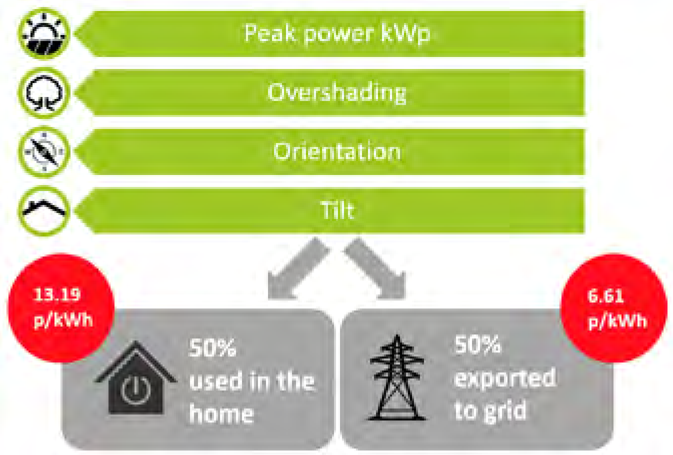


Figure 1 – SAP 2012 model

Overshading

Overshading is caused by buildings or trees that reduce the amount of sunlight hitting the PV panels. It is one of the factors applied to the output calculation for a PV system. There are 4 options:

- Heavy: more than 80% of the sky blocked by obstacles
- Significant: >60-80% of the sky blocked by obstacles
- Modest: 20-60% of the sky blocked by obstacles
- None or very little: >20% of the sky blocked by obstacles

When PV panels are installed by microgeneration certification scheme assessors, the overshading factor is calculated rather than SAP default values used. In SAP 10, these overshading factors have been adjusted to better reflect the overshading factors used by a microgeneration certification scheme assessor. This affects all the options except 'none or very little' and the factors have increased, which results in a reduced energy output from the system.

Solar generation vs demand

Whilst solar PV generates clean energy, the downfall is when generation is not made use of in times when there is high demand. In figure 2 below, the blue line demonstrates the electricity demand for a typical household throughout the day and the yellow line shows the solar energy generated.

As the energy generated from PV peaks around midday and the most demanding times for our energy requirement are mornings and evenings, it would be most efficient to harness the solar power produced during the day to reduce the electricity the household has to draw from the grid and pay for at other times of the day.

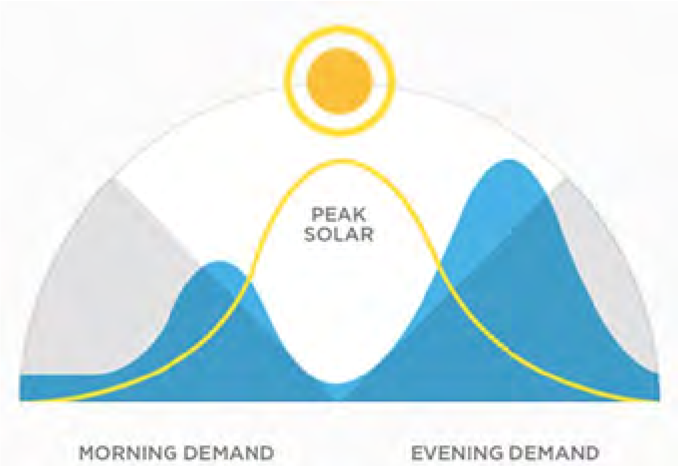


Figure 2 – Source: http://www.teslamotors.com/en_AU/powerwall

Batteries that store the daytime solar power or diverters that use the solar power to heat hot water with an immersion can do just that.

Solar battery storage

A battery storage system can store the surplus energy generated by PV panels which is not required for direct consumption at the time it is generated, resulting in a more efficient use of energy.

In figure 3 below, the small, brown section demonstrates what the household will need to use from the grid before the sun rises. When the sun rises the PV panels can generate energy which is divided up to charge the battery, used for direct consumption, as well as any surplus exported to the grid. In the evenings when peak household demand occurs, the energy stored earlier can be used.

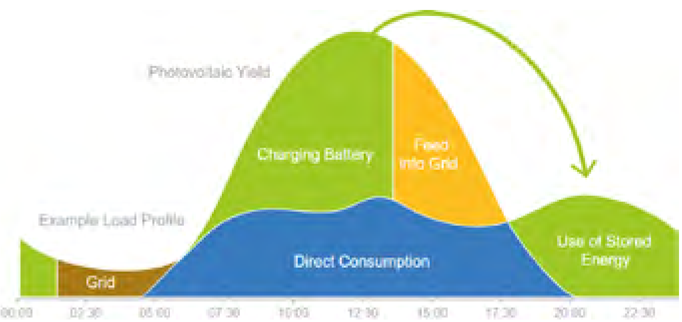


Figure 3

In SAP 10, the calculation will be able to use the battery capacity to adjust the split of energy used in the dwelling and energy exported to the grid.

The maximum capacity for a battery in the SAP model is 15kWh. To put that in context, a 2.5kWp system would produce around 6kWh per day and the average household electricity usage is 8-10kWh per day. When we compared the SAP rating in SAP 2012 and SAP 10 for various PV systems (with overshading set to none so the change to overshading factors had no effect), we found there was an increase of between 2 and 4 SAP points.

A solar battery storage system is separate to a standard PV system. It will have metal casing and is usually around 1m+ tall. Battery storage systems are very heavy so they will likely be located downstairs and, ideally, the surrounding temperature will be above 0°C to avoid the battery using its own power to stay warm, and no more than 25°C to avoid having to use energy to cool (although they are capable operating at temperatures between -20°C to 50°C). The typical cost for a solar battery storage system is approximately £5,000.

It is possible for some battery storage systems to provide backup power should a power cut occur.

Another benefit to battery storage is taking advantage of the 'time-of-use' tariff. A recent concept similar to the Economy 7 tariff, the time-of-use tariff has several different rates split up throughout the day – not just one like Economy 7. Charging the battery from the grid when the grid energy is cheapest and using that energy in the home when grid energy is most expensive, could result in additional savings.

To find out more about battery storage systems, you may find the NHBC guide 'Watts in store? Introduction to energy storage batteries for homes'[1] useful.

PV diverter to immersion

SAP 10 will also include the option for a PV diverter to an immersion.

A diverter senses any surplus electricity and directs it to the immersion heater until the set water temperature is reached. When the hot water temperature is reached the remaining solar generation goes to the grid – without a diverter, all surplus power is sent to the grid. This allows a PV system to charge up the water heating during the day when there is excess solar energy, and the hot water is then ready for use in the evening, reducing the hot water costs on the heating system.

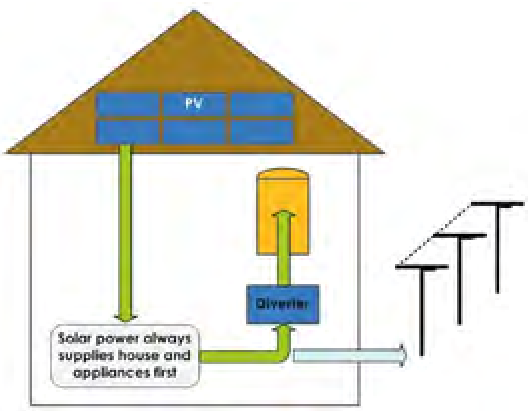


Figure 4

https://www.nhbcfoundation.org/publication/watts-in-store-introduction-to-energy-storage-batteries-for-homes/

If a PV diverter is present, it is likely to be in the same place as the inverter for the PV system that converts the direct current from the PV to alternating current for the dwelling. Remember, a hot water cylinder is required for the property to benefit from a PV diverter. The calculation would reduce the energy required for the water heating.

Our analysis found that inclusion of a PV diverter only increased the SAP rating by 1 point, depending on what proportion of the energy use is for water heating.

Figure 5 – example of a diverter

The cost of a diverter is between £200 to £500.

PV in SAP 10

In SAP 10, the same data about the PV system and its location is required as is required for SAP 2012. The output of the system then takes into account the existence of a battery or diverter, if present, and uses this to adjust the split of exported and used energy.

It is not possible to have both a battery and a diverter in SAP 10 and there is only provision for 'PV' battery storage, not battery storage for storing 'cheaper' electricity.

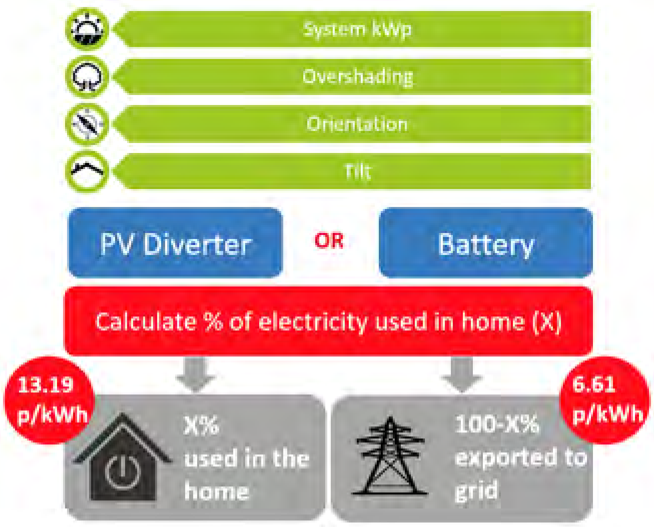
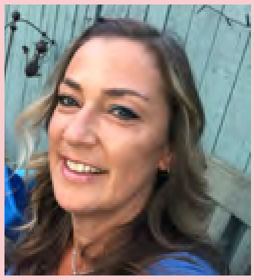


Figure 6 – SAP 10 model

The latest on SAP

SAP 10 has now been superseded by SAP 10.1; however, neither version is used for any official purpose. The Future Homes Standard consultation for changes to Part L and F closed in MARCH and we are waiting for the responses to be published – this will dictate what will be included in SAP 10.2.

Dr Lisa Blake, Technical Manager, Sava Lisa heads up our Technical Team. She joined Sava in 2006 armed with a PhD in Astrophysics and a desire to be part of a company promoting energy conservation. Since joining Sava she has enjoyed getting to grips with the different methodologies used to measure energy efficiency.



CHALLENGES FOR HOUSING PROVIDERS

ANDY FLOOK, BUSINESS DEVELOPMENT DIRECTOR, SAVA

This article discusses the challenges housing providers face with respect to the data and legislative changes and addresses the journey of overcoming the issues presented.

Understanding and complying with the mass of Government papers and legislation driving action on tackling fuel poverty can present a challenge. Across the country there's a push for energy efficient housing stock and maintenance of fair fuel pricing policies, as well as funding mechanisms such as 'ECO' to encourage property improvements. The Clean Growth Strategy has set the scene for the long term aims of decarbonising our working and living environments, and it is without question that most of these legislative drivers are driving behaviour in the right direction, but is this enough? What is especially challenging, is how to pull everything together in a meaningful way that ensures effective progress towards clean growth targets. There is also the need to make appropriate decisions around tackling fuel poverty and draw on any funding opportunities to assist with budgetary constraints for stock improvements.

Seeing the wood for the trees

Housing providers responsible for maintaining properties face a continuous struggle managing their housing data to enable strategic improvement decisions for the stock as a whole, and also considering each property and tenant in isolation. Whilst asset management system software exists to assist, there are a number of points to consider that are vital in successfully managing and improving housing stock, which are:

- the quality of data available
- the effective consolidation of data sets from different sources (e.g. EPCs, Gas Safety certificates, condition surveys, maintenance paperwork etc.)
- confidence in the information collected.

100% data quality, 100% confidence in the data and 100% effective consolidation of data from multiple sources sounds ideal, but for most this has become the holy grail. However, much like any mammoth task, taking small steps in the right direction and consistently striving to increase the percentages in each of these areas can make the vision a reality.

Where to start?

The best place to start is to understand the quality of the data that decisions are made from. Often, the most efficient investment in the early stages can be consolidating and cleansing the data. This allows the confidence to begin forecasting long-term improvement strategies: modelling the carbon savings and energy efficiency impact.

With clean, consolidated data, a simple question like 'how much will it cost to get all of my housing stock to a SAP rating of C by 2030?' can be a useful starting point. Helpfully, along with SAP ratings, EPC data provides recommendations for energy efficiency improvements and includes indicative costings. These can provide a good 'finger in the air' calculation in terms of the capital spend on stock required.

Quality of data

Gathering an accurate insight of the properties by physically going out and inspecting them can often be quite fragmented and does not always provide reliable and consistent information. The probable reason for this is because the individual visiting the property would be capturing the additional data as a by-product of the intended reason for the visit. For example, if a heating engineer visits 7 or 8 properties each day to conduct servicing or maintenance, spending additional time to collect information on the boiler, controls, and any other energy efficiency data would not always be at the top of their agenda. App-based data capture has certainly helped in recent years, but there is still a lot more that can be done. **The power of educating field teams on the importance of accurate data capture – and the consequences of not doing so – should not be underestimated.**

Consolidation of data

For every property within a housing stock there exists a vast quantity of information. Data on each property is not always linked together. For example, data collected during stock condition surveys or boiler maintenance checks can be invaluable in updating energy information. The starting point for this would be to review the energy data and see if there is any more up-to-date information that has been collected for other reasons. Making the most of all the data you hold is key.

Confidence in the information

As well as consolidating and cleansing data, there needs to be confidence in the validity of that data. Is there a compliance process in place to check the data before it is 'filed away' and used to inform decision making? Making effective use of data is a process and the end goal should be in sight. To get started we should be lining up the relevant legislation in front of us and considering all elements appropriately before making any big decisions. During the whole process, your level of confidence in the data from which you act upon, should improve. Many housing providers I speak with haven't quite established enough confidence to rely solely on utilising their asset management systems for making effective decisions around their stock (and I'm sure there will still be a big pile of spreadsheets all over the place acting as an in-house security blanket in the meantime). However, the evolving world of big data means we must all begin working towards a consolidated, single version of the truth. We don't need to look too far back to recall that the majority of the incoming information regarding housing stock that came from void inspections, inventories, improvement work etc., was just written on a piece of paper and often completely illegible. So, on reflection, there has been impressive progress, but there is still much room for improvement, and there is a need to act sooner rather than later to achieve the end goal.

Are there any 'quick wins'?

Assuming the data is consolidated and cleansed and you are satisfied that you have good-quality, accurate data, you could consider undertaking some desktop-based activities that identify easy actions to increase the SAP rating of your stock – all from the comfort of your own desk.
To demonstrate this, I have gathered some examples by utilising 'Intelligent Energy' (Sava's data analysis tool). However, it could equally be achieved with other similar products or even a well organised spreadsheet.

Below is a snapshot of overall SAP bands, based on a stock of 8,000.

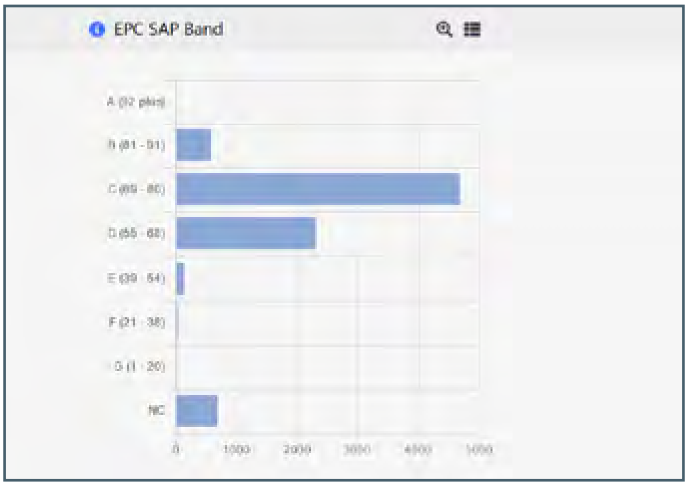


Figure 1

As each SAP band is broken down into specific ratings from 1-100 this information can be used as a starting point to interrogate the data to find opportunities. Some of the properties in SAP band D (55-68) will only be one or two SAP points away from reaching band C. This means you can identify properties that may only require minor measures to push them into the higher band. If we look at figure 2 below, we can see that there are nearly 400 properties which will move into band C with just one more SAP point.

Figure 2

The data can then be interrogated a little further to see the recommended measures that could be applied in order to improve the energy efficiency of the properties and get them into band C. The recommended measures can be analysed to locate the measures that achieve the lowest cost per SAP point increase. Figure 3 below shows one of the many available measures in Intelligent Energy.

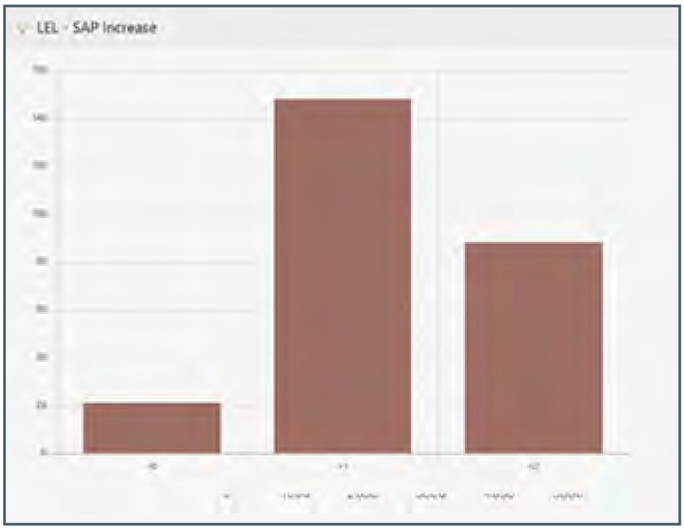


Figure 3

This recommendation is for Low Energy Lights (LEL). It shows there are over 140 homes which will benefit from a 1 SAP point gain and around 90 properties will benefit from 2 SAP points if 100% low energy lights were installed.

The chart in figure 4 shows the cost per SAP point for low energy lights. This is the install cost of the recommendation divided by the SAP point change. A lower figure means the measure would be more cost effective in terms of a SAP point improvement. This SAP point change is a cumulative change and assumes that other recommended measures have been installed.

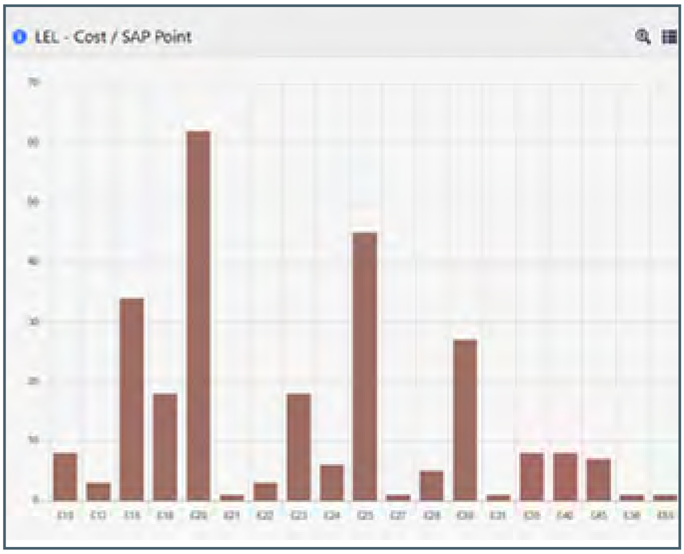


Figure 4

If you choose to issue low energy bulbs to the tenants of these properties (or you are confident that they already have them and the data is incorrect), you can now export the list of properties, update the data and recalculate within your asset management system. This will take over 200 homes into band C in a cost-effective way.

As another example, the lack of a boiler index number (PCDF index) could mean the SAP rating is several points lower than it could be – just by entering this information you could increase the SAP rating, pushing some properties into a higher SAP band.

These are just two examples but there are many other cases that can improve the energy efficiency of your stock by using a similar approach. If this type of analysis is brought into your processes as a part of your overall compliance regime, it will consistently provide you with more confidence in your data as well as moving the SAP ratings in the right direction.

Finding a balance

It goes without saying that there should be a balance between hitting targets and providing warm, energy efficient, healthy homes for tenants. While a plan to improve stock based on quality data analysis can be relatively straightforward, reacting and responding to the needs of the customer and, indeed, the property will also drive a lot of the improvement behaviour. This is where having more confidence in your inherent data can consistently improve homes in the most cost-effective way. For instance, by checking when boiler replacements are taking place, and ensuring that any quick, low-price wins such as low energy lighting or a cylinder jacket being installed during the visit can be beneficial to both the customer, the SAP rating and to the budget.

If you want to find out more about how we can support you with your SAP targets and De-Carbonisation programmes you can get in touch with us on 01908 672787.

Andy Flook, Business Development Director, Sava
Andy Heads Up Our Market development and customer management team. Andy's career started as an apprentice engineer with British Gas, after which he set up his own nationwide engineering training company and certification body for the Energy and Utility industry before joining Sava in 2013.

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